Volume 94 Supplement 1 November 2016 ISSN 0195-6701

Publishing on all aspects of Healthcare-Associated Infection

THE JOURNAL OF HOSPITAL INFECTION

http://www.journals.elsevier.com/journal-of-hospital-infection/

Abstracts of the Federation of Infection Societies (FIS) Annual Conference and the 10th Healthcare Infection Society (HIS) International Conference 2016, 6 – 8 November 2016, Edinburgh

The Official Journal of the Healthcare Infection Society

ELSEVIER

JOURNAL CITATION REPORTS • 2016
2015 IMPACT FACTOR 2.655
©THOMSON REUTERS

Available online at www.sciencedirect.com

ScienceDirect

THE JOURNAL OF
HOSPITAL INFECTION

The Official Journal of the Healthcare Infection Society

Editorial Office 162 King's Cross Road, London WC1X 9DH. Tel: +44 (0)20 7125 0822. E-mail: jhi@his.org.uk

Head Office 162 King's Cross Road, London, WC1X 9DH. Tel: +44 (0)20 7713 0273

President G. L. French **Chairman** E. Ridgway **Secretary** P. Jenks **Treasurer** A. Colville

Aims and Scope

The *Journal of Hospital Infection* is the editorially independent scientific publication of the Healthcare Infection Society. The aim of the Journal is to publish high quality research and information relating to infection prevention and control that is relevant to an international audience.

The Journal welcomes submissions that relate to all aspects of infection prevention and control in healthcare settings. This includes submissions that:

- provide new insight into the epidemiology, surveillance, or prevention and control of healthcare-associated infections and antimicrobial resistance in healthcare settings;
- provide new insight into cleaning, disinfection and decontamination;
- provide new insight into the design of healthcare premises.
- describe novel aspects of outbreaks of infection;
- throw light on techniques for effective antimicrobial stewardship;
- describe novel techniques (laboratory-based or point of care) for the detection of infection or antimicrobial resistance in the healthcare setting, particularly if these can be used to facilitate infection prevention and control;
- improve understanding of the motivations of safe healthcare behaviour, or describe techniques for achieving behavioural and cultural change;
- improve understanding of the use of IT systems in infection surveillance and prevention and control.

We also welcome submissions that relate to national policies or guidelines, especially where the subject matter is of international relevance.

Although our readership is predominantly clinical, we are also pleased to received basic science submissions that have clinical relevance.

All contributions should be submitted online at http://jhi.edmgr.com. Instructions to authors can be found at http://www.journalofhospitalinfection.com/content/author-information or by visiting the journal's home page http://www.journalofhospitalinfection.com/home

The *Journal of Hospital Infection* articles are published electronically on Science Direct with current and forthcoming contents available at http://www.sciencedirect.com

Publication information: *Journal of Hospital Infection* (ISSN 0195-6701). For 2016, volumes 92–94 (12 issues) are scheduled for publication. Subscription prices are available upon request from the Publisher or from the Elsevier Customer Service Department nearest you or from this journal's website (http://www.elsevier.com/locate/jhin). Further information is available on this journal and other Elsevier products through Elsevier's website (http://www.elsevier.com). Subscriptions are accepted on a prepaid basis only and are entered on a calendar year basis. Issues are sent by standard mail (surface within Europe, air delivery outside Europe). Priority rates are available upon request. Claims for missing issues should be made within six months of the date of dispatch.

Orders, claims, and journal inquiries: please contact the Elsevier Customer Service Department nearest you: **St. Louis:** Elsevier Customer Service Department, 3251 Riverport Lane, Maryland Heights, MO 63043, USA; phone: (800) 6542452 [toll free within the USA]; (+1) (314) 4478871 [outside the USA]; fax: (+1) (314) 4478029; e-mail: JournalsCustomerService-usa@elsevier.com. **Oxford:** Elsevier Customer Service Department, The Boulevard, Langford Lane, Kidlington OX5 1GB, UK; phone: (+44) (1865) 843434; fax: (+44) (1865) 843970; e-mail: JournalsCustomerServiceEMEA@elsevier.com. **Tokyo:** Elsevier Customer Service Department, 4F Higashi-Azabu, 1-Chome Bldg, 1-9-15 Higashi-Azabu, Minato-ku, Tokyo 106-0044, Japan; phone: (+81) (3) 5561 5037; fax: (+81) (3) 5561 5047; e-mail: JournalsCustomerServiceJapan@elsevier.com. **The Philippines:** Elsevier Customer Service Department, 2nd Floor, Building H, UP-Ayalaland Technohub, Commonwealth Avenue, Diliman, Quezon City, Philippines 1101; phone: (+65) 63490222; fax: (+63) 23521394; e-mail: JournalsCustomerServiceAPAC@elsevier.com

USA mailing notice: *Journal of Hospital Infection* (ISSN 0195-6701) is published monthly by Elsevier Ltd (The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, UK). Periodicals postage paid at Jamaica, NY 11431 and additional mailing offices.

USA POSTMASTER: Send change of address to *Journal of Hospital Infection*, Elsevier Customer Service Department, 3251 Riverport Lane, Maryland Heights, MO 63043, USA.

AIRFREIGHT AND MAILING in USA by Air Business Ltd., c/o Worldnet Shipping Inc., 156-15, 146th Avenue, 2nd Floor, Jamaica, NY 11434, USA.

Advertising information: Advertising orders and inquiries can be sent to: **USA, Canada and South America**: Elsevier Inc., 360 Park Avenue South, New York, NY 10010-1710, USA; phone: (+1) (212) 633 3794. **Europe and ROW**: European Journal Commercial Sales, Elsevier Ltd., 125 London Wall, London EC2Y 5AS, UK; phone: +44 (0) 20 7424 4259; fax: +44 (0) 20 7424.

Funding body agreements and policies: Elsevier has established agreements and developed policies to allow authors whose articles appear in journals published by Elsevier, to comply with potential manuscript archiving requirements as specified as conditions of their grant awards. To learn more about existing agreements and policies please visit http://www.elsevier.com/fundingbodies

Author inquiries: You can track your accepted article at http://www.elsevier.com/trackarticle. You are also welcome to contact Customer Support via http://support.elsevier.com.

For a full and complete Guide for Authors, please go to:
http://www.journalofhospitalinfection.com/content/author-information

♻ The paper used in this publication meets the requirements of ANSI/NISO Z39.48-1992 (Permanence of Paper).

Printed by Henry Ling Ltd, Dorchester, UK.

Supplement:

Abstracts of the Federation of Infection Societies (FIS) Annual Conference and the 10th Healthcare Infection Society (HIS) International Conference 2016, 6 – 8 November 2016, Edinburgh

Published as Supplement 1, Pages S1-S144, to
Journal of Hospital Infection, Volume 94, November 2016

The Journal of Hospital Infection

VOLUME 94 SUPPLEMENT 1 NOVEMBER 2016

HEALTHCARE INFECTION SOCIETY

Contents

Abstracts of FIS/HIS 2016 — Invited Speaker Abstracts **S1**

Abstracts of FIS/HIS 2016 — Oral Presentations S11

Topic: Antimicrobials and antimicrobial resistance S11
Topic: Antimicrobial stewardship S13
Topic: Clinical cases S15
Topic: Clinical microbiology S16
Topic: Decontamination S17
Topic: Environment S18
Topic: Outbreaks S19

Abstracts of FIS/HIS 2016 — HIS Grants Abstracts **S22**

Abstracts of FIS/HIS 2016 — Poster Presentations **S24**

Topic: Antimicrobials and antimicrobial resistance S24
Topic: Antimicrobial stewardship S34
Topic: Clinical cases S48
Topic: Clinical microbiology S56
Topic: Decontamination S64
Topic: Device related infection S69
Topic: Diagnostics S73
Topic: Education and training S81
Topic: Environment S86
Topic: Fungal infections S89
Topic: General S94
Topic: Immunisation S101
Topic: Outbreaks S103
Topic: Pathogenesis S111
Topic: Surgical site infections S111
Topic: Surveillance and epidemiology S115
Topic: Tropical infections S131
Topic: Viral infections S132

Author Index **S135**

Abstracted/Indexed in: Current Contents, ASCA, Science Citation Index, Infomed, Index Medicus, Medline, EMBASE/Excerpta Medica, Abstracts of Hygiene, Communicable Disease and Tropical Diseases Bulletin and Cumulative Index to Nursing and Allied Health Literature.

Available online at www.sciencedirect.com

ScienceDirect

Journal of Hospital Infection 94S1 (2016) S1–S10

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevierhealth.com/journals/jhin

Abstracts of FIS/HIS 2016 – Invited Speaker Abstracts

Effective guideline implementation – a knowledge mobilisation perspective

Raheela Ahmad. *Imperial College London*

The process of guideline development has changed from being exclusive and closed to being more open and consultative. But at the organisational level, impact of guidelines only occurs when knowledge of what is 'acceptable' is re-negotiated collectively within and across professional groups and teams.
This session will draw upon methods of knowledge mobilisation (knowledge transfer, translation, exchange and co-production) to help inform effective guideline implementation for infection prevention, control (IPC) and antimicrobial stewardship. Assessments of the structural, process and cultural environments for effective knowledge mobilisation from research in England will be shared.
Thinking towards future directions for IPC and antimicrobial stewardship, two main themes will be presented: a. the extent of guideline consistency at national and organisational levels across the health economy and, b. the potential role of service users across the healthcare system.

Case 4: Mycobacterium Avium Intracellulare in Heart valves – description of a cluster and what do we do now?

Matthijs Backx. *Infectious diseases and microbiology, Public Health Wales*

During 2014–15, PHE were notified of seven European cases of Mycobacterium chimaera endocarditis or deep infection following cardiac surgery, six cases in Switzerland and one in The Netherlands. Both countries have attributed the infections to organisms in the heater cooler unit (HCU) of the cardiopulmonary bypass equipment. In February 2015 PHE convened a multi-agency incident management team to investigate whether patients in the UK were potentially at risk of M. chimaera from contaminated HCUs. Case finding is complete in England and Wales and identified 17 patients with infections due to M. avium complex following cardiothoracic surgery in 10 different NHS trusts.
In view of the essential nature of heater cooler units and the fact that it is not currently possible to totally eliminate risks associated with their use, NHS England and MHRA require providers to take all reasonable steps to mitigate these risks. This includes explicit compliance with HSE requirements and PHE or MHRA guidance. A Field Safety Notice was issued by the manufacturers of the Sorin HCU in June 2015, updating the decontamination regime for HCUs and recommending microbiological monitoring and removal of highly contaminated devices from service. What have been the implications of these recommendations?

Infection control and antimicrobial resistance; suitable topics for guidelines?

Mark Baker. *Centre for Guidelines, National Institute for Health and Care Excellence (NICE)*

This session will describe the process by which Guideline topics were referred to NICE and how the guidelines were developed. It will include an update on the current content of relevant guidance and the plans to develop the portfolio in the future. Links will be made to the CMO (Dame Sally Davies) report and the subsequent five year strategy on reducing antimicrobial resistance.

Vector-borne infectious disease migration in the 21st century: are we prepared?

Matthew Baylis. *Veterinary Epidemiology, University of Liverpool, UK*

The end of the 20th and start of the 21st centuries have seen unprecedented emergence of vector-borne diseases in Europe. Lyme disease and tick-borne encephalitis are spreading and increasing in incidence. Cases of Crimean Congo Hemorrhagic fever have appeared. There have been outbreaks of mosquito-borne diseases such as dengue, chikungunya and malaria, and Zika threatens us in 2016. There has been an even more dramatic emergence of vector-borne diseases of animals. Bluetongue, a viral disease of ruminants, has occurred over most of Europe, including the UK, and caused the deaths of millions of sheep. Schmallenberg, a new viral disease, appeared in 2011 and caused vast numbers of birth defects in cattle and sheep across the continent. African swine fever, a devastating disease of pigs, is currently spreading in Eastern Europe and slowly moving west.
These dramatic events have been driven by numerous factors – social, demographic and environmental. They are facilitated by climate change, helping vectors to survive, spread and transmit disease.
This presentation will review the greatest challenges to the UK, assess their causes and describe what we can do – perhaps – to mitigate the threat.

The respiratory microbial ecosystem in health and disease

Debby Bogaert. *Paediatric Infectious Diseases, University of Edinburgh*

Microbial communities have co-evolved with humans for millions of years. They inhabit all surfaces of the human body, including the respiratory tract. Specific sites harbor specialized bacterial communities and it is increasingly recognized that these different micro-ecosystems play a major role in maintaining human health. The respiratory tract is a complex organ system which primary role in human physiology is the exchange of oxygen and carbon dioxide. The human airways are colonized with niche-specific bacterial communities: it is increasingly recognized that one of their main functions might be to prevent respiratory pathogens from gaining a foothold on the mucosal surface and spreading to the lower respiratory tract. Current research addresses how the healthy URT microbiome is established, and what ecological and environmental factors direct early and subsequent development of respiratory microbial communities. Moreover, we focus on the relationship between respiratory microbiota development and maintenance of respiratory health.

Successful application of behaviour change principles in IPC interventions

Michael Borg. *Infection Control, Mater Dei Hospital, Malta*

Microbial communities have co-evolved with humans for millions of years. They inhabit all surfaces of the human body, including the respiratory tract. Specific sites harbor specialized bacterial communities and it is increasingly recognized that these different micro-ecosystems play a major role in maintaining human health. The respiratory tract is a complex organ system which primary role in human physiology is the exchange of oxygen and carbon dioxide. The

human airways are colonized with niche-specific bacterial communities: it is increasingly recognized that one of their main functions might be to prevent respiratory pathogens from gaining a foothold on the mucosal surface and spreading to the lower respiratory tract. Current research addresses how the healthy URT microbiome is established, and what ecological and environmental factors direct early and subsequent development of respiratory microbial communities. Moreover, we focus on the relationship between respiratory microbiota development and maintenance of respiratory health.

Impact of the changes – endoscope decontamination

Christina Bradley. *Hospital Infection Research Laboratory, Queen Elizabeth Hospital Birmingham*

The Advisory Committee on Dangerous Pathogens (ACDP) published revised guidance for the management of medical devices in relation to reducing the risk of transmission of TSE related diseases in February 2015. This included revision to Annex F for endoscopy. More recently the Department of Health England have revised CFPP 01-06 (now HTM 01-06) to take account of these revisions and have included more information on the use of endoscope storage cabinets along with advice on residual protein testing, advice on decontamination of ERCP endoscopes and choledochoscopes etc. It is accepted that the assessment of cleaning is vital so the weekly testing schedule now includes the use of a process challenge device. The ACDP guidance recommends that endoscopes are reprocessed as soon as possible after use and HTM 01-06 puts a timeframe of 3 hours from use to the completion of the decontamination process. This and other changes to the advice on endoscope decontamination and the possible impact will be discussed.

Quality indicators and HAI prevention and control: experiences and perspectives

Silvio Brusaferro. *Hygiene and Public Health, University of Udine, Italy*

Quality and safety are currently essential characteristics required to healthcare organizations and to their professionals. Nevertheless how to measure and report quality and safety is still a debated issue. Although many experiences using different measures and indicators have been reported, a clear evidence about their role in increasing safety and quality is still lacking. Healthcare Associated Infections (HAI) because of their long tradition of measurement, because of the recognized role of an organization wide approach in their reduction and control, because of the evidences about the most effective ways to prevent them as well as for their impact in term of morbidity, mortality, litigations an costs, have been included in almost all available tools and systems for quality and safety evaluation in healthcare. There are also many experiences trying to agree about meaningful indicators related to HAI prevention and control as well as to Antimicrobial Resistance. The demand of quality and safety indicators in healthcare organizations is increasing supported by citizens, policymakers, insurers and professionals. Nevertheless more research is needed to define indicators focused on outcome more than on intermediate endpoints, targeted to different healthcare settings, meaningful to a patient centered perspective and linked to improvement in health outcomes.

Fusobacterium necrophorum*: a greater cause for concern in adolescents and young adults than group A *Streptococcus

Robert Centor. *Internal Medicine, University of Alabama at Birmingham*

Over the past 15 years, a series of studies have established that the gram negative anaerobe – Fusobacterium necrophorum – causes adolescent and young adult pharyngitis. The increasing incidence of the Lemierre syndrome (pharyngo-tonsillitis followed by rigors, suppurative internal jugular vein thrombophlebitis and septic emboli) spurred these investigations. More recently, several groups (including ours) have shown that Fusobacterium pharyngitis has the same clinical characteristics as strep pharyngitis, and occurs at least as often (and possibly more often) as a cause of pharyngitis in the 15–30 age group. Epidemiological studies from Denmark provided the data necessary to simulate the likely risk of Fusobacterium pharyngitis compared with the risk of strep pharyngitis. In an opinion piece I compared the risks of the Lemierre syndrome (from Fusobacterium pharyngitis) with the risk of acute rheumatic fever (from strep pharyngitis). I did not include peritonsillar abscess, although more recent data implicates F. necrophorum as the most common cause of PTA in this age group. The simulation provides evidence that for this age group, untreated Fusobacterium pharyngitis has greater risk of both mortality and morbidity than untreated strep pharyngitis.

Is behavioural science the real driver for improving effective antimicrobial prescribing?

Peter Davey. *University of Dundee Medical School*

The pressing need to measure and improve antibiotic use was recognised >40 years ago, so why have we failed to achieve sustained improvement at scale? Failure in medicine is largely due to ineptitude (failure to use existing knowledge) rather than ignorance (lack of knowledge). Consequently, it is notable that most interventions to improve antimicrobial prescribing are either designed to educate individual practitioners or patients about policies or to restrict prescribing to make practitioners follow policies. Interventions that enable practitioners to apply existing knowledge through decision support, feedback and action planning are relatively uncommon. There is an urgent need to improve the design and reporting of interventions to change behaviour. However, achieving sustained improvement at scale will also require a more profound understanding of the role of context. What makes contexts receptive to change and which elements of context, under what circumstances, are important for human performance? Answering these questions will require interdisciplinary work with social and behavioural scientists to integrate complementary approaches from human factors and ergonomics, psychology, education and organisational research.

Case 1: Acinetobacter outbreak in the Neonatal Unit – Are you ready for this?

Eleri Davies. *IP&C Cardiff and Vale UHB; HCAI Programme Public Health Wales, Public Health Wales NHS Trust*

The whole session is focussed on real infection prevention and control challenges experienced over the last few years. The Acinetobacter outbreak on a Neonatal unit will be presented to focus on the practical challenges faced in managing an outbreak of this nature, with an opportunity for brief discussion of controversial points.

Treatment of hepatitis B and C in children: catching up?

Suzanne Davison. *Paediatric Hepatology, Leeds Teaching Hospitals NHS Trust*

Eradication of HCV by 2030 and reduction of disease burden of HBV are national and global targets. To achieve these, affected individuals need identifying and referring for appropriate management. This entails a detailed assessment of host, virus and disease, and availability of treatment. Treating children has additional challenges. Most acquire infection perinatally with a high rate of chronicity. Disease manifestations are usually mild. Infection may therefore be unrecognised or specialist referral deemed unnecessary. However, treating children with early infection may improve response and reduce transmission. Another issue is that since relatively few children are infected compared to adults, clinical trials may be perceived as more challenging and less rewarding. As improved therapies emerge rapidly, delay in paediatric trials may lead to a drug being superseded prior to study conclusion. Approach to viral hepatitis in children is now 'catching up'. Concentration of expertise and a co-ordinated approach through clinical networks provides access to specialist care. European Medicines Agency has facilitated development of medicines for children. In 2016, results of the first paediatric trials of interferon-free regimes for HCV are emerging,

current treatments for HBV in adults are licensed for children, and trials of treatment for children during HBV 'immunotolerance' have commenced. Future challenges include improved screening and prevention through immunisation.

EU COMBACTE Group – Combatting Bacterial Resistance in Europe in a public-private partnership

Ron De Winter, Miquel Ekkelenkamp. *European Projects, University Medical Center Utrecht (UMCU)*

As part of its Action Plan against the rising threats from Antimicrobial Resistance, the European Commission initiated the New Drugs 4 Bad Bugs (ND4BB) programme. ND4BB kicked off in January 2013 with the COMBACTE-project, aimed at improving the efficiency of research and development of new antibiotics through open sharing of knowledge between pharma industry and academia, and addressing the barriers to clinical development of antibiotics. Crucially, the COMBACTE will generate innovative trial designs to facilitate the registration of novel antibacterial agents. This collaboration is currently supporting over fifteen international trials, involving both (registration) clinical trials with drugs under development and investigator-initiated research. One of the backbones of COMBACTE is CLIN-Net, which aims to become a premier Europe-wide network of hospitals prepared for and experienced in performing high-quality clinical studies. The ultimate goal is to create a self-sustaining organization active in all European countries. CLIN-Net has an up-to-date portfolio of clinical trial sites in all European countries that maximizes efficiency of site selection and study performance. Alongside, LAB-Net has been established: a pan-European laboratory network to deliver epidemiological and microbial surveillance data to guide the selection of clinical trial sites. To this end, COMBACTE tries to collaborate as much as possible with already existing (national) networks.

Tuberculosis – new therapies/trials, and the management of MDR and XDR TB

Martin Dedicoat. *Infectious Diseases, Heart of England Foundation Trust*

This session will discuss the basis for current X/MDRTB treatment regimens. New drugs and repurposed drugs will be discussed. A brief summary of ongoing trials and the TB drug pipeline will be outlined. The main learning outcomes will be 1. How to design an X/MDRTB regimen 2. Using genetic and phenotypic resistance data 3. The place of the new X/MDRTB drugs in patient management 4. Future X/MDRTB drug regimens.

Case 3: Faecal transplant – When the drugs don't work – But can we set it up in our centre?

Rishi Dhillon. *Public Health Wales Microbiology, Cardiff*

Faecal Microbiota Transplantation (FMT) is a widely recognised and accepted treatment strategy for recurrent Clostridium difficile infection. However there are still significant barriers to implementing such a service. This talk will explore some of the practical considerations required to be taken into account when setting up a FMT service.

Typhoidal/non-typhoidal enteric fever in sub-Saharan Africa and the recent typhoid outbreak in Blantyre Malawi

Nicholas Feasey. *Liverpool School of Tropical Medicine*

Serovars of Salmonella enterica number amongst the most common causes of bacterial bloodstream infection (BSI) in sub-Saharan Africa (SSA). Nontyphoidal serovars have been identified as major causes of BSI, or invasive Nontyphoidal Salmonella (iNTS) disease across SSA in association with HIV, malaria and malnutrition, whilst there is disagreement about the burden of Typhoid. Both Typhoid and iNTS disease typically present with non-focal sepsis, therefore diagnostic microbiological facilities, in short supply in SSA, are necessary for identification. MLW has conducted longitudinal bacteraemia surveillance in Blantyre, Malawi since 1998, enabling the identification of three epidemics of multidrug resistant invasive Salmonella disease and facilitating a number of major genomic studies of invasive Salmonella disease, which have identified novel clades of S. Typhimurium and S. Enteritidis. Recent studies from across SSA have started to clarify the true burden of both iNTS disease and Typhoid, revealing that the different serovars are in both geographical and temporal flux. Mortality from iNTS disease was recently at 390,000/year in 2010. Many questions remain unanswered; there have been no clinical endpoint studies of the management of iNTS disease, and the precise role that vaccines, WASH strategies and treatment play in the control of these conditions remains to be determined.

Recent discoveries around a novel typhoid toxin

Malick Gibani. *Oxford Vaccine Group, University of Oxford*

The typhoid-toxin is a recently identified exotoxin expressed by Salmonella Typhi. Converging lines of evidence suggest that typhoid-toxin may have a central role in the pathogenesis of typhoid fever and could account for the host-restriction properties of typhoidal Salmonella. In addition, typhoid-toxin is a strongly immunogenic antigen following natural infection, raising the intriguing possibility that typhoid-toxin could be a promising vaccine candidate for Salmonella Typhi. The lack of a meaningful animal model has, to-date, hampered the ability to explore this hypothesis in a biologically relevant host. A human challenge model for typhoid fever has recently been established by the Oxford Vaccine Group, providing a platform to study host-pathogen interactions in a controlled setting. In this talk, we will review evidence for the role of typhoid-toxin in the pathogenesis of typhoid fever and will present data from the human challenge model describing the host immune response to the typhoid-toxin. We will describe how the human challenge model is being applied to further investigate its role, by undertaking human challenge with a typhoid-toxin deficient strain of Salmonella Typhi. In addition, we will describe the regulatory requirements and processes involved in establishing human challenge models using genetically modified strains of bacteria.

Viral infections in neonates

Paul Heath. *Paediatric Infectious Diseases, St Georges University of London*

Although viral infections in the neonatal unit (NU) are likely to be more common than currently recognised, especially as causes of 'neonatal sepsis', there are several that are of particular importance. Neonatal HSV is a rare but increasing cause of disease and disability yet there is uncertainty as to the optimal strategy for prevention. Congenital CMV is also associated with controversy: who should be treated? How can it be prevented? What about treatment of postnatally acquired CMV? The evidence base on which to base decisions is unfortunately poor. Respiratory virus outbreaks on NNUs are well described with RSV, enterovirus and adenovirus most common and influenza surprisingly rare. Prevention of virus infections by intensifying hygiene measures and cohorting infected infants should be a major goal for NUs, as well as more common use of virus diagnostics. Healthcare-worker vaccination against influenza is essential and encouragement of vaccination of pregnant women with influenza vaccine is important. A maternal RSV vaccine is currently in phase III trials and offers promise in preventing the burden of this disease in young infants.

The global challenges of typhoid and invasive non-typhoidal salmonella disease in 2016

Robert Heyderman. *Infectious Diseases & International Health, Division of Infection & Immunity, University College London*

Salmonella enterica is a leading cause of invasive bacterial disease among adults and children worldwide. However, although described in the 1800s, invasive Salmonella infection (typhoid fever or invasive

nontyphoidal Salmonella) has largely not been seen as a public health priority. Over the coming years, life-threatening Salmonella disease will become even more prominent as highly effective protein-conjugate vaccines against Haemophilus influenzae type b (Hib), Neisseria meningitidis, and Streptococcus pneumoniae are widely introduced. In this context, there remain large gaps in our knowledge of Salmonella disease pathogenesis, routes of transmission, and infection reservoirs. Many still hold to the established dogma that nontyphoidal Salmonella largely causes self-limited enterocolitis and that animals are a likely reservoir. It is frequently argued that since typhoid fever is associated with a relatively low mortality rate, there is a low burden of illness. Recently, high throughput whole genome sequencing has shown how the complex epidemiology and host adaptation amongst different Salmonella serovars is reflected in the bacterial genome, revealing putative pathways for the spread of Salmonella and the origin of multidrug resistance. With the appropriate epidemiological context and novel diagnostics, it is hoped that we will be able to finally unravel the mysteries of invasive Salmonella disease.

Update on ESPAUR

Susan Hopkins. *Infectious Diseases and Healthcare Epidemiology, Royal Free London and Public Health England*

The English Surveillance Programme on Antimicrobial Use and Resistance (ESPAUR) was established by PHE in 2013 in response to the cross-government UK five-year antimicrobial resistance (AMR) strategy. The aim of the programme is to develop and maintain robust data for antimicrobial use (AMU) and resistance, in order to optimise antimicrobial prescribing across healthcare settings and measure the impact of AMU and antimicrobial stewardship (AMS) on AMR and patient safety. The programme has established and improved surveillance data; published annual reports with greater data granularity over time; AMR indicators are available to professionals and public through http://fingertips.phe.org.uk/profile/amr-local-indicators. It has performed and published an assessment of AMS activities and implementation of AMS toolkits. It has worked with NHS England to develop and enable data collection to improve AMS as part of NHS incentive schemes. ESPAUR launched the 'Antibiotic Guardian' campaign to drive changes in public and professional behaviour around AMU -more than 32,000 people have engaged with this campaign. In collaboration with Health Education England ESPAUR has scoped and developed implementation options related to education and training of healthcare professionals for antimicrobial prescribing and stewardship competencies. Half way through the AMR strategy (2013–2018), ESPAUR is on target to meet its challenging objectives.

An update in anaerobic microbiology: Relevance to clinical practice

Harriet Hughes. *Microbiology and Infectious Diseases, University Hospital of Wales, UK*

Anaerobes play an important role in clinical infection, with significant associated morbidity and mortality. Logistical difficulties in obtaining appropriate clinical specimens in a timely manner, together with technical difficulties of traditional diagnostic methods have resulted in a relatively low rate of culture of clinically significant organisms. The impact of this, together with the difficulties of susceptibility testing in many laboratories, means that anaerobic infections risk being under-diagnosed and inappropriately treated. The use of new diagnostic techniques in the routine clinical laboratory over recent years however, has resulted in increased identification of anaerobic pathogens in different clinical scenarios, and is shifting our understanding of the role of these organisms in clinical infection. Molecular techniques not yet routinely available are pushing this understanding further. Alongside this, identification of resistance mechanisms and susceptibility profiles of these organisms can be used to direct specific therapy and inform future empirical antibiotic choices. This talk will highlight the changes to routine diagnostic methods for anaerobes, and discuss how this has impacted on the range of anaerobic infections being diagnosed in our hospitals. It will also discuss the trends in local resistance patterns and how this may affect future empirical antibiotic choices. Finally, it will consider future challenges and solutions in the field of clinical anaerobic microbiology.

Infection control and antimicrobial resistance: what guidance is there and how should it be used?

Peter Jenks. *Microbiology, Plymouth Hospitals NHS Trust*

There is a multitude of guidance on infection control and antimicrobial resistance, so much so that one is almost spoilt for choice. Good quality guidance that is soundly evidence-based can promote the provision of excellent clinical practice and support quality improvement schemes. When used to guide decision making, they can also deliver efficiencies in clinical service provision and facilitate negotiation with commissioners. However, there are many areas of infection prevention and control practice where good quality evidence is lacking. While expert best practice guidance covers many of these areas, it is here that the practitioner needs to use their professional expertise and judgement. This presentation will describe the different guidance available on infection control and antimicrobial resistance and discuss how these might be used both clinically and strategically.

The impact of climate on healthcare-associated infections

Martin Kiernan. *University of West London*

This paper will review the literature on the effect of climate on healthcare-associated infections, drawing a distinction between seasonality and weather. Changes in meteorological factors can promote pathogen propagation and spread, and in patients, induce decreased immune function of patients. Temperature and humidity are important factors and have some influence on HCAIs. There is some evidence of seasonality for viral infections such as influenza and bacterial infections such as Legionella however there are also seasonal aspects to healthcare-associated infections such as gram-negative, staphylococcal and surgical site infections. The possible factors for this will be explored and discussed however seasonality (summer) and higher temperature (weather) do seem to be associated with higher rates of gram-negative healthcare-associated infection.

Infections in burns patients

John Kinsella. *Intensive Care Medicine, University of Glasgow*

Although burns are recognized to have a high mortality much of this mortality occurs in the Prehospital phase. As a consequence in hospital mortality is surprisingly low with typical mortalities from major centres in the low single figure percentages. Burn mortality is also falling, with an approximate 10% reduction in fires, burn casualties and mortality annually. Burn morbidity remains high, with long hospital stays, repeated procedures and multiple complications. Burn wound infections and sepsis increases the risk of mortality, impairs wound healing, increases graft failure and prolongs hospital stay. The diagnosis of burn wound infection is not simple, and relies on clinical appearances, markers of infection along with laboratory confirmation that is difficult to interpret. The earl y excision of burn wounds with grafting and coverage with synthetic materials appears to be reducing infection risk. Good epidemiological evidence now exists to demonstrate typical patterns of infect, particularly with gram-negative organisms that should lead to more accurate blind antibiotic regimens. The lecture will cover: · The current epidemiology of burns, · Burn outcomes, · The current Scottish burn care service · Typical patterns of infection in burn patients · Research challenges.

An update on non-tuberculous mycobacteria (NTMs)

Ian Laurenson. *Scottish Mycobacteria Reference Laboratory*

To Follow: Non tuberculous mycobacteria occur widely in the environment but many can cause significant clinical infections as well as contaminating samples and equipment. I will endeavour to summarise some of the key current issues and in healthcare.

Fundamentals of behaviour change

Carmen Lefevre. *University College London*

The importance of behaviour in preventing the spread of infection is increasingly recognised. For example, appropriate hand hygiene, correct use of protective gloves and clothing, and cleaning procedures, some of the key measures in preventing infection spread according the WHO, are all behaviours. For such measures to be effectively implemented we require a good understanding of what is required for a person to perform each behaviour. The most effective interventions to change behaviour target multiple parts of the health care system, including health care professionals, patients, and the public. Behavioural science provides methods for understanding behaviours and their influences, and for developing interventions that are most likely to be effective in their contexts. This talk will outline evidence-based principles of behaviour change and a systematic method for designing interventions to change behaviour. This involves defining a clear target behaviour, conducting a behavioural analysis to identify the facilitators and barriers of the target behaviour, and identifying the most suitable behaviour change techniques for the context. The talk will illustrate how these principles and methods can be applied to infection prevention, using examples of improving hand-hygiene and adherence to the 'Sepsis 6' guidelines in hospitals.

Resistance epidemiology update: new and old friends

David Livermore. *Medical Microbiology, University of East Anglia*

Old friends might be the wrong term in context, but the UK's ESBL and carbapenemase problems show no sign of diminishing. Rather, the proportion of carbapenemase producers with OXA-48-like carbapenemases is expanding and local transmission of these, and of isolates with NDM carbapenemases, is increasingly important. Multidrug-resistant serotype 15A pneumococci, which are not covered by any conjugate vaccine, continue to represent an expanding problem.
New resistance concerns include Enterobacteriaceae and *P. aeruginosa* with GES carbapenemases, which are difficult to recognise from phenotypes, also a few *Salmonella* and *E. coli* with the plasmid-mediated MCR-1 colistin resistance, though these are greatly outnumbered by isolates with mutational resistance. *P. aeruginosa* with VEB ESBLs are regular imports, best recognised by strong ceftazidime-clavulanate synergy. They are highly clonal. Regularly seen too are *K. pneumoniae* that have resistance to ceftazidime and cefepime, variable resistance or susceptibility to cefotaxime, together with reduced carbapenem susceptibility; ceftazidime-avibactam synergy is apparent but no relevant β-lactamase activity has been found, leaving their mechanism(s) an ongoing mystery. Lastly, a clonal outbreak of gonococci with high-level azithromycin resistance continues to cause concern: isolates were initially localised around Leeds, but have now spread into the Midlands and Southern England.

Investigator-led clinical infection research in the NHS: ARREST and ARK-Hospital

Martin Llewelyn. *Infectious Diseases, Brighton and Sussex Medical School*

The evidence we rely on to guide antibiotic treatment recommendations is remarkably weak. Better evidence is needed if we are to safely reduce unnecessary antibiotic use, particularly of broad-spectrum agents. With CRN support NHS clinicians can make a substantial contribution to research in this area. This is well illustrated by recent experience of the ARREST trial. ARK-Hospital is a new NIHR-funded research programme with the potential to dramatically reduce antibiotic overuse in NHS hospitals. By incorporating studies like ARREST and ARK-Hospital into our clinical practice we can ensure research is not merely completed but also impacts on our practice for the benefit of our patients.

HIV and ARVs: their impact on exposed uninfected children

Hermione Lyall. *Infectious Diseases, Imperial College Healthcare NHS Trust*

The number of HIV exposed uninfected (HEU) children born to HIV infected women now greatly outnumbers those few who are infected, an excellent consequence of worldwide PMTCT programmes. For more than 20 years, foetal exposure to antiretrovirals (ARVs) in utero has continued to increase, with over time, longer exposure and many different drug combinations. The possible effects of ARV in-utero exposure have to be considered on a complex background of the maternal, foetal and infant environment with consideration for: maternal immune function/activation; genetics; other infections; other drugs; smoking; prematurity; breast feeding and nutrition; and whether it is a resource rich or poor setting. Ideal studies should include all three groups: HIV unexposed uninfected (HUU); HEUs and HIV exposed infected (HEI) infants, unfortunately there are very few such large well controlled studies. Evidence for effects on mortality, congenital anomalies, cancers, infections, immune function, mitochondrial function, organ function and growth & development will be discussed. Specific drug associated toxicities will also be cited. The need for new epidemiological ways to follow up of HEU children, especially in resource poor settings, where the majority live, will be highlighted.

Is the Swedish and Finnish surveillance system a good indicator for quality?

Birgitta Lytsy. *Department of Clinical Microbiology and Infection Control, Uppsala University Hospital*

The Swedish Association of Local Authorities and Regions (SALAR) is an politically and economically independent employers' organisation that represents and advocates for local government in Sweden. All of Sweden's municipalities, county councils and regions are members of SALAR. SALAR represents and acts on their initiative. In 2008 SALAR initiated the national point-prevalence survey of health-care associated infections (HAI) that is still running twice a year and is mandatory for all regions. In 2013 SALAR implemented a national system for continous incidence surveillance of HAI. The Swedish surveillance system is semi-automated and similar to the Finnish system SAI. The presentation will describe how the Swedich surveillance system is built up, how it works, describe the data compiled with its advantages and limitations.

Surveillance of antimicrobial use and resistance in Scotland

William Malcolm. *NHS National Services Scotland*

The UK Five Year Antimicrobial Resistance Strategy (2013–2018), co-ordinated in Scotland through the Controlling Antimicrobial Resistance in Scotland (CARS) group calls for better access to and use of surveillance data and improved data linkage. Moreover, the UK strategy highlights that linked data on bacterial resistance, epidemiology of infection, antibiotic use and clinical outcome are required to assess the intended and unintended impact of antimicrobial stewardship interventions. This short presentation will give an overview of the arrangements for surveillance of antimicrobial use and resistance in Scotland. The presentation will consider where the data comes from and how it is managed but the key focus will be on how the information is used to drive improvements in the antimicrobial stewardship programme co-ordinated by the Scottish Antimicrobial Prescribing Group. The presentation will also cover details of how the NHS Scotland Infection Intelligence Platform aims to support clinicians to improve outcomes and reduce harm for patients with or at risk from infection through enhancing and linking infection information held within NHSScotland in a single secure platform.

Introduction to the NIHR CRN Infection Specialty Group

Jane Minton. *Infectious Diseases, Leeds Teaching Hospitals NHS Trust*

The NIHR Clinical Research Network provides the infrastructure in England to enable the NHS to participate in high-quality clinical research so that people can benefit from new and better ways of treatment. NIHR CRN provides support to researchers to set up clinical studies quickly and effectively; collaborates with the life-sciences industry to deliver their work programmes; provides health professionals with research training; and works with patients to ensure they are at the centre of all research activity. The NIHR CRN comprises 15 Local Clinical Research Networks covering England, each one delivering clinical research across 30 clinical specialties. Each Specialty Group consists of representatives from the regions in England and the devolved nations and other stakeholders such as Public Health England. The Infection Specialty Group supports and promotes research in Microbiology, Infectious Diseases and Genitourinary Medicine by supporting studies on the NIHR Portfolio. These cover a wide range of topics including antimicrobials, diagnostics, and vaccines and include both interventional and observational projects. We also support investigators and other stakeholders planning new Infection studies to ensure that those studies will address patients' needs and can be successfully delivered in the NHS.

Zika: the evolving outbreak of an old infection

Dilys Morgan. *Emerging Infections and Zoonoses, Public Health England*

Zika is a mosquito-borne viral infection principally transmitted Aedes aegypti mosquitoes. Infection is often asymptomatic or generally mild with symptoms similar to, but usually milder than dengue or chikungunya virus. In 2007, an epidemic occurred in Yap Islands in the Pacific Ocean, causing 5,000 infections. Outbreaks were then notified in several islands of the Pacific region in 2013 and 2014. Cases of Zika infection were first reported in Brazil from February 2015 onwards and by August 2016, 56 countries were reporting autochthonous transmission in the last three months An association between Zika infection in pregnancy and foetal microcephaly was first reported in October 2015 following a large increase in cases of microcephaly in Brazil. Based on a growing body of research, there is an international scientific consensus that Zika virus is a cause of microcephaly and other congenital anomalies (congenital Zika syndrome). Cases of Guillain-Barré Syndrome following suspected or confirmed Zika virus infection have also been reported. Although Zika virus was identified in 1947, new developments related to the disease and transmission continue to reported. This produces challenges for ensuring that guidance for travellers and their contacts who may be at risk of Zika infection remains consistent with the latest scientific evidence

From zero to hero

Sara Mumford. *Infection Prevention and Control, Maidstone and Tunbridge Wells NHS Trust*

In 2006 Maidstone and Tunbridge Wells NHS Trust had one of the largest C. difficile outbreaks in the UK. The subsequent Healthcare Commission report was published in October 2007. Over the last 10 years the Trust has successfully defined and implemented a successful Infection Prevention strategy which has taken the Trust from the worst fifteen Trusts for C. difficile rates to the highest performing fifteen with a rate of infection last year of 7.4 per 100 000 bed days. The strategy has been underpinned by a staff engagement and education programme, together with innovative practice and true Board to ward accountability and responsibility. In this presentation I will share some of the highs, lows, innovations and lessons learned of the Trust′s journey to turnaround its infection prevention performance and discuss the key drivers of our success.

Novel educational solutions to drive better prescribing – evidence of effectiveness?

Dilip Nathwani. *Ninewells Hospital and Medical School*

The critical role of education in supportive prudent prescribing is well recognised. This presentation will focus on the role of educational solutions in the context of antimicrobial stewardship. Key topics will include: 1. Why education delivery in the workplace can be so complex and challenging? 2. The educational needs of medical students and healthcare professionals 3. the governing principles of educational programmes and a framework for educational competency for stewardship 4. Evidence of the effectiveness of traditional and novel educational solutions in the context of prescribing 5. Review the experience and impact of e-learning interventions including the MOOC [https://www.futurelearn.com/courses/antimicrobial-stewardship] and the evolving concept of space learning.

Update on the epidemiology of MERS

Ali Omrani. *Infectious Diseases, King Faisal Specialist Hospital and Research Centre, Riyadh*

Since its first description in September 2012, over 1,700 laboratory-confirmed cases of Middle East Respiratory Coronavirus (MERS-CoV) infections have been notified to the WHO. The clinical spectrum of MERS-CoV infection in humans ranges from an asymptomatic or mild respiratory illness to severe pneumonia, multi-organ failure and high mortality. A few potential therapeutic agents have been identified but none has been conclusively shown to be clinically effective. Human to human transmission is well documented, but the epidemic potential of MERS-CoV remains limited at present. Healthcare-associated clusters of MERS-CoV have been responsible for the majority of reported cases. The largest outbreaks have been driven by delayed diagnosis, overcrowding and poor infection control practices. However, chains of MERS-CoV transmission can be readily interrupted with implementation of appropriate control measures. Bats harbor several betacoronaviruses that are closely related to MERS-CoV. Evidence from multiple sources implicates dromedary camels as natural hosts of MERS- CoV. Camel to human transmission has been demonstrated, but the exact mechanism of infection remains uncertain. Strict regulation of camel movement, regular herd screening, isolation of infected camels, use of personal protective equipment by camel handlers are potentially useful measures to prevent primary MERS-CoV infections.

To what extent does the environment contribute to gastroenteric infections – Review

Jon Otter. *Epidemiology, Imperial College Healthcare NHS Trust*

I suspect that if you were to ask this same question to 10 experts, you'd get more than 10 different answers, ranging from 'not very much at all' right through to 'the most common transmission route'. This talk will outline the evidence base that contaminated surfaces – and perhaps contaminated air – contributes to the transmission of key gastrointestinal pathogens Clostridium difficile and norovirus. The relationship between the level of surface contamination and the risk of transmission has not been studied in detail. It depends on various factors, including the characteristics of the organism involved, patient susceptibility and staff compliance with infection control policies (for example hand hygiene following contact with environmental surfaces). A number of studies have identified a correlation between a quantitative or semi-quantitative measure of the level of environmental contamination and the risk of pathogen acquisition. However, further studies are required to quantify the relationship between surface contamination and the risk of pathogen acquisition, and help us to direct prevention activities and resources.

The enigmatic virus of the great pandemic 1916–1924

John Oxford. *Virology, Queen Mary's School of Medicine and Dentistry*

The Influenza virus arising from Europe as early as 1916, spread widely in 1918 as soldiers and airmen, including my father, returned to the four corners of the world on the ships of the British Navy. Global case fatality figures of around 7% are widely accepted although there are serious gaps in our knowledge especially in China and India. But unexpectedly regions of two continents experienced the extremes namely zero deaths in American Samoa, and a death rate of greater than 79% in Okak, Labrador. Major factors here are social including colonisation and religion which impinged on the societies. We have exhumed Phyllis Burns and Richard Sykes to obtain clinical samples from 1916–1924 and have also searched pathology museums for lung blocks as has J.Taubenberger. But to date no single gene of the virus has been shown to correlate with virulence leading to conclusions about the importance of co-infection with pneumococcus and to the importance of social behaviour. The emergence of influenza from initial clusters in the British Army at Aldershot Barracks and at Etaple-sur-mer in 1916 could have occurred via short term contract doctors and nurses from Harvard Medical School USA who criss-crossed the Atlantic and worked at Etaples.

Methods to evaluate quality indicators

Pierre Parneix. *French Society for Hospital Hygiene (SF2H)*

Since ten years, quality indicators (QI) are mandatorily measured in all French hospitals. They are used for hospital quality improvement, public disclosure and regulation goals. After a decade of use, the Ministry of Health and the French National Authority for Health set up a task force to evaluate these QI. The goal was to provide a decision tool to help the authorities in terms of withdrawing, revising or continuing their use. From a literature review and a review of national initiatives, we identified potential criteria for assessment. The taskforce extracted a list of criteria for each goal using a modified Rand/UCLA Appropriateness Method. Each criterion was assessed using a quantitative approach or a qualitative approach: This integrated tool was tested on four national process QIs related to healthcare-associated infections (HAI) management. Three major international experiences were studied. Among the fourteen retrieved potential criteria, 12 were selected as appropriate for the evaluation of QIs for regulation use including: benefit; side effects, feasibility, barriers to Implementation and current metrological performances. Among these, 11 were selected for hospital improvement and 7 for public disclosure. Applied to the four HAI QIs, the task force proposed to withdraw the indicator related to multidrug-resistant bacteria management and to undertake major revision on the three others.

What's new in vaccines?

Andrew Pollard. *Paediatric Infection and Immunity, University of Oxford*

Immunisation is the cornerstone of public health policy globally and vaccine programmes in developed countries have provided a remarkable range of protection against serious infections that were once the major causes of early childhood morbidity and mortality. New vaccines have been introduced in the past 15 years which have had profound impact on child health. New candidates for high burden difficult infections such as malaria and dengue are now available and funding for control of outbreak pathogens (e.g. Ebola, plague) has been released to improve future preparedness. There has been little attention to understanding strategies for boosting the immune system of the growing population of elderly adults, and the prevention of nosocomial infection through vaccination has become a major focus of attention for developers. Despite the many successes, there remain some important gaps in the protection of children against infectious diseases which cause serious morbidity and have a massive burden on the health system (e.g. respiratory syncytial virus), or are rare but responsible for high morbidity and mortality (neonatal Group B streptococcal infection and adolescent capsular group B meningococcal vaccination). However, international efforts are expected to lead to new comprehensive programmes in the next decade.

Quality indicators: healthcare organizations and Insurances

Walter Popp. *German Society for Hospital Hygiene*

Quality indicators: healthcare organizations and insurances in the last years, there are a lot of new law and other regulations regarding Hospital Hygiene in Germany. The actual situation will be presented, especially regarding benchmarking of hospitals and discussion about future regulations. Also the role of healthcare organizations and insurances will be included.

Does education really change IPC behaviour?

Jacqui Reilly. *Health Protection Scotland*

It is often assumed that providing information on a topic will lead to knowledge gain and practice improvement. This assumption is flawed. A review of the evidence from IPC published literature on using education and training to change behaviour indicates variation in applied definitions of education and inconsistent reporting of educational interventions. Nonetheless there is evidence that education is an important component of a multimodal strategy for behaviour change in IPC. However the evidence indicates that single education sessions are unlikely to be successful and any positive change identified in the short term might not be reported long term pointing to the complexity of attitudes and behaviour. There is a need for the theory of andragogy to be considered by IPC professionals developing IPC training and education interventions as optimising the learning experience is key to maximising the potential for education and training to impact on behaviour.

Reducing sepsis mortality at scale

Kevin Rooney. *Anaesthesia and Intensive Care Medicine, Royal Alexandra Hospital*

Sepsis is an indiscriminate killer of people of any age, background and social status. Survivors of sepsis are also at increased risk of cognitive decline and account for a significant proportion of healthcare expenditure. In this presentation, Professor Rooney will share the National Strategy to fight Sepsis in Scotland which resulted in a 21% reduction in Sepsis Mortality. He will explain the 'What, How and Why' of the campaign, paying particular emphasis on the key attributes of reducing mortality at scale as well as any unanticipated consequences.

The role of intersectional innovations in preventing infection

Sanjay Saint. *Department of Internal Medicine, University of Michigan; VA Ann Arbor Healthcare System University of Michigan*

Professor Sanjay Saint, the George Dock Professor of Internal Medicine at the University of Michigan Medical School, Chief of Medicine at the VA Ann Arbor Healthcare System, and a Special Correspondent to the New England Journal of Medicine, will give the Lowbury Lecture entitled 'The Role of Intersectional Innovations in Preventing Infection.' He will make the following key points during this lecture. First, he will discuss the importance of infection prevention, in general, and catheter-associated urinary tract infection (CAUTI), in particular. Second, he will provide an overview of how to prevent CAUTI with a focus on recent data, and describe both technical and socio-adaptive aspects to reducing healthcare-associated infection. Third, he will define 'intersectional innovations' and distinguish intersectional innovations from 'directional innovations'. Fourth, he will provide an overview of the intersectional innovations that could impact infection prevention efforts such as human factors engineering, cognitive psychology, sociology, and management science. Finally, he will discuss future directions in infection prevention, including the possible role of mindfulness.

Genetic susceptibility to severe viral infections in children

Vanessa Sancho Shimizu. *Imperial College London*

Severe, unusual or recurrent viral infections of childhood are increasingly recognized as being due to an underlying genetic primary immunodeficiency. With recent advances in genomics and sequencing technology, there has been a surge in the discovery of single gene disorders identified as underlying childhood infectious diseases. Among these are a number of genes predominantly associated with viral infections of childhood, which will be discussed in this talk with a specific focus on the human herpesviruses. Some of these immunodeficiencies are specific to a particular viral infection whereas others predispose to multiple viral, bacterial or fungal infections. The discovery of these genes has greatly enhanced our understanding of protective immunity to pathogens, allowing us to gain new insights into the specific and non-specific immune mechanisms controlling viral infection.

Tuberculosis – whole genome sequencing and other laboratory developments

Grace Smith. *PHE NIS National Reference Mycobacteriology Service, PHE- Birmingham Public Health Laboratory*

Advocates of Whole Genome Sequencing technology suggest that whole genome determination should form a key part of future diagnostic pathways for M. tuberculosis. However, the NGS-based process requires careful evaluation before it can be introduced into routine practice as an accredited TB diagnosis solution. The Birmingham Public Health Laboratory (PHL) has lead on a pilot project for TB-WGS with which began in July 2014.A successful collaboration between Oxford University, PHE, NHS and international collaborating partners in France, Germany and Canada has enabled us to design a world-first pilot for creating a WGS-centred TB identification, resistance prediction and determining transmission events within local communities. The main aim of the Birmingham pilot was to the wider implementation of WGS as part of the routine management of NHS patients with TB and the more specific objectives included:

- To accelerate the introduction of WGS into the NHS TB care pathway
- To deliver improved patient care through a personalised therapeutic approach, especially for drug resistance prediction
- To deliver improved public health control of TB through better understanding and management of local transmission networks and to support national surveillance I will give an update on progress towards full accreditation of WGS for mycobacteria and additional developments in the Reference Service.

Issues affecting women with HIV

Shema Tariq. *University College London*

Of the 37 million people currently living with HIV globally, half are women. Looking at the United Kingdom (UK) in particular, women are the second largest group (after men who have sex with men) affected by HIV. Furthermore, advancements in antiretroviral therapy (ART) have resulted in significant improvements in survival leading to increasing HIV prevalence rates amongst women in their midlife and beyond. There are important biological and psychosocial differences between men and women that may lead to disparities in both HIV-related clinical outcomes and experiences of living with HIV. For women, this includes reproductive transition from puberty through to pregnancy and menopause. In this presentation I aim to provide a broad overview of HIV in women through the life course. As context I will summarise current epidemiological data on HIV in women in the UK. I will then focus on three key themes: virological response to ART, pregnancy and infant feeding, and finally the emergent area of menopause transition in women living with HIV.

HIV in pregnancy – current trends and challenges in the UK

Pat Tookey. *UCL GOS Institute of Child Health*

About 1200 women living with HIV currently become pregnant each year in the UK, down from the peak of nearly 1500 in 2010. Most of these women know about their HIV before they get pregnant, and around two-thirds are already taking anti-HIV drugs when they conceive. Transmission of infection from a diagnosed mother to her baby is at an all-time low, with fewer than 1 in 200 infants becoming infected themselves. Preventing new infections in women and children, maintaining high (and early) uptake of antenatal screening, providing appropriate care in pregnancy and ensuring that women can have as normal a pregnancy and delivery as possible while maintaining and even improving on this very low transmission rate are all vital but challenging goals. Why do paediatric infections still happen? What should be done if a woman declines the antenatal screening test? What are the safest HIV drugs to use before and during pregnancy? Do some women with HIV still need to deliver by caesarean section? Can a mother who has HIV breastfeed her baby? Before, during and beyond pregnancy we need to ensure and enhance the long term health and well-being of women living with HIV, and all their children.

Can new diagnostic technologies help infection prevention and management?

Estee Torok. *University of Cambridge*

This talk will outline recent advances in diagnostic technologies, including microbial whole genome sequencing, and discuss their potential applications in the diagnosis and prevention of infectious diseases.

Practical aspects of the changes

Karen Tweed. *Sheffield Teaching Hospital Trust*

Practical aspects of the changes for surgical equipment and endoscopy. The updated HTM 01-01 guidance has been developed to support health organisation in delivering the required standard of decontamination for surgical instruments, building on good practice to ensure the correct standards of infection prevention and control are met. The major change to the guidance is the recent changes in Advisory Committee on Dangerous Pathogens Transmissible Spongiform Encephalopathy (ACDP – TSE) which is suggesting a move towards in situ testing for residual proteins on instruments because of the continuing risk of transmission of prions. The guidance provides information on how sterile services departments (SSDs) can mitigate the patient safety risk from residual protein with a move towards first achieving this $\leq 5\,\mu g$ level and subsequently producing further reductions in protein contamination levels through the optimisation of decontamination processes. It is hoped that all acute trusts engage in this and have implemented this guidance by 1 July 2018 but for healthcare providers whose instruments are likely to come into contact with higher risk tissues, ie neurological tissue, are expected to give this guidance higher priority and move to in situ protein detection methodologies by 1 July 2017. The impact of this guidance and the feasibility of implementation will be discussed.

Examples of using surveillance data for quality improvement

Tejal Vaghela. *West Hertfordshire Hospitals NHS Trust*

Surveillance data of antimicrobial usage is critical to understanding changes in antimicrobial resistance and for measuring the effects of stewardship interventions. In addition quality improvement interventions utilising an audit and feedback approach can provide process and outcome measures as an integral part of an antimicrobial stewardship plan. This session will share examples from hospital practice from across the UK to show how surveillance and audit data have been used to improve clinical practice and patient outcomes. The work demonstrates how UKCPA colleagues are contributing to Objective 2

of the AMR Strategy: Optimising Prescribing Practice and Objective 5: better access to and use of surveillance data.

Thinking outside the box? Healthcare acquired waterborne infections from equipment

Jimmy Walker. *Public Health England*

Thinking outside the box? Healthcare acquired waterborne infections from equipment The recent publication of the 'Health Technical Memorandum 04-01: Safe water in healthcare Premises' included recommendations for the safe management of water systems, via the integration of water safety groups (WSG) to recognise and manage microbial risks to health. This presentation will assist those involved in WSG to assess the risks from a range of microorganisms including Legionella spp., Pseudomonas aeruginosa and Mycobacteria spp. Water is used in a wide range of equipment across hospitals and the risks are not always obvious. As well as considering water systems and outlets including showers and taps the presentation will also highlight the microbial risk from a range of stand-alone equipment including ice-machines, endoscopy washer disinfectors as well as heater-cooler units used during cardiac by-pass surgery. Control strategies will be discussed from a holistic perspective that will include competencies and training of staff.

Changes to ACDP guidance

Jimmy Walker. *Public Health England*

Recent guidance publications have maintained the precautionary approach in terms of the risk from prion related diseases and the potential for iatrogenic transmission and indicates that decontamination of re-usable surgical instruments is the cornerstone of safe surgery. Such approaches are underpinned by recent research that indicated that up to 1:2,000 of the population may have identifiable levels of abnormal prion protein in their peripheral lymphoid tissues and may be incubating the disease. As a consequence of this evidence, DH research and risk assessments the current suite of protein detection technologies were brought into question and alternative protein detection strategies related to the entire surface of instruments investigated. After reviewing the data, the Advisory Committee on Dangerous Pathogens (ACDP) published recommendations that were subsequently written into recent guidance updates in HTM 01-01 'Decontamination of surgical instruments' and HTM 01-06 'Decontamination of Endoscopes', to improve the decontamination of both reusable instruments and endoscopes. This presentation will discuss the back ground and the stages involved in formulating the recent DH guidance.

Clean water: complacency is not an option

Jimmy Walker. *Public Health England*

From a global perspective, climate change is predicted to have a major impact on people's lives. However, the recent regional extremes of temperature, from <10°C to >30°C, across the UK in September 2016 raised concerns that there may also be an impact in the burden and type of disease at a local level, and that this may occur sooner than has previously been considered. Changes to marine and fresh water supplies already affect significant parts of the world′s population and it is likely to get worse and affect more countries. Infectious agents vary greatly in size, type and mode of transmission and can include viruses, bacteria, protozoa and multicellular parasites. This presentation will consider the changes in infectious disease transmission patterns of water-borne diseases and the likely consequences of climate change due to warmer water, drought, higher rainfall, rising sea levels and flooding, all of which will have an impact on the risk of water-borne disease in the UK.

Emerging waterborne infections and new sources

Michael Weinbren. *Chesterfield Royal Hospital Foundation Trust*

Water systems from a hospital infection perspective, apart from legionella, were largely ignored within the UK despite a significant body of evidence until the Belfast neonatal outbreak. As we learn more about water systems there is increasing evidence emerging that drains are an important key to the jigsaw. It is still likely to be the case that a high percentage of water transmission events go unrecognised.

Laboratory diagnosis of *Pneumocystis jirovecii* – an update

P. Lewis White. *Public Health Wales, Microbiology Cardiff*

Pneumocystis jirovecii is a ubiquitous fungus that causes Pneumocystis pneumonia (PCP) specifically in humans. Diagnosis of PCP was hampered by the inability to culture Pneumocystis. Historically, diagnosis was based on microscopic examination and straining of respiratory samples for the presence of trophic and cysts forms. The performance of the different stains was generally comparable, but superseded by immunofluorescent testing using monocloncal antibodies to target the cyst, or both cyst and trophic forms. While the sensitivity of IF testing is superior to conventional staining it is not infallible, although specificity is good.

New diagnostic assays can assist in the diagnosis of PCP although result interpretation can be far from straightforward. PCP PCR has permitted testing of respiratory samples other than BAL, easing sampling pressures. PCR has greater sensitivity over IF but questions remain as to the significance of low level positivity, particularly in cohorts capable of raising an immune response. Conversely, PCR negativity in BAL samples can exclude disease, provided BAL sampling is adequate. The presence of 1-3-β-D-Glucan in serum is also a useful biomarker of PCP, providing high sensitivity and good specificity. However, 1-3-β-D-Glucan is not specific to PCP, and definitive thresholds for PCP are yet to be determined.

New guidelines for the diagnosis of PCP will also be discussed.

Stewardship issues related to rising resistance and new agents

Hayley Wickens. *University Hospital Southampton NHS Foundation Trust*

Good Antimicrobial stewardship requires a careful balance between choosing the correct antimicrobial to ensure optimal patient outcome, and being mindful of the effects on microbial ecology, particularly when making broad policy choices that will impact overall usage. At a time when antimicrobial resistance is inexorably rising, how do we use new agents appropriately?

Markedly variable risks of bacterial dissemination according to choice of hand drying method

Mark Wilcox. *Medical Microbiology, University of Leeds, Leeds Teaching Hospitals NHS Trust*

New data confirm the low proportion of CDIs that can be matched to prior cases. Independent significant risk factors for acquisition of CDI from another case include older age, longer inpatient duration and ribotype; these factors, male, higher severity and multiple positive samples increase the risk of onward transmission. Notably, there is a significantly greater risk of recurrence and 30-day mortality in patients with a matched donor. Changes to definitions used in England to apportion CDIs to healthcare/community will result in an increased proportion of cases designated as healthcare onset, and a marked decrease in those currently designated as community associated. The great majority of community onset cases with prior healthcare interactions occurred in the same Trust that reported the CDI. Treatment options for CDI will increase with the likely approval of bezlotoxumab, a human antitoxin B antibody. Bezlotoxumab reduces recurrence risk by ~40%, including in those at increased risk (severe cases, elderly, immunocompromised, hypervirulent strain). There is increasing evidence that metronidazole is an inferior treatment option for CDI, and so its place in guidelines requires review. FMT efficacy is

good although response rates in randomised studies are not as high as those reported in open series of patients.

Case 2: Carbapenemase producing enterobacteriacae in a rehabilitation centre – not quite the community but not an acute setting

Mandy Wootton. *Public Health Wales*

Spinal injuries units often house patients for long periods of time during rehabilitation, making transfer of colonising organisms between patients more likely. Carbapenemase producing organisms (CPO) limit clinical management of seriously ill patients but in specialist units may restrict rehabilitation and pose a serious public health risk. An OXA-48 containing K. pneumoniae was isolated from urine of a patient at UHW in February 2014. Retrospective testing of faeces from the same patient stored after C. difficile tests also was positive for K. pneumoniae and also E. coli, both containing OXA-48. Comprehensive screening of 62 patients, using enrichment techniques, over the next 18 months revealed 7 positive for OXA-48. Multiple infection control measures were implemented and communication between the unit and transferring hospitals was heightened. No patient had an acute infection due to the OXA-48 carrying organisms, however this study demonstrated the factors which were addressed in order to restrict the spread of colonising agents and procedures to be followed if infection did occur. Genetic characterisation of the OXA-48 isolates showed that genetic transfer of the OXA-48 had occurred between species and that the carbapenemase was present in multiple clones of both E. coli and K. pneumoniae.

Pneumocystis jirovecii – outbreaks and control of transmission

Eftihia Yiannakis. *Worcestershire Acute Hospitals NHS Trust*

Pneumocystis jirovecii pneumonia (PCP) is an important cause of morbidity and mortality in immunocompromised patients. Several nosocomial outbreaks of PCP have been reported in HIV-negative, immunocompromised patients. The primary route of P. jirovecii transmission has yet to be proven, however these outbreaks of infection suggest either inter-human transmission or a common environmental source. On formal review of the reported outbreaks, epidemiological and genotypic links between patients were identified. The evidence for nosocomial acquisition of PCP and possible person-to-person transmission of infection, suggests the need for formal infection control policies. These policies should include the routine surveillance for PCP in vulnerable populations as well as measures that should be considered to prevent the spread of infection between patients.

Abstracts of FIS/HIS 2016 – Oral Presentations

Topic: Antimicrobials and antimicrobial resistance

ID: 4815
Controlling AMR in Scotland: the One Health approach

Morag Christie[1], Eleanor Anderson[1], Pauline Dunlop[1], Scott Hanley[1], Alistair Leanord[2], Dominic Mellor[1], Jacqui Reilly[1], Christopher Sullivan[1]. *[1]Health Protection Scotland, [2]University of Glasgow*

Background: Antimicrobial resistance (AMR) is a major global public health issue. Recognising the complex ecological factors which drive and sustain AMR, among humans, animals and the environment, the Controlling Antimicrobial Resistance in Scotland (CARS) programme has adopted a 'One Health' approach.
Aim(s)/Objective(s): The CARS programme aims to deliver a long-term sustainable approach to control of AMR within Scotland.
Method(s): This will be achieved by establishing national infrastructure including:
- National AMR Research Centre
- Scottish Animal Health and AMR Stakeholder Group
- AMR Intelligence and Epidemiological Research Hub
- Behavioural Insights Team

Results: Early achievements include critical contribtuion to the 'UK One Health' report, the formation of the Scottish Animal Health and AMR group, reviews on veterinary prescribing guidance and biosecurity/disease avoidance, and a stock take on AMR human and animal data submitted to Electronic Communication of Surveillance in Scotland (ECOSS).
Discussion and/or Conclusion(s): Future, planned work includes:
- Concise collation of national guidance for veterinary prescribing of antimicrobials and avoidance of disease transmission, with development of a website for animal keepers and veterinarians.
- Development of a 'One Health' AMR intelligence resource including data from humans, animals, and the environment, and use these data explore evidence for any relationship(s) between AMR in these settings.
- Improve AMR data quality.
- Work with partners to influence public and professionals' attitudes and behaviours in relation to prescribing and AMR in all 'One Health' spheres.
- With partners, prioritise and co-ordinate AMR research in Scotland.
- Development of an environmental group to ensure involvement of this aspect in the AMR 'One Health' approach.

ID: 4822
Risk factors associated with antibiotic resistance in urinary isolates in the community: an exemplar of NHS Scotland's Infection Intelligence Platform

William Malcolm[1], Kim Kavanagh[2], Camilla Wiuff[3], Nicholas Reid[4], Ashutosh Deshpande[5], Charis Marwick[6], Jean Sneddon[7], Marion Bennie[7]. *[1]NHS National Services Scotland: Health Protection Scotland, [2]Department of Mathematics and Statistics, University of Strathclyde, [3]Health Protection Scotland, NHS National Services Scotland, [4]Pharmacy Department, NHS Ayrshire & Arran, [5]Microbiology Department, Royal Alexandra Hospital, NHS Greater Glasgow and Clyde, [6]Population Health Sciences, School of Medicine, University of Dundee, [7]Information Services Division, NHS National Services Scotland*

Background: Urinary tract infections (UTIs) are amongst the most common infections treated in primary care. Initial antibiotic treatment of UTI is usually empirical. There are concerns that antimicrobial resistance is increasing, particularly for antibiotics commonly used for UTI.
Aim(s)/Objective(s): Using individual level linked data to characterise factors associated with antibiotic resistance in urine samples.
Method(s): All positive community urine samples included in the "Surveillance of Antimicrobial Resistance in Urinary Isolates in Scotland" dataset in the period from January 2012 to June 2015 were analysed. Cases were assigned a resistance status of Fully Susceptible, Single Resistance or Multiple Resistance based on antibiotic susceptibility data.
Using the NHS Scotland Infection Intelligence Platform all cases were linked to national hospital activity data and patient-level community prescribing data. Risk factors associated with antibiotic susceptibility were assessed using multivariable multinomial logistic regression.
Results: Age, care home residence and increasing comorbidity were significantly associated with both categories of resistance after adjustment for other factors.
Cumulative antibiotic exposure had a dose-response effect. Those with 1-7DDDs were 1.12 times (95% CI: 1.04–1.22) more likely to have Multiple Resistance (compared to a Fully Susceptible infection) rising to 5.53 times (95% CI:4.98–6.14) for 29+ DDDs.
Discussion and/or Conclusion(s): Data linkage has allowed characterisation of risk factors for antibiotic resistance in urine samples. Such quantification will form the evidence base for development of prescribing decision support tools for more patient centred treatment of UTI and support robust antimicrobial stewardship policy.

ID: 4836
Increasing trend of vancomycin resistant enterococci (VRE) within Scotland

Christopher Sullivan, Julie Wilson, Edward McArdle, Eleanor Anderson, Michael Lockhart. *Health Protection Scotland*

Background: Enterococci are important hospital-acquired pathogens. They are a common cause of urinary tract infections but can also lead to more serious types of infections. Enterococci have intrinsic resistance to several antimicrobial classes and the ability to acquire additional resistance limiting the number of treatment options. Enterococci can easily disseminate within healthcare facilities if standard infection control precautions and transmission based precaution are not followed. Of particular concern within enterococci is resistance to glycopeptides antibiotics such as vancomycin.
Aim(s)/Objective(s): To describe the epidemiology of vancomycin resistant enterococci (VRE) within Scotland.
Method(s): VRE data were obtained from all diagnostic laboratories within Scotland. The most recent EUCAST clinical breakpoints were applied to all data and the trends were analysed.
Results: In Scotland there has been an increasing trend observed in VREs since 2012. Despite VRE bacteraemias remaining relatively low in Scotland and subsequently the burden of disease, it is of public health concern that the vancomycin proportion of resistance in Scotland is one of the highest in Europe.
Discussion and/or Conclusion(s): A change in the epidemiology of VREs across Europe has been reported, with an increasing number of countries demonstrating a significantly increasing trend. There is also the potential that the genes that confer resistance to vancomycin can be transferred to Staphylococcus aureus. More recently strains of VRE resistant to linezolid and tigecycline, which are both used to treat VRE, have emerged, limiting available therapeutic options and leading to prolonged hospital stay. Therefore it is essential that we fully understand the drivers for the change in epidemiology of VRE.

ID: 4865

Antimicrobial management of E. coli bacteraemia

Mariha Hamid[1], Paul Wade[2], William Newsholme[2]. [1]*King's College London,* [2]*Guy's and St Thomas' NHS Foundation Trust*

Background: Inappropriate antimicrobial use is a significant risk factor in the spread of antimicrobial resistance (AMR); this, coupled with a recent increase in the rate of E. coli bacteraemia and associated antibiotic resistance, reinforces the need to monitor adherence to clinical antibiotic guidelines.
Aim(s)/Objective(s): To explore the cases of E. coli bacteraemia in Guy's and St Thomas' NHS Foundation Trust reported between March and September 2015, in order to determine whether Trust guidelines were followed with regards to empirical antibiotic therapy, and whether antibiotic sensitivity patterns were used to adjust antibiotic choice.
Method(s): The patient sample was obtained from the Public Health England surveillance programme data. Data on prescribing and antibiotic sensitivity patterns were obtained from Trust electronic systems and compared to Trust antimicrobial guidelines.
Results: The analysis included 89 patients. Overall, 63% of cases adhered to guidelines. 31% of patients required an antibiotic adjustment based on sensitivity patterns, and appropriate alternatives were given in 75% of these cases. Co-amoxiclav was frequently used as monotherapy for cases where empiric guidance recommended dual antimicrobials (such as gentamicin e.g. in severe sepsis). The majority of patients who did not receive an appropriate antibiotic adjustment had been given co-amoxiclav despite reported resistance.
Discussion and/or Conclusion(s): Routinely documenting the acknowledgment of blood culture results may prompt clinicians to identify resistance patterns and adjust subsequent management decisions, reducing the number of patients who are continued on inappropriate antibiotics. This will be important for adherence to the 72-hour review component of the new AMR Commissioning for Quality and Innovation guidance.

ID: 4894

Acquired colistin resistance found in 2% of human enterobacteriaceae in Singapore

Pooja Rao, Jen Mee Long, Wen Ying Tang, Timothy Barkham. *Tan Tock Seng Hospital*

Background: Colistin has increased in importance over the last decade as multi drug resistant Gram negative bacteria have become more numerous and more difficult to treat. The report of acquired colistin resistance due to MCR-1, carried on a plasmid, heralds an era of therapeutic poverty and stimulated a search for colistin resistance in many countries to define the extent of MCR-1 in their populations. Having acquired a positive control for MCR-1 in May 2016, we found MCR-1 in three out of four enterobacteriaceae that had been flagged as colistin resistant on the Vitek system in mid-June 2016.
Aim(s)/Objective(s): The aim was to define the possible extent of colistin resistance in our population.
Method(s): We extracted colistin MIC data from the Vitek susceptibility testing system for a six month period from Dec 2015 to May 2016. Data for organisms naturally resistant to colistin were discarded. Colistin resistance was defined as an MIC >2 mg/L.
Results: Data were available for 3887 enterobacteriaceae. 78 (2%) were colistin resistant with MICs as follows. MIC < 0.5 mg/L, 3768; 1 mg/L, 22; 2 mg/L, 19; 4 mg/L, 17; 8 mg/L, 34; ≥ 16 mg/L, 27.
Discussion and/or Conclusion(s): Polymyxin is used instead of colistin in Singapore, and polymyxin MICs are measured with an E test, when clinically indicated, and interpreted with CLSI breakpoints. Colistin results, although on our Vitek system, did not flow through to the laboratory information system and constituted important but hidden data. Many of these colistin resistant bacteria are not multi drug resistant. Further work will define what proportion carry MCR-1 and how widespread this is in the community.

ID: 4961

Relationship between resistance in coliform bacteraemia and antimicrobial exposure

Jennifer Wood[1], Peter Davey[2], Bruce Guthrie[2], Virginia Hernandez-Santiago[2], Charis Marwick[3]. [1]*University of Dundee,* [2]*University of Dundee,* [3]*University of Dundee/NHS Tayside*

Background: Antimicrobial resistance (AMR) is a serious public health threat, with emerging resistance among coliforms particularly concerning. Antimicrobial use contributes to this but associations between individual past exposure and risk of AMR infection are not well understood.
Aim(s)/Objective(s): The aim is to quantify associations between antimicrobial resistance in coliform bacteraemia on admission to hospital (positive blood culture on day 0–2) and antimicrobial exposure in the prior 12 months, in a case-control study using linked routine data enhanced by case-note review. Cases are those with resistant infections and controls those with susceptible infections.
Method(s): The study includes all NHS Tayside residents admitted with coliform bacteraemia (first episode if >1) from Jan 2011 to Dec 2015. Patient-level data on hospital admissions, microbiology results, GRO deaths, and prescriptions dispensed from community pharmacies are anonymously linked by the Health Informatics Centre (HIC). Hospital inpatient prescribing data are not captured electronically so extracted by case-note review, then anonymised and linked. Logistic regression (univariate then multivariate) will generate odds ratios for the likelihood of resistant versus susceptible (e.g. to co-amoxiclav) bacteraemia associated with prior exposure (e.g. any exposure/cumulative exposure/most recent exposure to beta-lactam/beta-lactamase inhibitor combinations). Potential confounders in multivariate analyses are: age, gender, comorbidity, deprivation, care home residence, previous hospital admissions.
Results: There are 372 eligible bacteraemia episodes, 204 (54.8%) with admissions in the previous year. The complete dataset is almost assembled for analysis and the results will be available for presentation.
Discussion and/or Conclusion(s): Findings will help to inform prescribing policy, enabling tailored therapy for at risk individuals.

ID: 4963

A new scoring system to predict the risk of multiresistant pathogens in pneumonia and sepsis validated using 'big data' analyses

Michael Wilke[1], Nadine Tränkner[1], Kerstin Worf[1], Silvia Wilke[1], Wolfgang Heinlein[1], Klaus-Friedrich Bodmann[2]. [1]*Inspiring-Health, Dr. Wilke GmbH,* [2]*Klinikum Barnim, Werner-Forßmann Krankenhaus*

Background: Hospital-acquired pneumonia and sepsis pose a major challenge in intensive care medicine. A key factor for the survival of patients is the early administration of adequate initial antibiotic therapy, which covers the causative pathogens, especially if there are pathogens with multiple resistances (MDR). The correct assessment of the risk for MDR presence is a key strategy in antimicrobial stewardship. Multiple risk factors are described in the literature, hence few studies exist that did a systematic validation of those factors by using large data collections.
Aim(s)/Objective(s): The aim of this study is to develop and validate a risk scoring system that is able to predict the presence of MRE in these disease entities.
Method(s): A systematic literature research based on the PICO-principle was used to identify the risk factors for hospital-acquired pneumonia and sepsis described in the literature. A number of risk factors could be identified. The risk factors were – if possible – described by the use of routine data (OPS, ICD, etc.) that are easily available and will be validated on a large amount of patient cases (55 hospitals with 3.7 Million hospitalizations over 5 years). Using the valid risk factors a score will be developed using multivariate regression models and Receiver-operator Curves (ROC) to allow a better risk stratification in the initial phase of the therapy.

Results: To the abstract deadline date, 27 risk factors were identified and described with routine data. The multivariate regression models and the development of the score are under way. The results will be presented at the conference.

ID: 4994

Emergence of colistin resistant *Klebsiella pneumoniae* in an Oncology Center in Eastern India

Gaurav Goel[1], Mammen Chandy[2], Manas Kumar Roy[2], Sujoy Gupta[2], Sudakshina Mullick[2], Kasturi Sengupta[2], Sanjay Bhattacharya[2]. *[1]Tata Medical Center, Kolkata, India; [2]Tata Medical Center Kolkata*

Background: Colistin is often the only available antibiotic for multi—drug resistant Gram negative bacilli (MDR-GNB) like carbapenem resistant enterobacteriaceae (CRE). There are occasional reports of colistin resistance *Klebsiella*.
Aim(s)/Objective(s): Study of epidemiology about colistin resistance *Klebsiella* in oncology patients.
Method(s): Retrospective analysis – February 2014 to September 2015.
Results: A total of 12,957 cultures were studied, including 6290 blood cultures. Predominant MDR-GNB included *Escherichia coli* (482), *Klebsiella pneumoniae* (343), *Pseudomonas aeruginosa* (56). ESBL and CRE were 479 and 396 respectively. Fifteen colistin resistant *Klebsiella* (CRK) were isolated; from blood (3), respiratory specimens (4), urine (3), pus (2) and 1 each from bile, tissue and stool surveillance cultures. These included 10 males and 5 females (age 12–80 years; median 44). Underlying malignancies included hematological (9), gastro-intestinal tract (3) and urinary bladder (3). Three patients have had bone marrow trasplantation. Susceptibility pattern being carbapenems (all resistant), fosfomycin (all sensitive), tigecycline (8 sensitive-S); doxycycline (1-S); amikacin (1-S); cotrimoxazole (3-S) and chloramphenicol (3-S). Eleven patients had prior infections with carbapenem resistant *Klebsiella* (73%), while 3 had it in stool surveillance cultures. Previous use of colistin was noted in 53% (8 patients). All cause mortality was 47% (7).
Discussion and/or Conclusion(s): This study highlights CRK is associated with high mortality. Colistin resistance can arise *de novo* due to selection pressure or horizontal spread as a breach in infection control practices. There is a need to optimize use of colistin including dosage schedules and adjustments in deranged renal profile. Further molecular research is needed to see the predilection of *Klebsiella pneumoniae* for colistin resistance.

Topic: Antimicrobial stewardship

ID: 4479

Articulating citizen participation in national antimicrobial resistance policies: how does the UK compare to other European countries?

Enrique Castro-Sanchez[1], Michiyo Iwami[2], Raheelah Ahmad[2], Alison Holmes[2]. *[1]National Centre for Infection Prevention and Management, Imperial College London, [2]Imperial College London*

Background: National policies articulate the vision, objectives and resources required to deal with antimicrobial resistance (AMR). Participation of citizens in AMR activities is deemed essential, but may reflect and be limited to the roles allocated to them by national policies.
Aim(s)/Objective(s): We investigated and compared the language used and role given to citizens by different European AMR policies.
Method(s): We downloaded national policies from the European Centre for Disease Prevention and Control website (March 2016) selected a sample of policies available in English from the UK, Spain, Norway, Germany and the Netherlands.
We conducted a documentary analysis of policies to assess citizen participation using well established frameworks by Charles & DeMaio (1993) and Carman et al. (2013).
Results: For language, across the five countries, policies refer to 'the public' or 'patients' but not 'citizens'. The Norwegian policy used clear, commanding and committed language ('must', 'will') intended to facilitate citizen engagement in optimal antimicrobial activities and behaviours The Spanish policy adopted a 'rational' and didactic attitude towards antibiotic use by citizens, whilst Norway presented a progressive approach, 'assuring', 'encouraging' and 'supporting' citizen participation.
For roles, The Netherlands and Spain emphasised 'awareness', UK centred on 'education' and Germany 'training'. UK was the only country explicitly incorporating behavioural elements.
Discussion and/or Conclusion(s): Better performing countries in terms of antimicrobial usage offer broader and comprehensive approaches towards the integration of citizens in AMR activities. A 'rights' perspective is missing from the area, and in general citizen advocacy is yet to be developed in AMR policies.

ID: 4740

Do antimicrobial guardians require stewardship?

Wael Elamin[1], Hala Kandil[2], Tejal Vaghela[2]. *[1]Mid Essex Hospital Services NHS Trust, [2]West Hertfordshire Hospitals NHS Trust*

Background: The choice and duration of antimicrobials in ITU setting is closely monitored by microbiologists through their daily ward rounds and as such should be an area with good antimicrobial stewardship.
Aim(s)/Objective(s): We retrospectively examined the variation in the microbiologist-guided antimicrobial prescribing practice over six month periods covered by different microbiology consultants and the effect of this variation on antimicrobial stewardship.
Method(s): Pharmacy records for total antimicrobial usage (DDD) for every prescribed antibiotic in ITU were obtained and reviewed. The demographic details of ITU patients, clinical diagnosis, and mortality rates were collected for each of the specified periods. In addition, the microbiology results during the same period were retrieved from the laboratory information management system to compare the incidence of resistance during the periods examined. A cost analysis for the periods specified was also performed.
Results: Despite similar patients' numbers, demographic and local epidemiology during the periods of comparison, a significant variation in antimicrobial prescription was noted. While the consumption of the commonly prescribed broad spectrum antibiotics (tazocin, augmentin and meropenem) was similar, restricted antibiotics consumption (daptomycin, tigecycline, temocillin) and aminoglycosides was significantly different between the two periods.
Discussion and/or Conclusion(s): We note a variation in the microbiologist-guided antimicrobial prescribing practice between different consultants in a controlled environment. The differences cannot be attributed to pathogen resistance, or the patient's demography within the ITU. Further analysis is required to outline if these are behavioural differences or are indeed justified on clinical grounds.

ID: 4779

Course length and risk of repeat antibiotic prescription in women with community onset lower UTI

Sean MacBride-Stewart[1], R. Andrew Seaton[2], Anne Thomson[3]. *[1]Pharmacy and Prescribing Support Unit NHS Greater Glasgow and Clyde, [2]Antimicrobial Management Team NHS Greater Glasgow and Clyde, [3]Glasgow City Health Social Care Partnership (North East)*

Background: A 2005 Cochrane review concluded that 3 days of antibiotic therapy was similar in effectiveness to 5–10 days for achieving symptomatic cure in non-pregnant women with lower UTI whilst longer treatment courses were more effective in achieving bacteriological cure. Current NHS Greater Glasgow and Clyde (GGC) guidance recommends a 3 day course of either nitrofurantoin or trimethoprim for uncomplicated lower UTI in women.
Aim(s)/Objective(s): To determine whether shorter course therapy in UTI is associated with higher rates of repeat prescribing.

Method(s): From an administrative dataset of community pharmacy dispensed prescriptions, details of acute UTI antibiotics and patient identifier were extracted from January 1st 2013 to 31st of April 2016 for 89,835 GP registered adult women in GGC.
The first courses of nitrofurantoin or trimethoprim following a 365 day washout period was identified. Course length was estimated. Repeated course of UTI antibiotic (trimethroprim, nitrofurantoin, co-trimoxazole, co-amoxiclav, quinolones or cephalexin) was determined in the following 42 days.
Results: Proportion requiring a repeat antibiotic course was not related to nitrofurantoin course length (17.1%, 16.8% and 17.3% for 3, 5 and 7 day courses respectively; Pearson chi-square = 0.31 P = 0.86). Shorter course lengths of trimethoprim was associated with a larger proportion of repeated courses (13.6%, 12.7%, 12.5% for 3, 5 and 7 day courses respectively; Pearson chi-square = 9.94 P < 0.01).
Discussion and/or Conclusion(s): Shorter course lengths of trimethoprim but not nitrofurantoin was associated with a higher rate of repeat antibiotic prescription. Course length specific to microbiological isolate was not assessed.

ID: 4867
Starting smart is easier than focusing – challenges faced in an elderly population

Frances Edwards[1], Hugo Donaldson[2], Mark Gilchrist[2]. *[1]London North West Hospitals NHS Trust, [2]Imperial College Healthcare NHS Trust*

Background: Current national guidance for antimicrobial stewardship in secondary care recommends a strategy of "Start Smart – then Focus".
Aim(s)/Objective(s): We audited our adherence to this guidance on our weekly Microbiology/Pharmacy Antimicrobial Stewardship rounds in the Department of Medicine for the Elderly.
Method(s): Data from 127 patient reviews over 10 weeks were analysed.
Results: All the patients (n = 127) had an indication documented and 87% had evidence of an infection (two or more of a clinically relevant sign, symptom or diagnostic result for the documented indication). The most common indication was urinary tract infection (n = 37, 26.1%), followed by community acquired pneumonia (27, 19.0%), cellulitis (15, 10.6%) and hospital acquired pneumonia (13, 9.2%). Antibiotics were prescribed according to Trust guidance in 54% (n = 68) and on the advice of the infection team in 36% (n = 46). Only 10% (n = 13) of prescriptions were inappropriate. Cultures were sent from 68% patients but only 30% of patients had a relevant culture result. The antibiotic review resulted in no change to initial plan in 56% of cases and stop completely in 17%. Many patients remained on broad spectrum antibiotics, with 26% (n = 42) prescribed piperacillin/tazobactam.
Discussion and/or Conclusion(s): While adherence to the "Start Smart" guidance was high, the "focus" element including de-escalation was challenging due to the lack of relevant culture results in the majority of cases.

ID: 4883
Significant and sustained reduction of meropenem consumption following the introduction of daily meropenem stewardship programme

Tejal Vaghela[1], Singh Prema[2], Eleni Mavrogiorgou[2], Rakan El-Hamad[2], Wael Elamin[2], Hala Kandil[2]. *[1]West Hertfordshire Hospitals NHS Trust Watford General Hospital, [2]West Hertfordshire Hospitals NHS Trust*

Background: Judicious meropenem use is an important goal of antimicrobial stewardship programme (ASP). At our Trust the use of meropenem is restricted. We noticed an increase (100%) in meropenem consumption in February 16.
Aim(s)/Objective(s): We report a successful ASP initiative introduced in March 2016 to reduce meropenem consumption.
Method(s): All patients prescribed meropenem were identified daily using the pharmacy system. ITU patients were excluded as meropenem use in this setting is daily reviewed by microbiologists. Patients prescribed meropenem without microbiology input or justified clinical indication were clinically reviewed on the wards by the Antimicrobial Stewardship Team. Data on meropenem consumption (DDD/1000 admissions) were collected monthly over 3 month's period.
Results: There was a significant and sustained monthly reduction of meropenem consumption as follow: 98, 67, 56, 26 DDD/1000 admissions in February, March, April and May 2016 respectively, with a total reduction of 73% after the introduction of meropenem stewardship initiative. There was 20% reduction of Piperacillin & Tazobactam consumption during this 3 month period. We noticed marginal increase in cephalosporins (11%) and quinolones (19%) consumption during the same period.
Discussion and/or Conclusion(s): Our meropenem stewardship program has promoted appropriate use of meropenem and resulted in decreased consumption of meropenem. The impact of this program on mortality rate, Clostridium difficile infection and re-admission warrants further investigation.

ID: 4913
The challenges of improving day 3 antimicrobial stewardship reviews

Sarah Drake, Anne Melhuish, Damian Mawer, Abimbola Olusoga, Emily Williams, Raymond Mak, Jonathan Sandoe. *Leeds Teaching Hospitals NHS Trust*

Background: PHE 'Start smart – then focus' guidelines (2015) recommend undertaking antimicrobial stewardship reviews 48–72 hours after prescribing an antimicrobial.
Aim(s)/Objective(s): We performed an audit cycle aiming to improve the frequency and quality of day 3 antimicrobial reviews at Leeds Teaching Hospitals.
Method(s): Standards were developed from local guidelines and 'Start smart – then focus'. Data was collected prospectively from the clinical notes and drug charts of patients requiring day 3 review on four wards, for one month. A reminder sticker was then piloted for four weeks, alongside which we visited the wards regularly to promote and embed its use. Data collection was then repeated for one month.
Results: In the initial phase 33/94 (35%) of patients had no documented evidence of a review. Only 13% had a review documented in the medical notes and drug chart (the audit standard). 46/66 (70%) continued broad-spectrum intravenous antimicrobials. After introduction of the sticker, the re-audit showed they were not being used and the day 3 review process had not improved. Medical staff from all grades reported several reasons why this intervention failed: lack of antimicrobial knowledge, challenges in reviewing antimicrobials without microbiological samples, and difficulty reviewing antimicrobials when the initial indication was unclear.
Discussion and/or Conclusion(s): Undertaking day 3 reviews is a complex process that may not be improved by interventions targeting this stage of antimicrobial prescribing alone. A multifaceted approach is likely to be necessary. Identifying future interventions requires further studies to improve our understanding of how medical staff approach and undertake antimicrobial prescribing.

ID: 5023
Developing national Antimicrobial Stewardship (AMS) surveillance in England

Diane Ashiru-Oredope[1], Emma Budd[1], Sejal Hansraj[1], Philip Howard[2], Stuart Brown[2], Susan Hopkins[1]. *[1]Public Health England, [2]NHS England*

Background: A survey conducted by PHE in 2014 highlighted that the majority of Trusts completed AMS related ward audits frequently (>6 monthly). In March 2016 PHE developed an AMS surveillance tool and conducted a pilot to test the feasibility of centrally collecting details across England.
Aim(s)/Objective(s): To collect details of existing AMS audits in English Trusts using a central audit tool.
Method(s): A web based tool was circulated to the national antimicrobial pharmacist network across 146 Acute NHS Trusts. This was a voluntary pilot audit completed by healthcare professionals; ethics approval was not required.

Results: 33 Acute NHS Trusts piloted the surveillance tool; 12 were teaching hospitals. All had collected patient level audit/quality improvement data relating to national AMS guidance in the previous year; these data were most commonly collected on a monthly (39%) or quarterly (27%) basis. A high proportion of wards were typically surveyed at least once over the past year (51–100%). Antibiotic courses were reviewed with formal documentation at 48–72 hours after initiation of therapy by 36% of Trusts.
Discussion and/or Conclusion(s): Following publication of an AMR CQUIN (Commissioning for Quality and Innovation) by NHS England which includes empiric review of antibiotic prescriptions as one of the indicators and comments from respondents of the pilot, the AMS surveillance tool was simplified to focus on the key elements required by both the national AMS toolkit SSTF and the AMR CQUIN. A sample data collection audit tool was designed to accompany the surveillance tool and both circulated to Trusts to support their submission for the CQUIN.

Topic: Clinical cases

ID: 4711
Beans for breakfast darling?

Alison Burgess[1], Begona Bovill[2], Elizabeth Johnson[3], Megan Jenkins[2]. *[1]PHE, Southmead Hospital, Bristol, [2]Southmead Hospital, Bristol, [3]National Mycology Reference Laboratory*

A thirty-four year old teacher with a history of mild asthma presented with a two week history of fever, arthralgia and progressive shortness of breath since returning from a school-trip to Guyana. The trip was based within the rainforest and included accommodation near a bat colony. He had taken proguanil hydrochloride with atovaquone as malaria prophylaxis. A pansystolic murmur was noted but examination was otherwise unremarkable. He had a swinging pyrexia to 38.9°C. Initial investigations revealed normal white cell count, CRP 81 mg/L, ALT raised at 117 U/L. Admission chest radiograph had widespread nodular opacification and a subsequent CT thorax demonstrated multiple pulmonary nodules. Echocardiogram showed mild tricuspid regurgitation only. Sputum was sent urgently for standard and mycobacterial culture.

ID: 4807
Fusobacterium nucleatum and Parvimonas micra polymicrobial infection in a patient with spondylodiscitis

Leanne Cleaver, Damien Mack, Shara Palanivel, Simon Warren. *NHS*

A 45 year old Caucasian female was referred to the Royal National Orthopaedic Hospital, Stanmore for an eight week history of back pain after lifting a bag onto a luggage rack, which was not responding to physiotherapy and analgesia.
The patient reported no fevers, sweats, or weight loss in this time. She also recalled no urinary symptoms, had never had any other back pain or injury, no epidural anaesthetic, and no other significant illnesses. The patient has an intrauterine device (copper coil) which has been in situ since 2009.
The patient had undergone surgery to remove varicose veins in the leg as a teen for Klippel Trenaunay Syndrome. She sustained a trauma to the right hand in early 2015, which she did not receive antibiotics for and had not received antibiotics prior to the current complaint. Some years previously the patient had had a dental cavity filling and some subsequent dental hygienist procedures and had good oral health.
The patient was born and raised in Australia and moved to the United Kingdom 20 years previously, where she currently resided in London working in finance. Recent travel history included visiting Manila in 2014. Other than the aforementioned, the patient was healthy and well. Upon referral, the patient underwent X-ray and magnetic resonance imaging (MRI) of the spine which showed acute supporative osteomyelitis of the twelfth thoracic vertebra and the first lumbar vertebra. The patient then had a computed tomography (CT)-guided vertebral biopsy; one sample was sent to the microbiology department at the Royal Free Hospital, London.

ID: 4896
Hypoglycaemia and a disseminated infectious disease… time to think!

Alberto San Francisco, Bethany Davies, Gillian Jones, Catherine Sargent. *Brighton and Sussex University Hospitals NHS Trust*

76 year-old female, retired opera singer, with background history of Hypertension, Atrial Fibrillation, Asthma and Right total Knee replacement presented to the orthopaedics team in December 2015 with 6-month history of intermittent swelling and pain on her right knee, weight loss, anorexia and intermittent sweats.
Initial X-rays raised suspicion for inflammation in the distal femur close to the prosthetic material. Further Nuclear medicine scans revealed increased radionuclide uptake in the distal right femur and an incidental finding of a large soft tissue abscess in the right thigh. MRI confirmed a 20 cm thick walled cystic mass in the right proximal thigh. She was admitted in March 2016 for surgical washout and debridement of the thigh abscess. CT CAP showed evidence of disseminated disease with milliary pulmonary nodules. Pus cultures from the abscess identified the causative microorganism. HIV test was negative. She was started on 2 different intravenous antibiotics with symptomatic improvement and reduction of inflammatory markers. However, on day 10 of treatment she developed recurrent episodes of severe hypoglycaemia, recurring despite intravenous dextrose and glucagon injections. She subsequently developed severe hyponatremia following aggressive resuscitation with iv. dextrose and required ICU admission for 6 days.
The Endocrinology team reviewed the case and advised that one of the antibiotics was likely to be the cause of the hypoglycaemic episodes. The patient was switched to a different intravenous antibiotic and no further hypoglycaemic episodes were recorded.
What was the underlying diagnosis, and which was the offending drug?

ID: 4918
A fatal case of pyogenic liver abscess complicated by two traits of one pathogen

Kerry Roulston[1], Tehmina Bharucha Bharucha[1], Katie Hopkins[2], Jane Turton[2], Damien Mack[1]. *[1]Royal Free London NHS Foundation Trust, [2]Antimicrobial Resistance and Healthcare Associated Infections Reference Unit, Public Health England*

A 63 year old lady of Bangladeshi origin presented with a four day history of fever, rigors and right upper quadrant pain. She had a recent diagnosis of metastatic pancreatic cancer with biliary stent insertion three weeks earlier. On admission the patient was septic (temperature 38°C, heart rate 125, blood pressure 106/44, respiratory rate 25) with a white cell count of 28 (neutrophils 25) and a c-reactive protein of 318. Piperacillin-tazobactam was started for presumed biliary sepsis and blood cultures taken on admission grew a fully susceptible *Escherichia coli*. A computed tomography scan revealed a large multi-septate liver abscess, a drain was inserted and *E. coli* was isolated. The patient deteriorated and died seven days after admission.
A second organism associated with this condition was also isolated from the liver aspirate and a rectal screening swab which posed a significant challenge in the management of this patient. The emergence of such organisms presents a new and significant threat to global public health.

ID: 4955
A very chronic infection

Chloe Walsh, Jane Minton. *Leeds Teaching Hospitals NHS Trust*

A 49 year old woman was referred to Infectious Diseases with pyrexia of unknown origin (PUO). Past medical history includes systemic lupus erythematosus with multi-organ involvement and long term prednisolone use. She was admitted with fever without localising

symptoms, which responded to piperacillin/tazobactam. Fever recurred on stopping antibiotics. Examination revealed a dull right lung base; imaging confirmed consolidation, but suggested that changes were chronic.
Her respiratory problems date back to 1990 when she had "pleurisy". Imaging reveals pleural thickening and consolidation of the right lung since at least 2004. In 2010 she had empyema. Symptoms improved following thoracoplasty and washout of the pleural cavity. In 2012, she presented with bacteraemia, and has since had multiple admissions with pneumonia and bacteraemia; likely secondary to the same chronic infection. She is currently receiving prolonged antibiotics, as surgical management is too high risk.
Such prolonged bacterial infection is rarely described. In PUO it is essential not to dismiss any clues when assessing patients and to be aware that chronic infection can establish when source control is not adequately achieved.

ID: 4998
Mysterious mycosis from Maidenhead

Michael Butler[1], David Denning[2], Jane Democratis[3]. *[1]Frimley Health Foundation Trust, [2]Professor of Infectious Diseases in Global Health, University Hospital of South Manchester, [3]Consultant Physician Infectious Diseases, Frimley Health NHS Foundation Trust*

We report a 49 year old British-Asian female with a 40 year history of unilateral recurrent cellulitis and chronic lymphoedema referred for consideration of prophylactic antibiotics. Removal of dressings identified no cellulitic changes but rather an invasive fungating lesion, with MRI revealing underlying osteomyelitis.
The chronic lymphoedema had developed in the left leg at the age of fifteen, the skin on which began to break down, and she developed a fungal infection, with recurrent secondary bacterial cellulitis. Following failed attempts by the vascular team to save the rapidly deteriorating leg, she required an above knee amputation to save her life. She was lost to follow up before a diagnostic work up was complete.
The patient is of Pakistani ethnicity, born in the UK, with no significant travel history. Apart from suffering from onychomycosis from the age of three, she is otherwise fit and well, showing no signs of any other immunocompromise, nor any recurrent mucosal candidiasis.
After two years of good health, the patient re-presented to the clinic with accelerated oedematous changes and new onset of fungal infection in her remaining right leg. A race began to make a diagnosis, curb the infection and save the remaining leg.

ID: 5012
What is optimal antimicrobial therapy for PVL MSSA infection?

Daniel Pan, Gavin Barlow, Kate Adams. *Hull and East Yorkshire NHS Trust*

A 15-year-old healthy boy accidentally fell over whilst playing football, subsequently scraping his left leg. A few days later he presented to hospital with fever and severe progressive back and leg pain. Admission blood tests showed a C-reactive protein (CRP) of 82 mg/L and normal range white cell count. Magnetic resonance imaging suggested pyomyositis of the left obturator, adductor and pubococcygeal muscles. Subsequent blood tests showed leukopenia, thrombocytopenia, CRP of >380 mg/L and an elevated creatine kinase of 399 U/L. Thoracic CT showed extensive bilateral consolidation with cavitation.

Topic: Clinical microbiology

ID: 4718
Comparison of inpatient Clostridium difficile rates in cystic fibrosis and respiratory patients at a Large Centre

Liana Hewson. *University of Manchester*

Background: Previous research has identified a high carriage rate of C. difficile in Cystic Fibrosis (CF) patients. On the inpatient unit of Manchester adult CF Centre (MACFC) it is common to detect antigen positive, toxin negative C. difficile in stool samples. There is lack of clarity as to how best to treat these patients, particularly around isolation for infection control as this greatly impacts on treatment of respiratory disease.
Aim(s)/Objective(s): The aim is to investigate the rate of antigen positive, toxin negative C. difficile in CF patients and develop guidelines for the management of such patients.
Method(s): From 2011 to 2014 C. difficile testing for presence of glutamate dehydrogenase (GDH) antigen and toxin A and B in the stools of CF patients with diarrhoea was compared with testing of stools of general respiratory patients with diarrhoea.
Results: The mean rates of antigen positive, toxin negative C. difficile were 36.5% (95% CI 29.5–43.9%) on the CF unit and 9.2% (95% CI 7.1–11.7%) on other respiratory wards. For each year studied, results of testing in the two populations are significantly different.
Discussion and/or Conclusion(s): The rates of antigen positive, toxin negative C. difficile are significantly higher in CF patients than in general respiratory patients.
We have instituted PCR testing of stool samples to establish potential for the C. difficile identified to produce toxin. If PCR testing is negative, with a clear non-infective cause of diarrhoea we are developing guidelines whereby patients do not need isolation, allowing patients to engage with necessary exercise and physiotherapy.

ID: 4805
A randomised control trial and results of sequence typing of sequential MRSA isolates

Toney Thomas[1], Deirdre Hughes Fitzgerald[2], Georgina Gethin[3], Hilary Humphreys[4]. *[1]Beaumont Hospital/RCSI, [2]RCSI, [3]NUI Galway, [4]RCSI/Beaumont Hospital*

Background: Eradicating MRSA from the nose is important in preventing MRSA infection. Mupirocin resistance restricts the use of repeated courses. A randomised control trial was conducted to determine if medical grade honey is an appropriate alternative to mupirocin.
Aim(s)/Objective(s): To compare sequential isolates, i.e. historical (original first isolate from that patient), on recruitment and on study completion using *spa* typing.
Method(s): Isolates were *spa* typed. DNA sequencing was performed by GATC Biotech, Germany and *spa* type assigned.
Results: To date, 100 patients have completed the study, resulting in 209 isolates. The mean age was 73.2 y and 36% female. Most (93%) were previously known MRSA, duration 0–15 y. Of the 209 isolates, 66 were historic, of which 41 were nasal and the remainder were clinical isolates. There were 143 nasal isolates; 100 on enrolment and 43 at study end. A *spa* type was assigned for 205 isolates, predominant *spa*-types were t032, t515, t127 and t4559. Two new *spa* types were identified and assigned t15373 and t15959 by the SeqNet curator. Of the 66 patients, 45 (68%) had an indistinguishable *spa* type on both occasions. Among persistent MRSA carriers (n = 46/100), 42 had an indistinguishable *spa* type on recruitment and at the end of study.
Discussion and/or Conclusion(s): Genetic diveristy of MRSA colonising strains necessitates surveillance and molecular analysis to identify new and resistant strains. Identification of an indistinguishable *spa* type among two thirds of persistent MRSA carriers supports the widely held view that most persistent carriers are colonised with the same strain, rather than with new strains.

ID: 4859
A 6 month evaluation of a frozen faecal microbiota transplant service for the treatment of chronic Clostridium difficile infection

Kelly Bicknell[1], Andrew Flatt[2], Carole Fogg[3]. *[1]Portsmouth Hospitals NHS Trust, [2]Portsmouth Hospitals NHS Trust, [3]University of Portsmouth*

Background: In July 2015, the Wessex Faecal Microbiota Bank was funded to provide frozen faecal microbiota transplant (FMT) service to patients with recurrent Clostridium difficile infection (CDI). FMTs have a reported cure rate of 94%, but barriers to widespread use include

logistics, patient perception and a lack of local expert clinical advice. The frozen FMT service was designed to overcome these issues and provide an accessible, timely, widespread service.
Aim(s)/Objective(s): The aims of the service evaluation are to describe the demographics of FMT patients, establish whether the clinical outcomes are comparable to those described in the literature, evaluate patients' acceptance of FMT and determine if an FMT bank can provide a regional service.
Method(s): The service has been evaluated using clinical outcomes, patient satisfaction surveys, and quality of life (QoL) surveys. Data is collected pre-procedure, immediately post-procedure, at 6 week and 6 month.
Results: Fifteen patients were treated in the first 6 months of operation. Preliminary data shows the demographics of patient receiving FMT are similar to those with chronic CDI (mean age 69, Charlson comorbidity index 4 M:F ratio 1:1). Outcomes are similar to those reported in the literature; 80% of patients resolving symptoms following first FMT. Patient feedback is positive; QoL has increased significantly (Mean: 20 point increase). Information and the procedure have an average rating >4/5. FMT uptake in Wessex; All regional hospitals perform FMTs locally.
Discussion and/or Conclusion(s): The service is achieving promising clinical and QoL outcomes, patients are positive about FMTs and the uptake shows a regional bank is a desirable resource.

ID: 4861
PPI exposure and carriage of multi-resistant Gram negative bacteria

Lewis Jones[1], Richard Cunningham[1], Doyo Enki[2], Robert Tischhauser[1]. *[1]NHS, [2]Plymouth University Peninsula Schools of Medicine and Dentistry*

Background: Gram-negative bacterial resistance is a major cause of infection, which is usually preceded by ingestion and colonization of the gastrointestinal tract. Proton Pump Inhibitor (PPI) use is a proven risk factor for infection with gastrointestinal pathogens. We carried out a case-control study to determine whether PPI use is also associated with an increased carriage rate of multi-resistant Gram negative bacteria.
Aim(s)/Objective(s): To determine whether prior use of PPIs is a risk factor for diagnosis of multi-resistant Gram-negative infection compared with a matched control group with no infection or infection with a sensitive organism.
Method(s): A retrospective case note review of Plymouth Hospital inpatients between 1/4/14 and 31/3/15 was performed. 130 patients with ESBL producing E. coli or K. pneumoniae (cases) were identified and compared with 130 controls without identified resistance. Controls were matched by age, gender, admission date, source (hospital, nursing home, home) and admitting Care Group (Medical, Surgical, Women & Children).
Results: Preliminary results after analyzing the first 78 patients suggest that the proportion of cases taking PPI is higher than in the control group. 21 of 40 cases and 13 of 38 controls were taking a PPI on or during the 6 months before admission. Full results and statistical analysis after inclusion of all subjects will be presented.
Discussion and/or Conclusion(s): Preliminary results suggest a positive association between carriage of ESBL producing Gram-negative bacteria, and PPI use. If confirmed in a larger sample, PPI stewardship may be an additional control measure to reduce transmission of resistant Gram negative bacteria.

ID: 4984
10 year case review of bacteraemias due to *Mycobacterium abscessus* in a UK tertiary hospital

Huina Yang[1], Luke Bedford[2], Charlotte Summers[3], Sani Aliyu[1], David Enoch[1]. *[1]Cambridge University Hospitals NHS Foundation Trust, [2]Papworth Hospital NHS Foundation Trust, [3]University of Cambridge*

Background: The *Mycobacterium abscessus* complex are a group of rapidly growing, multidrug-resistant non-tuberculous mycobacteria. They are associated with a wide range of clinical syndromes in both immunocompetent and immunosuppressed individuals. *M. abscessus* are successful pathogens due to their ability to form biofilms which aids environmental survival and easy colonisation of mucosal surfaces and invasive devices.
Results: We reviewed the medical notes and laboratory data of all patients with *Mycobacterium abscessus* bacteraemia over a 10 year period. Five patients were identified over this period. All 5 patients had at least one central intravascular device at the time of the bacteraemia. Four out of 5 were health-care associated. Four of the patients were also post transplantation. The time to positivity of the blood culture bottles ranged from 5 to 10 days. The majority (4 out of 5) had multiple sets of blood cultures with *M. abscessus*. In our series, the 30 day mortality was 20% and 90 day mortality was 40%.
Discussion and/or Conclusion(s): In our experience, *M. abscessus* frequently causes an indolent infection associated with intravascular devices. Increased morbidity is associated with subsequent seeding to distant sites, particularly in imunocompromised individuals. Although the diagnosis is often delayed, the increase use of new diagnostics in the routine laboratory, such as MALDI-TOF has helped to improve early identification and treatment. *M. abscessus* should be regarded as a true pathogen when identified in blood cultures, and prompt removal of suspected infected intravascular catheters may be essential for the successful management of this infection.

Topic: Decontamination

ID: 4687
Use of wipes for patient hand hygiene

Christina Bradley[1], Martyn Wilkinson[2], Adam Fraise[2], Martin Kiernan[3]. *[1]Hospital Infection Research Laboratory, Queen Elizabeth Hospital Birmingham, [2]Hospital Infection Research Laboratory, Queen Elizabeth Hospital Birmingham, [3]Visiting Clinical Fellow, University of West London*

Background: Much attention has focussed on hand decontamination for healthcare workers; little attention has been paid to patient hand hygiene. Patients confined to bed are often unable to access hand washing facilities. They could use an alcohol hand rub but these are not advised for soiled hands or social hand hygiene. One alternative is the use of a hand wipe, similar to those supplied by airlines and restaurants. However, is this an effective way of removing transient micro-organisms from the hands? This study was designed to assess the efficacy of an antimicrobial hand wipe (Clinell® Antibacterial Handwipe) compared with hand washing.
Method(s): The methodology was based on EN 1499 (2013) and EN 1500 (2013) as there is no standard for this type of product. The hands of 20 volunteers were artificially contaminated by immersion in *Escherichia coli* and then sampled before and after using a reference soft soap or a wipe with and without an antimicrobial agent for 60 seconds. The counts obtained were expressed as $\log_{10}$ and the $\log_{10}$ reductions calculated.
Results: The patient hand wipe with no antimicrobial agent was inferior to the soft soap. However, the antimicrobial wipe was statistically non-inferior to the soft soap. A $\log_{10}$ reduction of 3.54 was obtained for the reference, 2.46 for the control patient wipe, and 3.67 for the antimicrobial patient wipe.
Discussion and/or Conclusion(s): The evidence suggests that the antimicrobial patient wipe, when applied for 60 seconds, is at least as good as soap and water, representing an acceptable alternative to handwashing from a bactericidal perspective.

ID: 4905

Influence of a probiotic-based sanitizing methods on surface pathogen persistence and resistance: an effectiveness and safety study

Elisabetta Caselli[1], Maria D'Accolti[2], Paola Antonioli[3], Luca Lanzoni[2], Maddalena Coccagna[2], Maria Teresa Camerada[2], Sante Mazzacane[2]. *[1]University of Ferrara, [2]CIAS, University of Ferrara, [3]S. Anna University Hospital, Ferrara*

Background: Contamination of hospital surfaces can contribute to transmission of healthcare-associated infections (HAIs), representing a global concern. Chemicals-based cleaning shows limitations in controlling surface bioburden, and can select resistant species. Recently, a system based on detergents containing probiotics of the spore-forming *Bacillus* genus (PCHS) was shown to decrease surface pathogens up to 90% more than conventional disinfectants.
Aim(s)/Objective(s): Here we wanted to analyse the impact of PCHS on the drug-resistance features of the hospital surfaces microbiota, and to assess its safety of use.
Method(s): Microbial drug-resistance was analysed by a microarray detecting 84 resistance-genes in the total microbiota and in individual isolates, and confirmed by conventional antibiograms. Also, a four-year microbiological surveillance was implemented, evaluating the presence of *Bacillus* strains in all the clinical samples of the patients admitted to PCHS-treated hospitals.
Results: PCHS use induced a drop (up to –99%) of resistant pathogen strains, rather than selecting them. Notably, detergent-*Bacillus* strains remained genetically unmodified even after years of continuous contact with surface pathogens, and no infections attributable to *Bacillus* were observed in 32,139 analysed samples from seven hospitals.
Discussion and/or Conclusion(s): Results show that PCHS application can effectively reduce the number of pathogens and their drug resistance. Furthermore, the genetic stability of PCHS-*Bacillus* trains, together with the absence of HAI attributable to probiotic *Bacilli* suggest that they do not have the ability to cause infections, even in the subjects at higher risk for adverse events, such as hospitalized patients, and support the safety of environmental use of probiotics for sanitation purposes.

Topic: Environment

ID: 4420

Transfer frequency of dry surface biofilm in health-care environment – the role of health care worker's hand

Durdana Chowdhury, Shamaila Tahir, Mark Legge, Honghua Hu, Khalid Aljohani, Anand Deva, Karen Vickery. *Macquarie University*

Background: Hospital environmental surfaces become contaminated by pathogens shed by infected patients and can survive for extended periods when incorporated into dry surface biofilms (DSB). Within biofilms, bacteria are protected from desiccation and increased tolerance to removal by cleaning agents and disinfectants. We hypothesise that pathogens in DSB play a significant role in the endemic transmission of healthcare-associated infections.
Aim(s)/Objective(s): This study aims to determine if DSB can be transmitted from hospital surface to healthcare worker's hands.
Method(s): DSB of *Staphylococcus aureus* was grown in vitro on polycarbonate and glass coupons in CDC bioreactor over a period of 12 days with periodic nutrition interspersed with long periods of dehydration. Each coupon had 10^7 bacterial cells. Transmission was tested using gloved and ungloved hands via various materials (plastic and glass coupon and cotton sheet) before and after treatment with 5% neutral detergents.
Results: Transmission of organisms was 10 times higher with bare hands than gloved hands. Both nitrile gloves and surgical gloves transmitted approximately 6 times the bacteria than latex gloves. Following hand contamination with DSB, transmission to 20 subsequent surfaces was highly possible. Cotton bed sheet also showed higher rate of transmissibility. It is astonishing that, 7.3% organism can pass through cotton sheet to contaminate skin of hands. Surprisingly, DSB treated with 5% neutral detergent increased the transmission rate of DSB bacteria tenfold.
Discussion and/or Conclusion(s): DSB is highly transmissible. It is higher with bare hand and can be transmitted to the patient from bed mattress, through the bed sheet.

ID: 4503

Non-slip socks: A potential reservoir for transmitting multidrug resistant organisms in hospitals?

Nikunj (Nik) Mahida, Tim Boswell. *Nottingham University Hospitals*

Background: Falls and fall-related injuries are common within acute healthcare settings. In response to patients admitted with unsuitable or inappropriate footwear, a number of hospitals have introduced non-slip socks to reduce falls.
Aim(s)/Objective(s): This study evaluates whether non-slip socks can be become contaminated with multidrug resistant organisms found on the floor.
Method(s): 54 pairs of used socks and 35 environmental floor samples were obtained from 7 wards in a tertiary referral hospital. Socks were anonymously collected from patients by offering a new pair of non-slip socks in exchange for the in-use pair. On each ward where socks were collected, five floor areas (2 ward corridors, 3 toilets) were sampled using a Polywipe™ sponge.
Results: Vancomycin resistant enterococci (VRE) were detected from 46 socks (85%) and Meticillin-resistant Staphylococcus aureus (MRSA) from 5 (9%). Environmental sampling cultured VRE from 24 floor samples (69%) and MRSA from 6 floor samples (17%). Clostridium difficile was not detected from any sample.
Discussion and/or Conclusion(s): The study demonstrates that non-slip socks can become contaminated with multidrug resistant pathogens. Patients not only use them to walk to various parts of the hospital during the inpatient journey but also wear them in bed. It suggests a potential route for cross-transmission, which thus far has not been considered.

ID: 4550

Comparison of environmental sampling methods for the investigation of an outbreak of Group A Streptococcus

Amelia Joseph[1], Vivienne Weston[2]. *[1]Nottingham University Hospitals/ Health Education East Midlands, [2]Nottingham University Hospitals*

Background: There is no guidance on the optimal method of sampling the non-healthcare environment for Group A Streptococcus (GAS) during an outbreak.
Aim(s)/Objective(s): To compare methods of sampling soft furnishings in a residential home setting during an outbreak of GAS.
Method(s): Three cases of GAS infection (emm type st1.0) and eight asymptomatic cases were identified over a four month period in a residential home setting. During the outbreak we sampled soft furnishings (carpets, curtains and soft furniture) using three methods: standard swabs onto blood agar; Polywipe® sponges into brain heart infusion broth with subculture to streptococcal selective agar; and blood agar sweep-plates. Isolation of GAS was compared at 24 and 48 hours.
Results: All standard swab samples were negative. GAS was isolated from the patients' carpets by sweep-plate method in three, and by Polywipe® sponge method in two, of the four samples. Curtains in one patient's room and in the communal living room were positive by sweep-plate method, but negative by Polywipe® sponge method. A footstool in the communal living room was positive by both sweep-plate and Polywipe® sponge methods. There were no additional positives at 48 hours compared to 24 hours of incubation. All environmental isolates were emm type st1.0.
Discussion and/or Conclusion(s): The sweep-plate method is a rapid and effective way of sampling soft furnishings for GAS.

Dragging the rim of the agar plate over the fabric pile may release organisms that would not be recovered by other methods. Using selective agar could refine this method specifically for the target organism in an outbreak.

ID: 4585

Impact of moving to a new hospital build with high proportion of single rooms on rates of hospital-acquired infection and outbreaks

Julia Vasant[1], Elizabeth Darley[2], John Leeming[3], Samantha Matthews[4], Fiona Hammond[4]. *[1]Department of Infection Sciences, North Bristol NHS Trust, [2]Department of Infection Sciences and Infection Control, North Bristol NHS Trust, [3]Department of Infection Sciences, North Bristol NHS Trust, [4]Department of Infection Control, North Bristol NHS Trust*

Background: Isolation of patients with transmissible infections is a major component of hospital infection control. In 2014 North Bristol NHS Trust (NBT) re-located from a dual-site hospital with 10% single rooms to a purpose-built design with 75% single rooms.
Aim(s)/Objective(s): To determine whether moving from a 1000-bed hospital with 10% single rooms to new premises with 75% single rooms resulted in reduced hospital-acquired infection rates.
Method(s): NBT annual mandatory reporting data for hospital-acquired *C. difficile*, meticillin-susceptible *Staphylococcus aureus* (MSSA) bacteraemia, *E. coli* bacteraemia and ward closures for norovirus outbreaks were analysed from April 2011 to March 2016 inclusive. (MRSA bacteraemia rates were zero).
Results: Annual incidence per 100,000 bed-days over study period:

- *C. difficile*: reduction from 23.3 to 15.8, no increased rate of decline post-move.
- MSSA bacteraemia: reduction from 9.6 to 7.1, no decrease in the year immediately post-move.
- *E. coli* bacteraemia: reduction from 23.2 to 13.0 (reporting commenced July 2011), no increased rate of decline in the year post-move.
- Norovirus ward closures: Pre-move 21, 34 and 13 (2011/12, 2012/13 and 2013/14 respectively). Post-move 1 and 4 (2014/15 and 2015/16).

Discussion and/or Conclusion(s): Transfer of *C. difficile*, MSSA and *E. coli* requires contact between colonised patients or their environment, and is largely controlled by optimal infection control practice and cleaning. Hospital-acquired bacteraemia frequently originates from in-patients colonising flora, hence minimal impact with increased isolation facilities. Norovirus transmission, in contrast, has a significant airborne component and outbreak frequency and duration have been notably reduced following greatly increased ability to isolate cases.

ID: 4809

The development of methods to investigate Dry Surface Biofilms in Intensive Care Units and methods to assess cleanliness challenges

Greg S. Whiteley[1], Karen Vickery[2], Iain Gosbell[3], Slade Jensen[3], Helen Hu[2], Trevor Glasbey[4], Ahmed Almatroudi[2], Jessica Knight[5], Durdana Chowdhury[2], Shamaila Tahir[2], Khalid Johani[2]. *[1]Western Sydney University, [2]Surgical Infection Research Group, Faculty of Medicine and Health Sciences, Macquarie University, [3]Molecular Medicine Research Group, School of Medicine, Western Sydney University, [4]Whiteley Corporation, [5]Antibiotic Resistance and Mobile Elements Group, Ingham Institute for Applied Medical Research, Liverpool, New South Wales, Australia*

Background: The spread of multi-resistant-organisms (MRO) within intensive care units (ICU) is a significant concern for infection prevention of healthcare associated infections (HAI). The presence of MRO embedded within biofilms on dry surfaces has recently been confirmed. The ability of these organisms to both survive and resist normal hygiene measures has also now been confirmed.
Aim(s)/Objective(s):

1. To investigate the presence of dry surface biofilms in ICU settings;
2. To investigate the cleanliness within ICU settings;
3. To replicate dry surface biofilms under Laboratory conditions similar to an ICU;
4. To investigate the behaviour and resistance of MRO following growth in biofilms similar to those found in ICU.

Method(s): The presence of biofilms and MRO has been undertaken using microbial techniques suitable for recovery of sessile bacteria. Cleaning conditions and disinfecting and sterilising techniques were applied to bacteria grown under simulated biofilm conditions similar to those found in ICU. Surface to surface contamination via hands (gloved and ungloved) was investigated.
Results: Bacteria including MRO found in biofilms in ICU have exaggerated longevity and enhanced resistance to surface disinfection (chlorine) and sterilisation (autoclaving). These organisms demonstrate transfer via hand contact onto multiple subsequent surfaces.
Discussion and/or Conclusion(s): The transmission of MRO within ICU and other healthcare settings is often via hands that can be contaminated following touching of environmental biofilms. The implications of dry surface biofilms acting as a reservoir for MRO is highly significant for aseptic technique and hygiene management within ICU settings.

ID: 4848

Fire burns, smoke kills. Microbial risk assessment of smoke and heat exhaust ventilation system (SHEVS) tests in a hospital building

Céline Hernandez, Laure Belotti-Ehrhard, Céline Ménard, Jacinthe Foeglé, Thierry Lavigne. *Hôpitaux Universitaires de Strasbourg*

Background: There is some concern among infection control specialists that hospitals smoke and heat exhaust ventilation system (SHEVS) may present a threat for immunocompromised patients. Smoke inhalation being the primary cause of death in indoor fires, SHEVS is mandatory and requires regular testing. Yet a current of unfiltered air running through unused ducts and spreading in the very core of a ward is bound to induce a burst of airborne contamination. Besides, fire dampers in ventilation ducts close during the tests, causing vibrations in the ductwork and maybe sending dust downstream, to other wards.
Aim(s)/Objective(s): Finding no data about this potential danger, we opted for our own environmental investigation.
Method(s): Air was sampled for bacteria and fungi before, during and after SHEVS tests, in several wards corridors directly subjected to the essay and a few levels above, in our pediatric oncology unit. We also reviewed the results of systematic samplings, paralleled with the date of previous tests or accidental fire alarms. This was intended as a complement to the systematic study of a contamination episode in pediatric oncology we presented at the HIS 2014 meeting, the impact of incidental triggering of the fire alarm, elsewhere in the building, being an unresolved question at the time.
Results: In most cases, SHEVS tests induced a sharp, yet variable, elevation of the fungal contamination. Nonetheless, this effect was restricted to the ward directly under test.
Discussion and/or Conclusion(s): This result comforts us about the legitimacy of the containment measures we empirically enforce during SHEVS tests.

Topic: Outbreaks

ID: 4501

Detection of blaIMP producing Enterobacteriaceae in a tertiary care centre in the UK

Surabhi Taori[1], Kirstin Khonyongwa[1], Nergish Desai[2]. *[1]King's College Hospital, [2]King's College Hospital NHS Foundation Trust*

Background: The incidence of Carbapenemase producing Enterobacteriaceae has been increasing worldwide. In the UK, outbreaks of organisms with bla_{KPC}, bla_{NDM}, bla_{OXA48} and bla_{VIM} have been reported whereas bla_{IMP} has been relatively rare.

Aim(s)/Objective(s): We report an increase in incidence of Enterobacteriaceae with *bla*$_{IMP}$ in a tertiary care hospital in London, detected in a low risk population by enhanced screening and concurrent outbreak investigations.
Method(s): Patients are regularly screened for CPE carriage in high risk specialities (liver transplant, haematology, haemodialysis and intensive care). Contacts of positive cases are traced and screened and investigations widened if an outbreak is detected. Screening was done on Brilliance CRE agar. Molecular confirmation was by PCR and typing by VNTR analysis at the PHE reference laboratory.
Results: Detection of two *K.pneumoniae* (*bla*$_{OXA48}$ and *bla*$_{NDM}$) colonisations in high risk areas prompted contact tracing which led to screening in low risk wards (cardiology and general medicine). Unexpectedly, fourteen patients with bla$_{IMP}$ producing Enterobacteriaceae were detected. These comprised three different strains of *K. pneumoniae* and one E.cloacae of which two also colonised clinical sinks. One strain predominated causing 8 colonisations and two bacteraemias (one death). Active screening, deep cleaning and enhanced environmental and hand hygiene has resulted in no further cases of two of the three strains.
Discussion and/or Conclusion(s): Current guidelines recommend risk based screening; however detection of carriers in erstwhile low prevalence populations is changing the definition of risk factors. A relatively rare but diverse carbapenemase gene *bla*$_{IMP}$ may be emerging in the UK with clinical implications to protocols for laboratory detection.

ID: 4737

An outbreak of Group A Streptococcus: The challenges of outbreak management in the residential care setting

Amelia Joseph[1], Tracey Lamming[2], Sally Bird[3], Wendy Walker[3], Peter Hoffman[4], Vivienne Weston[5], Vanessa MacGregor[2]. *[1]Nottingham University Hospitals/Health Education East Midlands, [2]Public Health England East Midlands, [3]NHS Mansfield and Ashfield Clinical Commissioning Group, [4]Public Health England Colindale, [5]Nottingham University Hospitals*

Background: There are currently no national guidelines on the control of Group A Streptococci (GAS) in care homes.
Aim(s)/Objective(s): We describe the management of an outbreak of GAS in an 82-bedded facility providing residential and nursing care separated over four floors.
Method(s): Two residents from the residential care floor of the home presented with invasive GAS (IGAS) *emm* type st1.0 infection within a two week period prompting an outbreak investigation. Retrospective case-finding, resident and staff screening, and environmental sampling were undertaken.
Results: Retrospective case-finding identified another two recent cases of GAS in the home and one possible linked case of IGAS at a mental health facility. Screening identified three residents and six staff with throat carriage; five were confirmed as *emm* type st1.0, two further results awaited. The residential level communal areas had soft furnishings that were difficult or impossible to clean. Environmental sampling yielded GAS *emm* type st1.0 from residents' rooms' carpets and curtains, as well as curtains and furniture in the communal lounge despite a deep clean. A terminal clean with hypochlorite and steam-cleaning of furniture and carpets was synchronised with antibiotic prophylaxis offered to all residents and staff at the home.
Discussion and/or Conclusion(s): Four confirmed symptomatic cases and at least five asymptomatic cases were identified, plus one possible case. Contamination of carpets and soft furnishings may have contributed to transmission. Decontamination of the environment was complicated by the choice of furnishings, exemplifying the importance of good infection control "by design" even in residential level care settings.

ID: 4738

Outbreak with a PVL + CA-MRSA strain in a maternity ward linked to an asymptomatic healthcare worker in Belgium

Jan Bellon[1], An Willemse[2], Tina De Beer[2], Katia Verhamme[2], Kristien Van Vaerenbergh[2]. *[1]OLV ziekenhuis campus Asse, [2]OLV Ziekenhuis*

Background: Panton-Valentine Leucocidin (PVL) positive community-acquired methicillin resistant Staphylococcus aureus (CA-MRSA) can cause necrotic skin lesions and severe necrotizing pneumonia. Outbreaks with PVL + CA-MRSA in maternity wards have been described in literature.
Aim(s)/Objective(s): To investigate an outbreak with a PVL + CA-MRSA in a maternity ward from September 2015 until December 2015.
Method(s): The outbreak investigation consisted of a literature study, a retrospective analysis of the medical records and the reinforcement of infection control procedures. Additionally a nasal screening of all healthcare workers was performed, as well as genotyping of the PVL + CA-MRSA isolates using the spa typing method.
Results: Eight cases of PVL + CA-MRSA patients were observed in the hospital. The cluster consisted of 3 families and affected both mother and newborn. In 1 family the father and an older child were also involved. All 3 mothers and 1 father suffered from invasive skin infections and 1 newborn showed 2 skin blisters. Three family members were colonized. Genotyping showed that all 8 isolates belonged to the same spa type t008 clone "USA300". Screening of all healthcare workers of the maternity ward resulted in the identification of 1 person colonized in the nose with the same clone "USA300". After several unsuccessful decolonization procedures the carrier was treated with peroral antibiotic therapy and now remains negative for MRSA. No new cases were further detected.
Discussion and/or Conclusion(s): Reinforcement of infection control procedures, screening of healthcare workers for PVL + CA-MRSA and decolonization of the health professional who carried the genetically identical strain resulted in an outbreak control.

ID: 4872

Breaking the chain of transmission – 2 clusters of *A.baumanii* on ICU

Manjula Natarajan[1], Essam Rizkalla[2], Dina Elzimaity[3], Dawn Westmoreland[3], Jennie Lovell[3], Sonia Mellor[3], Martha Bird[3]. *[1]Kettering General Hospital Foundation Trust, [2]Kettering General Hospital FT, [3]KGH FT*

Background: In 2014, the new and expanded purpose built ICU had 16 beds of which 50% were side rooms. With the new build came state of the art equipment, new fabric and interiors, The new unit could nurse Levels 1–3 patients, and treated >600 patients a year with average length of stay of 5.9 days.

Cluster 1

In July & August 2014, there were 2 cases (both sputums) of *A. baumanii*, with similar PFGE typing, and sensitive to Meropenem. One patient was difficult to intubate, agitated, and staff had persistent difficulty in retaining invasive devices.

Cluster 2

Between November 2014 and February 2015, 4 cases of *A.baumanii* were identified (3 sputums and tip), resistant to Meropenem, similar PFGE typing but different VNTR typing to previous cluster.
Aim(s)/Objective(s): On-going transmission of 2 strains of *A.baumanii* in ICU was evidenced over a period of 8 months. An outbreak team consisting of PHE and Trust key representatives investigated potential source of transmision and implemented interventions to reduce further transmission on the unit.
Method(s): Following PHE advice, ICU changed cleaning regimes, frequency and practice. All new patients were screened on admission. Respiratory equipment cleaning practice was reviewed and changed. Case presentation to trust-wide forum raised awareness on hand-hygiene and antibiotic stewardship. Visiting teams were

challenged on poor practice. Environmental sampling did not reveal a source.
Results: No more cases for 15 months.
Discussion and/or Conclusion(s): 15 months since outbreak, enhanced surveillance and discussion at trust wide Lessons Learnt forum has helped sustain changes in practice and reduce cross-infection on ICU.

ID: 4877

Counting the cost of controlling an outbreak of carbapenemase-producing Enterobacteriaceae: an economic evaluation

Jon Otter[1], Philip Burgess[2], Frances Davies[1], Siddharth Mookerjee[1], Julie Singleton[1], Mark Gilchrist[1], Darren Parsons[1], Eimear Brannigan[1], Julie Robotham[3], Alison Holmes[1]. *[1]Imperial College NHS Healthcare Trust, [2]Department of Health, [3]PHE*

Background: Carbapenemase-producing Enterobacteriaceae (CPE) are an emerging threat to healthcare facilities worldwide.
Aim(s)/Objective(s): To perform an economic evaluation on the cost associated with containing an outbreak of CPE.
Method(s): An outbreak affecting 40 patients with NDM-producing *Klebsiella pneumoniae* CPE occurred in a group of 5 hospitals across 3 sites in London between March and December 2015. Costs associated with the outbreak were split into actual expenditure, and 'opportunity cost' (sub-divided into increased staffing time, missed revenue-generating procedures, and the cost of extended length of stay). Costs are accounted from the hospital perspective. Interventions contributing to the cost included enhanced CPE screening, drug costs, staff time, contact precautions (isolation), ward/bay/bed closures, temporary ward-based monitors of hand and environmental practice, environmental decontamination, estates renovations, and elective surgical missed revenue.
Results: The management of the outbreak cost a total of £1,303,721 over 10 months, comprising £498,258 of actual expenditure, and £805,463 in opportunity cost. The opportunity cost comprised: £319,756 related to lost bed days, £295,704 in missed revenue from elective surgical procedures, and £190,003 in staff time. Lost bed days accrued the most cost, followed by cancelled elective surgical procedures. The opportunity costs were notably greater than the actual expenditure.
Discussion and/or Conclusion(s): NHS hospitals have experienced CPE outbreaks and the cost estimates that we present show that a local, regional or national emergence of CPE could be highly costly for the NHS. This highlights the serious nature and high cost of antimicrobial resistance.

Abstracts of FIS/HIS 2016 – HIS Grants Abstracts

Evaluating the treatment of surgical site infection (SSI) in patients undergoing surgery for spinal metastases

Ross A. Atkinson, Anna Jones, Benjamin M. Davies, Dmitri van Popta, Karen J. Ousey, John Stephenson. *Connolly Hospital, Dublin*

Background: Surgical site infection (SSI) is a highly undesirable complication of any surgical procedure. Spinal tumour patients, who may have undergone chemo- and radiotherapy, are immunosuppressed and nutritionally compromised, are at increased risk of SSI. Understanding the risk to patients requiring surgery, and the costs associated with this complication, is important for operative planning.
Aims: The aims of this project were to retrospectively audit suitability of patients with metastatic spinal tumours for surgery based on a recognised prognostic tool; conduct a survival analysis of patients experiencing SSI; characterise the management plan for spinal metastatic tumour patients experiencing SSI; and calculate the costs associated with SSI in this patient group.
Methods: A retrospective case review study identified spinal metastatic tumour patients both with and without SSI undergoing surgery between January 2009 and December 2012. Eligibility for surgery (using the Revised Tokuhashi Scoring [RTS] system) and fitness for surgery (using the American Society of Anesthesiologists [ASA] grade) were determined. Overall survival was assessed using the Kaplan-Meier method. A semi-parametric Cox proportional hazards survival (time-to-event) analysis was undertaken to assess the relationships between covariates and survival. The management of those with SSI was reviewed from existing clinical documentation, and the costs to the service associated with SSI were calculated.
Results: A total of 176 surgical procedures for metastatic spinal tumours were undertaken in 152 patients (77 females and 75 males, mean age 60.5 ± 12.9 years) over the four year study period. SSI occurred following 17 procedures in 17 patients (SSI rate 11.2 per 100 patients; 9.7 per 100 procedures). As expected, better survival was observed in patients with higher RTS scores and lower ASA grades. Survival was substantively better in patients without SSI (median 276 days [95% CI 183–369 days]) when compared with those with SSI (median 135 days [95% CI 62–208 days]) ($P = 0.075$). Costs were significantly higher in patients with SSI when compared with a random sample of patients without SSI ($p = 0.019$). In-patient hospital stay and return to theatre were the main costs associated with SSI. Return to theatre was the most expensive single intervention employed to treat SSI.
Conclusions: Both RTS and ASA can be used as indicators of patient survival in those undergoing surgery for spinal metastases. SSI has a negative impact on survival, but a larger study sample would be needed to confirm this. SSI in this patient group significantly increases healthcare costs, mainly due to prolonged hospitalisation and return to theatre for wound management.

Do biocides increase antibiotic resistance in *Klebsiella pneumoniae* and *Escherichia coli*?

H. Herault[1], K. Hopkins[2], M. Sutton[3], N. Woodford[2], J.-Y. Maillard[1].
[1]*School of Pharmacy and Pharmaceutical Sciences, Cardiff University, Cardiff, Wales,* [2]*PHE Colindale, London,* [3]*PHE Porton Down, UK*

Since the discovery of penicillin in 1929, antibiotics have been heavily used and misused to treat bacterial infections. This resulted in an increased number of multidrug resistant bacteria. Bacteria are adapting faster to antibiotics than pharmaceutical companies are able to introduce new ones on the market. Therefore, multi-drug resistant organisms are becoming one of the most important concerns worldwide. Without any new family of antibiotics developed within the last decade, infection prevention and control measures are predominant, relying on the efficiency of biocides to contain the spread of "superbugs". Biocides are now extensively used, questioning their impact on the development and transfer of resistance mechanisms within bacteria. The selective pressure exerted by biocides could lead to co-selection and cross-resistance mechanisms, enhancing the maintenance and transfer of resistance genes.
As little is still known about the impact of biocides on antibiotic resistance, this study aims to investigate four commonly used biocides, including a quaternary ammonium compound (benzalkonium chloride), a biguanide (chlorhexidine digluconate) and two heavy metals (copper sulfate and silver nitrate), on the maintenance and transfer of carbapenem-resistance genes among *E. coli* and *K. pneumoniae* clinical isolates. Using microdilution broth method, minimum inhibitory and bactericidal concentrations (MICs and MBCs) were determined for 210 clinical isolates. For each biocide, the distribution presented a single modal value, except for copper where a bi-modal distribution with two peaks was observed. Correlations studies were performed using Spearman's nonparametric test to detect potential links between the susceptibility profiles to biocides and antibiotics. Regardless of the bacterial species, weak to moderate but significant correlations ($p < 0.05$ to $p < 0.001$) were found between the MICs of benzalkonium chloride and chlorhexidine. For *K. pneumoniae* isolates, correlations between elevated MICs and MBCs of benzalkonium chloride or silver nitrate and elevated MICs of ertapenem were observed. Furthermore high MICs/MBCs of chlorhexidine and clinical resistance to imipenem, meropenem and ertapenem were identified. Further studies are needed to investigate the reasons behind these apparent correlations.

Pseudomonas aeruginosa: contamination of tap outlet fittings and consequential contamination of tap water

Chloe Hutchins. *University of Southampton and Public Health England, UK*

Recent neonatal deaths were linked to *Pseudomonas aeruginosa* and the contamination of hospital tap water. Investigations demonstrated that the tap outlet fittings (OFs) were heavily colonised by *P. aeruginosa*. Cross-contamination during cleaning has been implicated in OF contamination.
To investigate the contamination of OFs via contaminated cleaning cloths and the consequential contamination of water delivered from both frequently and infrequently used taps.
Microfibre cloths contaminated with *P. aeruginosa* (10^8 CFU/mL) were used to wipe three different types of OF (A, B and C). OFs were inserted into an experimental tap rig for up to 24-hours. Survival over time was assessed by culture. Taps were used at high-and low-frequencies by subjecting taps to single, and multiple flushes. Water was sampled via membrane filtration.
The median number of *P. aeruginosa* transferred from cloths to OFs was 1.4×10^5 CFU. *P. aeruginosa* persisted on all OFs for 24-hours. However, in comparison to OFA, significantly fewer organisms were recovered from OFB and C after 8- and 12 h respectively.
At all time points and despite tap usage, *P. aeruginosa* was recovered from water delivered from OFA at levels above the augmented care alert level (i.e. ≥10 CFU/100 mL). Water delivered from OFB did not contain *P. aeruginosa* beyond the first flush.
Contamination of OFs via cleaning cloths is possible and can lead to contaminated water being eluted from frequently- and infrequently-used taps. OF design, whilst not removing the potential for retrograde contamination, may, in combination with a flushing regimen, reduce the risk of persistent contaminant presence in the water.

Investigation of existing and novel antimicrobial agents to treat intravascular catheter-related infections caused by *Staphylococcus aureus*

Eoghan O'Neill. *Department of Clinical Microbiology, RCSI, Dublin 9, and Department of Microbiology, Connolly Hospital, Dublin 15, Ireland*

Infection of intravascular catheters by *Staphylococcus aureus* is a significant risk factor within the healthcare setting. To treat these infections and attempt salvage of an intravascular catheter, catheter lock solutions (CLSs) are being increasingly used. However, the most effective CLSs against these biofilm mediated infections has yet to be determined and clinical practice varies greatly. The purpose of this study was to (1) evaluate and compare the efficacy of antibiotics and antiseptics in current clinical use against biofilms produced by reference and clinical isolates of *S. aureus*, (2) evaluate the efficacy and suitability of two newly described antimicrobial agents, ML:8 (containing caprylic acid) and Citrox (containing falvonoids), as CLSs versus *S. aureus* biofilms grown *in vitro* and *in vivo* and (3) evaluate the effectiveness of a number of enzymatic agents to disrupt *S. aureus* biofilm by developing static and flow biofilm assays to represent an *in-vivo* like model of infection. Findings from these studies report the true therapeutic potential of existing and novel agents in the treatment of *S. aureus* catheter-related biofilm infections.

Abstracts of FIS/HIS 2016 – Poster Presentations

Topic: Antimicrobials and antimicrobial resistance

ID: 4369
Antibiotic resistance patterns of bacterial isolates in adult intensive care unit at Nizwa hospital, Oman

Nashwa Alkasaby. *Faculty of Medicine, Mansoura University, Egypt*

Background: Infection is a commonly encountered problem for patients in intensive care units (ICUs) and Multidrug-resistant (MDR) bacterial infection is predominant.
Aim(s)/Objective(s): The aim of this study was to detect the frequency of different bacterial isolates and their antibiotic susceptibility pattern from patients admitted to adult ICU in a 5 year period from January 2008 to December 2012 at Nizwa hospital, Oman.
Method(s): Different microbiological samples were collected and analyzed by routine conventional methods at microbiology section, laboratory department; Nizwa hospital. Antibiotic susceptibility (ABS) test was done using modified Kirby-Bauer disk diffusion method as per Clinical and Laboratory Standards Institute (CLSI) guidelines.
Results: Total (3930) clinical samples were processed, out of which 12.8% (504/3930) showed evidence of infection, 73.6% (371/504) were Gram-negative bacteria, 22.8% (115/504) were Gram-positive and 3.6% (18/504) were *Candida* species. Respiratory tract infection was the most common site of infection. Among the isolates, the most commonly found microorganism was *Pseudomonas aeruginosa* in respiratory samples, pus and wound infection, However *Klebsiella* spp. and *Escherichia coli* were predominant in urinary tract infection. Coagulase negative *Staphylococcus* was the predominant in blood. Extended-spectrum β-lactamase (ESBL)-producing *Escherichia coli*, *Klebsiella* spp. and Proteus occurred in 43.2% (29/67), 28.6% (18/63) and 45.5% (5/11) of total *Escherichia coli*, *Klebsiella* spp. and Proteus isolates, respectively. While 16.6% of *Staphylococcus aureus* isolates were Methicillin Resistant *Staphylococcus aureus* (MRSA).
Discussion and/or Conclusion(s): Adult ICUs are faced with the increasingly rapid emergence and spread of antibiotic-resistant bacteria. Excellent antibiotic policy and infection control implementation are important priorities for these critically ill patients.

ID: 4422
Extended-spectrum beta-lactamase producing Gram-negative bacterial isolates causing nosocomial infection in Nepal: an emerging threat to clinical therapeutics

Manoj Sah[1], Ram Krishna[2], Shyam Mishra[2], Basiata Rijal[2], Bharat Mani Pokhrel[2]. *[1]Kathmandu University, Kantipur Dental College Teaching Hospital & Research Center, [2]Department of Microbiology, Institute of Medicine, Tribhuvan University Teaching Hospital (TUTH), Kathmandu, Nepal*

Background: Extended spectrum β-lactamase (ESBL)-producing bacterial isolates causing nosocomial infection pose unique challenges to medical practitioners now-a-days placing an extra burden on individual patients and on healthcare system due to irrational uses of antibiotics in Nepal.
Aim(s)/Objective(s): The study was aimed to determine the ESBL-producing bacterial isolates accountable for nosocomial infection.
Method(s): Two hundred seventy nine nosocomial bacterial isolates were studied over a period of one year from March 2011 to February 2012 at Department of Microbiology, Tribhuvan University Teaching Hospital, Kathmandu, Nepal as described by American Society for Microbiology (ASM). Antibiotic susceptibility testing was performed by the Kirby-Bauer Disk Diffusion method as recommended by Clinical and Laboratory Standards Institute (CLSI). A combination disk method was done for detection of ESBL-production according to CLSI guidelines. Data were analyzed using SPSS 17.0.
Results: Of the total isolates, *Escherichia coli* 36.2% (n = 98), *Acinetobacter* species 27.7% (n = 75) *Klebsiella pneumoniae* 18.5% (n = 50), *Pseudomonas aeruginosa* 13.7% (n = 37) and *Citrobacter freundii* 3.3% (n = 9). Alarmingly, 21.5% (n = 58) bacterial isolates were recovered ESBL-producer in which *K. pneumoniae* was found to be predominant 26% (n = 13) followed by *E. coli* 24.5% (n = 24), *P. aeruginosa* 18.9% (n = 7), and *Acinetobacte*r species 17.3% (n = 13).
Discussion and/or Conclusion(s): We found a high prevalence of nosocomial bacteria producing ESBL in our hospital which prompts a special attention for the management of such patients as well as urgent need for implementation of infection control strategies to prevent the dissemination of such strains. ESBL detection should be routinely performed in clinical laboratory as false reporting would results in treatment failure despite in vitro sensitivity.

ID: 4673
Analysis of the biofilm formation ability of antibiotic resistant *Escherichia coli* and *Klebsiella pneumoniae* strains

Sinan Baho[1], Shivanthi Samarasinghe[2]. *[1]DMU, [2]De Montfort University/ Faculty of Health and Life Sciences*

Background: Biofilm formation represents one of the major health problems due to its difficulty to be eradicated. Most studies focus on seeking for new antibiotics to treat biofilms but very little focus on the bacterial virulence factors' genes related to biofilm formation.
Aim(s)/Objective(s): In our work we are trying to find the relationship between biofilm formation and Quorum Sensing (QS) virulence factors' genes. This might give new insights for using new therapeutic alternatives other than the traditional antibiotic.
Method(s): In this work, the amount of biofilm formation of the antibiotic resistant strains of *Escherichia coli* and *Klebsiella pneumoniae* at different time points of growth (6, 12, 24 and 48 hours) was determined using Biofilm Formation Assay (Tissue Culture Plate Assay; TCP). Six wells and 96 wells tissue culture plates were used in this study using LB broth and nutrient broth, and in static and shaking incubation conditions.
Results: Results showed that amount of biofilm produced varies according to the bacterial growth stage at 6, 12, 24 and 48 hours of growth and culture conditions (static or shaking) in addition to the type of the growth media.
Discussion and/or Conclusion(s): In conclusion, quantity of biofilm produced is affected by the strain type, growth stage and culture conditions. Using these result, next step will be the selection of the highest biofilm producer strains for deletion of one of the QS controlled virulence gene and study this effect on strain's biofilm formation ability.

ID: 4675
Comparing the feasibility and accuracy of wound aspiration and wound swab in surgical site infection: a prospective study

Mohammad Razai. *London Northwest Healthcare*

Background: Surgical wound infections remain a significant clinical problem. Currently wound swabs are preferred method to identify causative organisms over wound aspiration biopsy.
Aim(s)/Objective(s): This prospective study aimed to compare the pathogenic bacteria isolated from wound aspirations and wound swabs in patients who had empirical antimicrobial therapy. The feasibility of the procedure and whether the patients experienced any significant pain during or after aspirate sampling was also explored.
Method(s): Seven patients with surgical site infection who had antimicrobial therapy were included in a prospective comparative study between wound aspiration and wound swabs.

Results: Aspirate cultures were positive in 57% of the patient. The mean number of isolates per sampling was 1.0 from fine-needle aspirates, compared to 1.6 from wound swabs. The correlation of isolates from aspirates and swabs was 60%. Two aspirates did not yield significant growth but yielded heavy and moderate growth from wound swabs. In one wound swab additional organism (*Pseudomonas* sp) was isolated from the same wound and one wound swab yielded scanty coliform growth but nil growth from aspirate. In two closed, inflamed cellulitic area with nil growth from aspirate wound swab was not taken.
Discussion and/or Conclusion(s): The FNA microbiopsy technique in this study used only a small amount of tissue for sampling, which was not painful for patients. It was possible to obtain aspirate from closed cellulitic tissue where simple swab was not possible. The aspirate results yielded less pathogens and fewer organisms compared to wound swabs reflecting more accurately the state of the wound infection and response to antimicrobial treatment.

ID: 4695
Trends and variations in antimicrobial susceptibility testing between laboratories in North West England: implications for interpretation of surveillance data

Vicky Watts, Paul Cleary, Andrew Dodgson. *Public Health England*

Background: Surveillance of multidrug-resistant organisms (MROs) of public health significance using routine laboratory data is complicated by variations in practice between reporting sources.
Aim(s)/Objective(s): We examined trends and variation in antibiotic susceptibility testing (AST) of Enterobacteriaceae between laboratories in North West England between 2010 and 2016.
Method(s): Retrospective analysis of routine diagnostic laboratory data.
Results: We analysed AST data from 21 laboratories for 12,021 Enterobacteriaceae isolates.
Testing of *Klebsiella pneumoniae* for meropenem susceptibility increased between 2010 and 2012 (85–98%), remained stable until 2014 and declined in 2016 (92%); testing was generally high but varied between laboratories in 2015/16 (median: 95%, IQR: 84–98%, min: 49%). Findings were similar for *Enterobacter* spp and for ertapenem resistance testing. Testing of *E. coli* varied considerably between laboratories in 2015/16 (median: 21%, IQR: 12–36%, max: 100%, min: 4%). A high proportion of *K. pneumoniae* were tested for susceptibility to a third generation cephalosporin in 2015/16 but this was variable between laboratories (ceftazidime: median:86%, IQR:62–97%; cefpodoxime: median:64%, IQR:39–99%). Findings were similar for *Enterobacter* and *E. coli*. Testing of *K. pneumoniae* and *Enterobacter* for colistin susceptibility declined between 2010 and 2016 (8–3%; 17–10%) and remained low for *E. coli* (<2%). There was a marked decline in AST for trimethoprim, nitrofurantoin and fosfomycin (*K. pneumoniae* and *Enterobacter*) and ciprofloxacin (*E. coli*) from 2014.
Discussion and/or Conclusion(s): We identified variation in AST between laboratories and over time, complicating interpretation of routine surveillance data. We recommend routine collection and reporting of laboratory practice to aid interpretation of surveillance data.

ID: 4706
Impact of hospital-wide use of antiseptic bath/wipes on incidence of MDROs

Moi Lin Ling[1], Ismawati Mohammad Amin[2], Molly How[2], Yong Ming Tee[2], Kwee Yuen Tan[2]. *[1]Singapore General Hospital Pte Ltd, [2]Singapore General Hospital*

Background: Studies suggest that daily bathing of patients with chlorhexidine may prevent hospital-acquired bloodstream infections and the acquisition of multidrug-resistant organisms (MDROs). In Singapore, the common MDROs seen in hospitals are MRSA, VRE, CRE and multiresistant *Acinetobacter baumannii* (MR-ACBA).
Aim(s)/Objective(s): We implemented hospital-wide use of antiseptic bath/wipes in 2013 as an additional initiative to the existing MDRO bundle used. The latter comprising active surveillance for MDROs, Contact Precautions, hand hygiene and environmental hygiene, was implemented hospitalwide from 2009.
Method(s): Healthcare-associated MR-ACBA was significantly reduced from 0.26 to 0.12 per 1,000 patient days following the hospitalwide use of antiseptic bath. In contrast, no reduction was seen in the incidence of healthcare-associated MRSA, VRE or CRE.
Results: Healthcare-associated MR-ACBA was significantly reduced from 0.26 to 0.12 per 1,000 patient days following the hospitalwide use of antiseptic bath. In contrast, no reduction was seen in the incidence of healthcare-associated MRSA, VRE or CRE.
Discussion and/or Conclusion(s): The use of antiseptic bath is an important component of the MDRO bundle to help reduce the MDRO bioburden amongst skin colonisers. However, its long term use will need to be assessed with respect to possible resistance development.

ID: 4721
Resistance to disinfectants and antiseptics – a risk?

Bernhard Meyer[1], Ellie Wishart[2]. *[1]Ecolab Deutschland GmbH, [2]Ecolab United Kingdom*

Background: While the problem of antibiotic resistance is well understood within the infection prevention community, there remains some confusion about a potential risk of resistance against disinfectants and antiseptics (biocidal substances).
Aim(s)/Objective(s): Assess available literature and knowledge on application of biocidal substances to identify the risk of relevant microbial resistance to these substances and the potential risk of promoting antibiotic resistance.
Method(s): Review and evaluation of available literature.
Results: Whereas antibiotic resistance can be defined as an increased minimum inhibitory concentration, resistance to biocidal substances must be defined as failing defined log reduction according to accepted standards as outlined in EN 14885 at concentrations and contact times, which deliver kill of standard test organisms. Also, genetically determined resistance must be distinguished from phenotypic adaptation, which is found e.g. in biofilms. Using these definitions, the development of relevant resistance to biocidal substances has not been observed in more than 50 years of routine use. Notably, antibiotic resistance was found even before broad clinical use of these substances. Given the broad and unspecific mode of action of biocides, it is unlikely that this will happen. Correct use of biocidal substances like avoiding sublethal exposure of microbes under conditions supporting microbial growth and selection further reduce this risk. It was also demonstrated that correct use of biocidal substances does not promote antibiotic resistance.
Discussion and/or Conclusion(s): It is concluded that correct use of biocidal substances may provide opportunities to reduce the risk of spread of antibiotic resistance.

ID: 4728
Development and implementation of a standardised antimicrobial stewardship audit to improve benchmarking across a region

Naomi Fleming[1], Bolla Balwinder[2], Tim Hills[3], Monica Marriott[4], Julia Lacey[5], Suraiya Chandratillake[6], Anna Braithwaite[7], Corrine Ashton[8], Claire Salt[9], Suewen Leo[2], Annette Clarkson[3], Aneeka Chavda[4]. *[1]Kettering General Hospital, [2]United Lincolnshire Hospitals NHS Trust, [3]Nottingham University Hospital, [4]Sherwood Forest Hospital NHS Foundation Trust, [5]Derby Teaching Hospitals NHS Foundation Trust, [6]Milton Keynes Hospital NHS Foundation Trust, [7]Chesterfield Royal Hospital NHS Foundation Trust, [8]Leicester University Hospital, [9]Northampton General Hospital*

Background: Trusts are encouraged to benchmark antimicrobial quality assurance measures to provide an additional context to consumption data.[1] The regional antimicrobial pharmacists group share data but this does not take into account differences

between hospitals including patient mix. This may bias the results preventing effective benchmarking of antimicrobial prescribing quality indicators.
Aim(s)/Objective(s): To develop and implement a standardised audit methodology using the same patient mix and speciality of staff examining antimicrobial stewardship indicators across a region.
To achieve 90% in agreed audit standards.
Method(s): Quality indicators, audit standards, data collection criteria and patient specialties applicable to all hospitals in the region were agreed. Trust antimicrobial pharmacists collected and analysed data on 100 patient cases from agreed specialities between November and December 2015.
Results: Ranges and means are reported.
Standard1: Antimicrobial choice reasonable: (range 67–97%) mean 85%
Standard 2: Indication documented: (range 33–97%) mean 79%
Standard 3: Stop/review date documented: (range 20–95%) mean 64%
Standard 4: 72 hour prescribing decision: (range 50–94%) mean 73%
Standard 5: Pharmacist screen: (range 57–86%) mean 72%
Standard 6: Not reasonable but screened: (range 4–36%) mean 17%
Standard 7: Consultant review; (range 73.5–100%) mean 86%.
Discussion and/or Conclusion(s): This audit allowed a consistent approach to data collection; patient mix and data interpretation were comparable. There was no indicator where the region achieved 90% and there was a wide variation in many indicators. This data is useful to highlight outlying and achieving Trusts encouraging best practice sharing across the region. This audit will be repeated annually, allowing effective comparisons to be drawn.

ID: 4758
Clinic-epidemiological profile and molecular characterization of linezolid resistant coagulase negative staphylococci from India

Gajanand Mittal[1], Vasundhra Bhandari[2], Vandana Rani[1], Rajni Gaind[1].
[1]VMMC & Safdarjung Hospital, [2]DST-INSPIRE

Background: Reports on characterization of linezolid resistant (LR) staphylococci are limited from India.
Aim(s)/Objective(s): We investigated clicoepidemiological profile and molecular characterization of LRCoNS.
Method(s): 15 blood isolates of LRCoNS were characterized for mechanism of LR. Species identification was done by sequencing of *16S rRNA* gene. Demographic data, clinical and antibiotic history and co-morbid conditions were recorded through chart review. Linezolid and glycopeptides MIC was determined by microbroth dilution and E-test respectively. PCR was performed for *cfr* gene and *domain V* region of the 23S rRNA. Mutations were detected by sequencing of five copies of 23S rRNA gene.
Results: LR was observed in diverse species of CoNS (9 *S. haemolyticus*, 3 *S. cohnii* and 3 *S. arlettae*). All LRCoNS were noscomially acquired. All patients had co-morbidities without prior exposure to linezolid, clindamycin or chloramphenicol. Mean age was 30 years (8 month – 80 year). All isolates were susceptible to vancomycin and 10 were teicoplanin resistant. Linezolid MIC ranged from 8–32 µg/mL and *cfr* gene was detected in all isolates. Novel mutations were detected; G2614T (n = 10) and C2384T (n = 1) in *domain V* region of 23S rRNA. One isolate of *S. arlettae* showed both mutations. Among three isolates no mutation was identified. There was no correlation between linezolid MIC and *cfr* gene, type of mutation detected, number of mutant copies.
Discussion and/or Conclusion(s): LR is emerging in diverse species of CoNS without prior exposure. Multiple mechanisms contributed to resistance and novel mutations were detected. Resistance mediated by *cfr* gene is of great concern as it can be rapidly disseminated and capable of transmitting horizontally between diverse species.

ID: 4776
Bacteriophages in prophylaxis of healthcare-associated infections (HAIs) in a neurosurgical intensive care unit (ICU)

Andrey Aleshkin[1], Eugenia Selkova[2], Olga Ershova[3], Nikolai Volozhantsev[4], Edward Svetoch[4], Irina Kiseleva[2], Lidiya Novikova[2], Svetlana Bochkareva[2]. *[1]Gabrichevsky Moscow Research Institute for Epidemiology and Microbiology, [2]Gabrichevsky Moscow Research Institute for Epidemiology and Microbiology, [3]Burdenko Research Institute of Neurosurgery, [4]State Research Center for Applied Microbiology and Biotechnology*

Background: Phages have been used to prevent and/or treat infectious diseases of bacterial etiology for almost a century.
Aim(s)/Objective(s): The purpose of this research was to establish the effect of a single administration of bacteriophage in patients of neurosurgical ICU on circulation of hospital pathogens.
Method(s): 42 patients on prolonged mechanical ventilation in an ICU were administered a 20 mL dose (10^8pfu/mL) of bacteriophage cocktail per os, some patients had multiple administrations. A phage cocktail combined host range was 73% of the antibiotic-resistant strains (A.baumannii, K.pneumoniae, P.aeruginosa) isolated in the ICU. Anti-phage IgG-antibodies were tested by enzyme-linked immunosorbent assay (ELISA).
Results: A.baumannii, K.pneumoniae, P.aeruginosa were isolated from the samples of the patients' endotracheal aspirate (ETA), blood, urine and feces, with a content of up to 87%. In the first episode of trials, one day after a 3-day therapy, effective sanitation was confirmed in 62.5% of the cases. Pharmacokinetic tests have shown that per os administered bacteriophages penetrate through the gastrointestinal tract into blood, feces, urine, ETA. Repeated therapy did not result in a significant eradication of pathogens. Anti-phage immunity after the intake of preparation was tested by ELISA for presence of significant titers of specific IgG-antibodies.
Discussion and/or Conclusion(s): The right course of action for using bacteriophage cocktails in ICUs will be to establish fixed contents of phage species in the cocktail with subsequent selection of phage strains (or mandatory alteration with new phage strains in cases of repeated administration for the same patient), active against current pathogens in the ICU, from an existing Phage Bank.

ID: 4784
Transition to ribotyping of *Clostridium difficile* in a university hospital in Norway

Michaela M. Lelek[1], Silje Bakken Jørgensen[1], Andre Ingebretsen[2].
[1]Akershus University Hospital, [2]Oslo University Hospital

Background: *Clostridium difficile* associated diarrhoea (CDAD) causes considerable morbidity and mortality world-wide. The emergence of virulent clones has increased CDAD morbidity in many countries.
Aim(s)/Objective(s): To assure early outbreak detection in our hospital, we have established a local CDAD surveillance system.
Method(s): CDAD is diagnosed by the hospital microbiology laboratory by a two-step method using LAMP-technology. All positive samples are subsequently cultured, and *C. difficile* isolates are ribotyped at the national *C. difficile* reference laboratory. Infection control staff monitors new cases weekly.
Results: During 2014 and 2015, 195 cases of CDAD were identified. 83 acquired their CDAD more than 48 hours after being admitted to the hospital, 68 acquired CDAD outside of the hospital, and 44 were only treated in primary care.
Ribotypes 081, 131, 207 and NO24 occurred solely in hospitalized patients, while 087 and 106 were found only in patients that had not been admitted. There were a few others that originately only outside of the hospital.
Discussion and/or Conclusion(s): The departments with the highest occurence of CDAD were the infectious diseases department and the haematology department. There was no significant accumulation of specific ribotypes on any ward. The distribution of ribotypes in our

hospital differs from previously published distributions from other countries.

ID: 4793

Antimicrobial susceptibility pattern of *Staphylococcus aureus* isolated from clinical specimens to conventional and newer antimicrobials in Eastern India

Srujana Mohanty[1], Bijayini Behera[2], Subhrajyoti Sahu[2], Ashok K. Praharaj[2]. *[1]All India Institute of Medical Sciences (AIIMS) Bhubaneswar Odisha, India, [2]All India Institute of Medical Sciences (AIIMS) Bhubaneswar Odisha, India*

Background: Global spread of methicillin resistant *Staphylococcus aureus* (MRSA) constitutes one of the most serious contemporary challenges to the treatment of hospital-acquired infections.
Aim(s)/Objective(s): We aimed to assess the antibiotic susceptibility pattern of *S. aureus* from clinical specimens in a tertiary care hospital in Eastern India.
Method(s): *S. aureus* was isolated and identified using standard methods between July 2015 and April 2016. Antimicrobial susceptibility testing was performed per CLSI 2015 using standard disc-diffusion or Etest.
Results: Total 284 *S. aureus* were obtained from pus (61.6%), respiratory tract (10.9%), urine (9.5%), blood (8.8%), body fluids (6.3%), and catheter tips (2.8%). Overall, 127 (44.7%) were MRSA, while 158 (55.6%) were multidrug resistant. MRSA was highest in respiratory samples (67.7%), followed by urine (59.2%) and blood (56.0%). High resistance was to penicillin (81.7%), erythromycin (62.3%) and ciprofloxacin (52.1%), while low-level resistance was to linezolid (0.7%), tigecycline (2.1%), rifampicin (8.1%) and doxycycline (9.5%). All were susceptible to teicoplanin. 166 (58.4%) isolates were susceptible to vancomcin (MIC ≤2 µg/mL), while 118 (41.5%) demonstrated reduced vancomycin susceptibility (RVS) (MIC >2 µg/mL). The proportion of isolates with RVS was similar in both MRSA (53/127, 41.7%) and methicillin-sensitive *S. aureus* (MSSA) (65/157, 41.4%).
Discussion and/or Conclusion(s): High percentage of *S. aureus* demonstrated RVS, which may limit its usefulness in MRSA and be associated with increased complications in MSSA infections. Linezolid, tigecycline, rifampicin and doxycycline may be considered as alternatives. As the glycopeptide resistance is increasing globally commensurate with their increased use, the rates of vancomycin resistance along with other antibiotics among *S. aureus* should be investigated periodically.

ID: 4798

Managing complicated urosepsis in patients with significant comorbidities: balance between antimicrobial therapies and surgical intervention

Keith Yuen, Melis Altunel, Adeel Anwar, Sulman Hasnie, Philip Stanley. *Bradford Royal Infirmary*

Background: A 56-year-old diabetic with urosepsis had imaging confirming emphysematous pyelonephritis. Augmentin resistant enterobacter was cultured in admission urine and blood. As clinical condition deteriorated piperacillin/tazobactam was switched to Meropenem empirically and repeat imaging confirmed renal abscesses formation. Radiologically-guided drainage of pus yielded enterobacter again and drain fluid grew VRE. The patient was discharged after recovery was made with three weeks of ertapenem and linezolid.
Readmission was required due to persisting urosepsis compounded by multi-organ failure. Urine again cultured enterobacter which was now AmpC positive but remained carbapenem sensitive. Imaging (third series) showed renal abscess recurrence not amenable for drainage. There was further clinical deterioration after initial recovery with Meropenem and attempts of continuous treatment in the community, from where urine cultured enterobacter resistant to carbepenems secondary to AmpC activity and porin loss. Further readmission culture yielded two different strains of *E. coli*, both were ESBL producers with Ciprofloxacin and Carbapenem sensitive and resistant strains. Imaging showed repeated recurrence of renal abscesses, which were drained radiologically. Treatment with meropenem, linezolid, ciprofloxacin and caspofungin saw marked clinical improvement, and repeat invasive cultures yielded no growth.
Discussion and/or Conclusion(s): Source control is key in managing urosepsis. Empirical escalation of antimicrobial treatment at times of clinical deterioration without source control with abscess drainage in this case led to prolonged carbapenems use and the inevitable development of carbapenem resistance.
Nephrectomy was indicated here due to recurring sepsis. However, one has to consider nephron preservation in patients with significant cardiovascular comorbidities, and the high peri-operative morbidities/mortalities associated with unstable patients.

ID: 4802

A retrospective review of antibiotic usage, microbial identifications and antimicrobial sensitivities in adult patients with neutropenic sepsis

Taku Sugai[1], Katharine Lazarus[1], Yee Man Tracey Hui[2], Prasanna Kumari[1]. *[1]The Hillingdon Hospitals NHS Foundation Trust, [2]Ealing Hospital, North West London NHS Trust*

Background: Neutropenic sepsis is a leading cause of morbidity and mortality amongst cancer patients receiving treatment. The management of which remains a challenge. NICE guidelines discourage the routine empirical use of aminoglycosides with broad-spectrum antibiotics because of toxicity concerns. However, with the emergence of resistant strains of micro-organisms; clinicians must identify those at risk and adjust antimicrobial agents based on a local antibiogram.
Aim(s)/Objective(s): To review antibiotic usage, microbial identifications and antimicrobial sensitivities amongst adults with neutropenic sepsis.
Method(s): Data was collected as part of a retrospective audit of neutropenic sepsis at Hillingdon Hospital between 1/4/15 and 31/5/16.
Results: There were eighty-three cases of neutropenic sepsis in sixty-three patients, forty-two of these were haemato-oncology patients and twenty-one oncology. Twenty-seven of fifty-eight positive culture results were gram-negative organisms. Eight isolates were resistant strains including six cases of Enterobacteriaceae and two cases of *Stenotrophomonas maltophilia*. Within the six resistant strains of Enterobacteriaceae, three isolates were ESBL producing, two were AmpC beta producing and one was Tazocin resistant by another mechanism.
Five of six resistant Enterobacteriaceae strains were identified in haemato-oncology patients. Four of these strains were resistant to single agent Tazocin but sensitive to both Gentamicin and Meropenem.
Discussion and/or Conclusion(s): Our small study supports the use of Gentamicin with Tazocin as first-line emperical anti-microbial therapy in high-risk haemato-oncology patients. A close collaboration between the microbiology and the frontline clinicians is essential in providing optimum antimicrobial therapy for neutropenic sepsis.

ID: 4804

Profiling biofilm-associated diabetic foot infections according to current medical management strategies

Khalid Johani[1], Matthew Malone[2], Honghua Hu[3], Iain Gosbell[4], Slade Jensen[5], Karen Vickery[3]. *[1]Macquarie University, [2]High Risk Foot Service, Liverpool Hospital, South Western Sydney LHD, [3]Surgical Infection Research Group, Faculty of Medicine & Health Sciences, Macquarie University, [4]Antimicrobial Resistance and Mobile Elements Group, Ingham Institute of Applied Medical Research, Sydney, [5]Molecular Medicine Research Group, Microbiology & Infectious Diseases, School of Medicine, Western Sydney University, Australia*

Background: Cadexomer iodine (Iodosorb) is commonly used in the management of chronic, non-healing wounds to reduce the microbial load. Molecular analyses are much more informative than standard culture techniques allowing researchers to develop a detailed

overview of bacterial populations. The aim of this study was to determine if cadexomer iodine as a mono-therapy could reduce biofilm phenotype bacteria colonizing diabetic foot ulcers (DFUs) in-vivo

Results: *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Prevotella melaninogenica, Elizabethkingia meningoseptica, Propionibacterium acnes* and *Pseudomonas stutzeri* were the most abundant bacterial species present across the samples before and after treatment. We observed a significant decrease in the diversity of and changes in the community composition after treatment with an increase in bacterial abundance. The presence of biofilm was determined via scanning electron microscope. We found that Iodosorb reduced but did not remove biofilms from 50% of the samples, whereas 36% revealed no changes and 14% started to produce biofilm. Log reductions of biofilm cells indicated that in 9 of 15 patients, a reduction of between 1 and 3 $\log_{10}$ was possible.

Discussion and/or Conclusion(s): Given the inherent tolerance of biofilms to many forms of antimicrobials, cadexomer Iodosorb demonstrated the ability to decrease bacterial diversity, load and biofilm formation. The effectiveness of this topical antimicrobial maybe increased further if used as an adjunct therapy in a biofilm based woundcare model. Additional analysis of wound characteristics and any shifts in community diversity are required to clarify why some wounds bacterial loads increase with the apparent use of cadexomer iodine.

ID: 4808

Routine washing of patients with octenisan – is it the way forward?

Katie Hardy[1], Gill Abbott[2], Jane Codd[2], Katie Sunnocks[3], Hannah Gil[3], Sahida Shabir[2], Carolyn Lewis[2], Peter Hawkey[1], Mark Webber[3]. *[1]Public Health England, [2]Heart of England NHS Foundation Trust, [3]University of Birmingham*

Background: Antiseptic body washes are used as part of the decolonisation treatment for patients known to be colonised with MRSA, but there has also been a move to use antiseptic body washes for routine washing of all patients for the duration of their hospital stay.

Aim(s)/Objective(s): In 2014, octenisan was introduced Trust wide for routine washing for all patients. This study aimed to review the introduction assessing the use, acceptability and susceptibility.

Method(s): Usage data, in the form of number of bottles of octenisan was ascertained for March 2014 to April 2015. Two questionnaires were developed to determine both staff and patient opinion regarding the information received about the antiseptic, the usage and acceptability. MIC and MBCs to octenisan were established for a panel of 77 MRSA isolates pre and post octenisan introduction.

Results: The usage of octenisan varied by clinical area. A total of 237 staff and 99 patient questionnaires were completed and demonstrated a need for improved communication regarding both the availability and the correct duration for application, with only 3% knowing correct duration. Both patients and staff stated that they would be happy to continue using octenisan (98%) with no skin irritation being reported. Eleven isolates had an MBC >1 µg/mL, with the number increasing post introduction 9.8% (5/51) versus 23.1% (6/26).

Discussion and/or Conclusion(s): Octenisan was widely accepted by both staff and patients, but there is a need for improved communication to ensure the product is being used effectively, especially in light of evidence of an increase in decreased susceptibility.

ID: 4813

Despite widespread use, fluoroquinolone resistance in *Mycobacterium tuberculosis* is unusual in Singapore

Timothy Barkham, Wen Ying Tang, Cynthia Chee, Sonny Wang. *Tan Tock Seng Hospital*

Background: Fluoroquinolones (FQ) are important second line antibiotics for tuberculosis (TB) but are only tested if an isolate of *Mycobacterium tuberculosis* (MTBC) is resistant to first line drugs. Data on FQ resistance rates are scarce as resistance to first line drugs had been a trickle in Singapore, with only four rifampicin resistant and six multi drug resistant cases in 2011. The annual incidence of TB was 40/100,000, equivalent to about 2000 TB cases/year. Concern was raised that the widespread use of FQs, often for urinary and respiratory tract conditions, may be selecting for FQ resistant MTB and that we aren't aware of it because we don't test enough isolates. Note that FQ resistance is 50–60% amongst hospital strains of Enterobacteriaceae. The concern was that when rifampicin resistance does become more common, we may then unearth a hidden problem of FQ resistance that may precipitate the emergence of 'XDR' TB.

Aim(s)/Objective(s): To measure the prevalence of fluoroquinolone resistance in MTBC.

Method(s): Clinical samples from 364 patients, submitted between 2014 and 2016, that were smear and subsequently TB PCR positive were tested for quinolone resistance by amplification and sequencing of the quinolone resistance determining region.

Results: A single mutation associated with quinolone resistance, either A90V, D94G or S91P, was found in three samples.

Discussion and/or Conclusion(s): This FQ resistance rate of <1% is lower than the 2.5% rate reported in a study from the USA in 2009 and is lower than the rate of 3.5% seen in local MTBC with resistance to a first line drug.

ID: 4826

A comparison of *pncA* gene sequencing with Mycobacterial Growth Indicator Tube (MGIT) for detecting pyrazinamide resistance in Mycobacterium tuberculosis

Rachel Halkerston[1], Amie-Louise Seagar[2], Pauline Claxton[2], Ian Laurenson[2]. *[1]The University of Edinburgh, Biomedical Teaching Organisation, [2]Scottish Mycobacteria Reference Laboratory*

Background: Pyrazinamide (PZA) is a key drug for treating tuberculosis, but diagnosing PZA-resistance is technically challenging. Mycobacterial Growth Indicator Tube (MGIT) 960 resistance determination may overestimate phenotypic resistance compared with the now obsolete Bactec 460. Mutations in the *pncA* gene, which encodes the enzyme pyrazinamidase, cause the majority of PZA-resistance.

Aim(s)/Objective(s): To determine whether *pncA* sequencing predicts PZA-resistance by comparing mutation presence to the phenotypic MGIT 960 result amongst isolates also resistant to isoniazid and/or rifampicin.

Method(s): We examined 48 *M. tuberculosis* isolates referred to the Scottish Mycobacteria Reference Laboratory between 2006 and 2015. The MGIT 960 phenotypic PZA-resistance and *pncA* gene sequencing was carried out on all isolates. All mutations were evaluated by comparison to the tuberculosis mutation databases TBDReaMDB and MUB-II-TB-DB, with a systematic review of PUBMED literature published March 2013 to March 2016 inclusive.

Results: We observed MGIT 960 PZA-resistance and a *pncA* mutation in 21 of 48 isolates. *pncA* mutations were detected in 3 MGIT 960 PZA-susceptible isolates. The sensitivity of *pncA* sequencing for detecting resistance was 100% (95% Confidence Interval (CI): 81.0% to 100%) and specificity 88.9% (95% CI: 69.7% to 97.1%). We identified 3 mutations not previously reported in the literature.

Discussion and/or Conclusion(s): Amongst these isolates *pncA* sequencing is a good predictor for PZA-resistance in if used in conjunction with the MGIT 960. Three new mutations were identified. Future research should include evaluation of pyrazinamidase activity, *rpsA* and *panD* genes.

ID: 4827

Epidemiology and outcomes of carbapenem-resistant Gram-negative infections; a single-center experience from Saudi Arabia

Lina N. Albalawi, Kareemah Alshurtan, Sarah Alajmi, Mohamed Bohlega, Noha Mukhtar, Sahar Althawadi, Abdulrahman Alrajhi, Mohamed Shoukri, Ali S. Omrani. *King Faisal Specialist Hospital and Research Centre*

Background: Infections caused by carbapenem resistant *Enterobacteriaceae* (CRE) are increasing.
Aim(s)/Objective(s): To study the epidemiology and outcomes of CRE infections in our center.
Method(s): Retrospective review of CRE isolated in a single, 1,000 beded tertiary care center in Saudi Arabia, during the years 2012 to 2015.
Results: 87 adult patients with CRE infections were identified. 39% were males with median age of 59 years (IQR 29–70) and median Charlson Co-morbidity index of 2 (IQR 1–5). Baseline co-morbidities included diabetes mellitus (49%), malignancy (25%), organ transplant (23%), chronic kidney disease (22%) and chronic liver disease (20%). 61% were in an intensive care unit at the time of CRE isolation. 37% had received carbapenem therapy within the preceding 90 days. Patients had been admitted a median of 2 (IQR 1–3) times within the preceding year; with a median total length of stay of 18 days (IQR 2–30).
K. pneumoniae (72%) and *E. coli* (13%) were the commonest CRE species. Overall, 25% were susceptible to ciprofloxacin, 40% to gentamicin and 77% to colistin. Respiratory tract (37%), skin (16%), abdomen (15%) and urinary tract (12%) were the commonest sites of infection. Median total duration of antimicrobial therapy was 27 days (IQR 13–42). The majority (60%) of patients received combination antimicrobial therapy. The most frequently used agents within those combinations were carbapenems (49%), colistin (40%) and tigecycline (24%). Clinical and microbiological responses were achieved in 51% and 44% of patients, respectively. All-cause 30-day mortality was 29%.
Discussion and/or Conclusion(s): Most patients with CRE infections received combination antimicrobial therapy. Clinical outcomes are poor.

ID: 4835
Colistin-resistant Gram-negative infections; case series from Saudi Arabia

Reem Almaghrabi, Yamama Aljishi, Mohamed Alkathlan, Layan Akkielah, Abdulrahman Alrajhi, Ali Omrani. *King Faisal Specialist Hospital and Research Center*

Background: Non-intrinsic colistin resistance in Gram-negative bacilli (CRGNB) has been associated with poor clinical outcomes
Aim(s)/Objective(s): Describe microbiological and clinical outcomes of patiens colonised or infected with CRGNB
Method(s): Retrospective search of Microbiology database for CRGNB isolated between 2010 and 2015.
Results: 10 CRGNB isolates were identified (*K. pneumoniae* 7, *P. aeruginosa* 2 and 1 *A. baumannii*) from 9 individual patients. Colistin MIC ranged from 8 to 256 mg/L. Median age was 53 years (range 30–94), 5 males. Eight patients were admitted to the ICU. Two patients had received kidney transplants abroad within the preceding 3 months. Six patients required mechanical ventilation during their hospital stay; all patients had central venous access.
Only 4 patients had active CRGNB infection, all caused by *K. pneumoniae* (bacteraemia 1, urinary tract infection with secondary bacteraemia 1, hospital acquired pneumonia 1 and intra-abdominal infection 1). Treatment regimens included tigecycline, meropenem, co-trimoxazole and colistin for a median duration of 14 days (range 6–32). Clinical and microbiological response was achieved in all but 1 patient.
Five patients were colonised with CRGNB (*K. pneumoniae* 3, *P. aeruginosa* 1 and A. *baumannii* 1). Site of colonisation was the respiratory tract in 3, wound in 2 and urinary tract in 1 patient. Spontaneous microbiological clearance was demonstrated in 3 out of 5 patients within a median duration of 8 days.
Overall, the median hospital stay was 23 days and median ICU stay was 10 days. All-cause 30-day mortality was 22.2% (2/9).
Discussion and/or Conclusion(s): CRGNB infection are relatively uncommon but are associated with considerable morbidity and mortality.

ID: 4845
The management of MDR and XDR-TB: 5 year experience from a tertiary referral centre

Naeem Desai, Farnaz Dave, Emma Mceldowney, Susan Humphreys, Alec Bonington. *Pennine Acute Hospitals Trust*

Background: Multi-drug resistant tuberculosis (MDR-TB) is defined as an infection with *Mycobacterium tuberculosis* strains resistant to at least rifampicin and isoniazid, whereas extensively drug-resistant tuberculosis (XDR-TB) has additional resistance to any fluoroquinolone and at least one injectable second line drug (amikacin, kanamycin or capreomycin). In 2014, 502 cases of MDR-TB and two cases of XDR-TB were reported in the UK. These patients require complex costly antibiotic regimens with significant toxicities, and outcomes remain poor. This highlights the need for more clinical experience with newer agents such as bedaquiline.
Aim(s)/Objective(s): Our aim is to present our experience of managing MDR/XDR-TB, as well as to present our findings in three patients managed using bedaquiline.
Results: At our unit we have managed thirteen patients with MDR-TB and one patient with XDR-TB between 2011 and 2015. We present three of these patients who received six months of bedaquiline through the compassionate use programme as part of their treatment course. We explore the challenges in the two MDR-TB cases that led to bedaquiline use in the second phase of both patient's treatment, and the sensitivities that led to use of bedaquiline from the outset in our case of XDR-TB. Furthermore we discuss the significant risk of toxicity with bedaquiline, including prolongation of the QTc interval, and suggested monitoring schedules. All three patients improved following treatment and have not required further TB treatment to date.
Discussion and/or Conclusion(s): This case series highlights the complexities of managing resistant TB and adds to experiential evidence of the use of bedaquiline.

ID: 4860
A prospective multicentre observational study of mecillinam susceptibility to pathogenic urinary bacteria in a healthcare network in the United Kingdom

Hassan Farah[1], Luke SP Moore[2], Mark Gilchrist[3], James Hatcher[4]. *[1]Imperial College Healthcare NHS trust, [2]Imperial College London (UK) Imperial College Healthcare NHS TrustNIHR Health Protection Research Unit in Healthcare Associated Infections and Antimicrobial Resistance, [3]Imperial College London (UK) Imperial College Healthcare NHS Trust, [4]Infectious Diseases/Microbiology, Imperial College London (UK) Imperial College Healthcare NHS Trust, London, UK*

Background: Public Health England published guidelines in 2015 recommending the use of pivmecillinam as an empirical choice of treatment for uncomplicated urinary tract infections. There is a paucity of surveillance data on the susceptibility of uropathogens to mecillinam. We conducted a prospective multicentre observational study of mecillinam susceptibility.
Aim(s)/Objective(s): The primary aim was to analyse mecillinam susceptibility to community-acquired *E. coli*, *Klebsiella* spp., and *P. mirabilis*. Secondary aims were to compare susceptibilities of other commonly prescribed antibiotics to mecillinam, and to collect demographic data to assess differences in various population settings.
Method(s): Urine culture and identification were performed using standardised laboratory techniques. The corresponding sensitivities were determined by disc diffusion method and in line with the European Committee on Antimicrobial Susceptibility Testing (EUCAST). Data on urine susceptibility was extracted from the centralised laboratory information management system from February to April 2016.
Results: Significant growth occurred in 2701 out of 15464 urines received from February to April 2016. Mecillinam showed a 97% sensitivity rate from 2181 isolates of *E. coli*, *Klebsiella* spp., and *P. mirabilis*. Sensitivity rates to nitrofurantoin, co-amoxiclav,

cephalexin, ciprofloxacin, nitrofurantoin, and trimethoprim were 94.4%, 92.4%, 92%, 90.3% and 65.2% respectively. In this study, only 3 out of 118 isolates were mecillinam-resistant ESBL positive isolates with no resistance observed amongst Amp-C producers.
Discussion and/or Conclusion(s): Mecillinam shows excellent *in-vitro* activity against common community-acquired uropathogens. *In-vitro* resistance of mecillinam to isolates producing ESBL and Amp-C producers is low. Our study provides evidence to support the current national guidance recommendation.

ID: 4901
Virulence and resistance features in microbial strains recovered from hospital surfaces

Mihaela Magdalena Mitache[1], Georgeta Totea[2], Irina Gheorghe[3], Coralia Bleotu[4], Carmen Curutiu[3], Nicoleta Amariei[3], Mariana Carmen Chifiriuc[3]. *[1]University Titu Maiorescu of Bucharest, Faculty of Medicine, [2]Maria Burghele Hospital Buftea, [3]Department of Microbiology, University of Bucharest, Faculty of Biology, [4]Stefan S. Nicolau Institute of Virology, Bucharest*

Background: The incidence of nosocomial infections increased with diversification of medical services provided.
Aim(s)/Objective(s): Investigation of resistance and virulence markers in microbial strains isolated from the hospital environment recovered after surfaces decontamination with quaternary ammonium compounds, triclosan, iodine in order to predict their role in healthcare-associated infections.
Method(s): The resistance phenotypes were established using disk diffusion and double-disk diffusion test. The investigated virulence factors were adherence to Hela cells and to inert substratum, haemolysins, lecithinase, gelatinase, lipase, DN-ase, amylase and iron chelating agents. Simple and multiplex PCR assays were used to identify the genetic support of cell-associated and soluble virulence factors (plcH, plcN, protease IV, alg, coag, ExoU,T and S, pldA, HelD, eaea, bfpA, eaf, AggR, EAggE, EAST1, VT1, VT2, pap, afa,sfa) and of resistance to beta-lactams, aminoglycosides, tetracyclines, quinolones, macrolides and disinfectants (intI1, qacG, qacH,qacE, NfxB, Fab).
Results: The isolated strains *E. coli*, Klebsiella, *Pseudomonas aeruginosa* and *Staphylococcus* sp. exhibited resistance to trimetroprim sulphametoxazole, nitrofurantoin, ampicillin, piperacillin-tazobactam, amoxicillin clavulanic acid, cefaclor, ceftibuten, aztreonam, tobramicin, amikacin. The pore-forming enzymes, proteases and siderophores-like production, as well as the adherence to inert and cellular substrata were among the most frequent virulence factors. The Gram-negative non-fermentative bacilli exhibited resistance to beta-lactams and gentamycin and pan-resistance phenotypes, the Enterobacteriaceae strains to tetracyclines, beta-lactams, aminoglycosides, quinolones and *Staphylococcus* sp. strains showed the MLSBi phenotype. The molecular assays allowed to identify the genetic support of virulence and resistance.
Discussion and/or Conclusion(s): The microbial strains proved to exhibit multiple drug resistance and virulence determinants, suggesting their potential to persist and initiate hospital-associated infections.

ID: 4915
Frequency and risk factors for aciclovir-associated AKI in adults

Lucy Ryan[1], Christopher Duncan[2], Jonathan Foster[3], Manoj Valappil[4], Matthias Ludwig Schmid[2]. *[1]Newcastle University Medical School, [2]Infectious Diseases, Royal Victoria Infirmary, Newcastle upon Tyne NHS Foundation Trust, [3]Pharmacy, Newcastle upon Tyne NHS Foundation Trust, [4]Virology, Public Health England*

Background: Acute kidney injury (AKI) is a well-established side effect of parenteral aciclovir, but there are limited data on its prevalence in adults in route clinical practice.
Aim(s)/Objective(s): To describe the prevalence of, and baseline/treatment-related risk factors for, aciclovir-related AKI.
Method(s): We performed a pilot retrospective analysis using electronic prescribing, laboratory medicine and patient record databases. Data on all doses of parenteral aciclovir administered in a tertiary infectious diseases centre over a three-year period (2013–2016) were extracted. All patient episodes in which a baseline serum creatinine was available prior to, and within 48 h/7 d of aciclovir dosing were included. Patients on dialysis were excluded. AKI incidence and severity was graded according to KDIGO criteria. Continuous data were normalised by log-transformation for unpaired t test; categorical date were analysed by Fisher's extract test (GraphPad Prism).
Results: We identified 80 aciclovir treatment episodes in 77 patients. Fifteen episodes in 14 patients were associated with AKI (grade1: 8; grade 2: 3; grade 3: 4), giving an overall prevalence of 18.8%. Patients with AKI were significantly older (mean age 62.5 v 50.4, P = 0.039) and exposed to a larger cumulative dose of aciclovir (11.9 g v 6.2 g, P = 0.037). There were non-significant associations with plausible baseline or treatment-related risk factors, probably due to the modest sample size.
Discussion and/or Conclusion(s): AKI is an appreciable risk with parenteral aciclovir, particularly in older patients, and warrants close monitoring. These data justify the assessment of intervention(s) to reduce the risk of AKI.

ID: 4917
Virulence factors and antibiotic susceptibility patterns of coagulase-negative staphylococci strains isolated from Intensive Care Unit and Cardiology

Mihaela Magdalena Mitache[1], Georgeta Totea[2], Carmen Iordache[3], Marcela Popa[3], Carmen Chifiriuc[3]. *[1]University Titu Maiorescu of Bucharest, Faculty of Medicine, [2]Maria Burghele Hospital Buftea, [3]University of Bucharest, Faculty of Biology, Department of Microbiology*

Background: Coagulase-negative staphylococci CoNS is one of the major causes of nosocomial infection, most infections being associated with different types of prostheses. Even though this bacteria has a low pathogenicity, the impact of the global CoNS infections is considerable, medical and socio-economic.
Aim(s)/Objective(s): Evaluation of microbiological risk represented by CoNS strains isolated from different hospital environments, in order to establish potential contamination risk for patients.
Method(s): The isolated strains have been identified using miniAPI galleries and investigated for antibiotic susceptibility profiles using disk difusion method. The production of cell-associated factors, adherence to inert and cellular substratum, biofilm development and soluble enzymatic virulence factors, hemolysins, lecithinase, lipase, caseinase, gelatinase, amylase, esculin hydrolysis, DN-ase was assesed using phenotypic methods, microdilution methods for adherence to inert substratum and biofilm, selective media for enzymatic factors production and molecular methods PCR-based methods.
Results: CoNS strains isolates exhibited an antibiotic resistance pattern with high resistance to penicillin 34%, erythromycin 22%, tetracicline 18% and kanamicin16%. Regarding virulence factors, the strains isolated exhibited with higher prevalence pore forming toxins (lecithinase) and proteases (caseinase, gelatinase), with potential roles in pathogenesis. All tested strains presented capacity to adhere to inert and cellular substrate presenting different adherence patterns and to develop biofilm.
Discussion and/or Conclusion(s): The presence of virulence factors, and antibiotic resistance among analized straince, and also the ability of these strains to form microbial biofilms create difficult medical problems, especially because widespread use of large invasive medical procedures (probes, catheters, heart valves, prostheses). Contamination of this devices is associated with risk of subsequent development of human infections.

ID: 4927

CPE screening: Molecular vs Culture – a comparison

Pamela Hunter, Sarah Whitehead, Thomas Gillespie. *NHS Lanarkshire*

Background: Carbapenemase producing Enterobacteraciae (CPE) are endemic in some healthcare facilities worldwide. There is a risk these could become endemic in Scottish hospitals. Consequently, Scottish government has mandated CPE screening of patients who have been in hospitals in rUK and worldwide.
Aim(s)/Objective(s): We set out to compare use of CPE screening plates with a molecular method.
Method(s): We carried out a 3 month pilot involving 4 wards at Monklands District General Hospital. For 6 weeks samples from patients requiring CPE screening were tested using CPE screening plates (Chromogenic UTI agar (Thermo Fisher) with a 10 microgram ertapenem disc, and for the subsequent 6 weeks, Cepheid GeneXpert® was used for PCR.
Results: Conventional culture requires patients to be isolated for a minimum of 6 days, whereas molecular methods could give a negative result within hours. A comparison of turn round time for the two methods; cost, ease of patient and laboratory staff use and effect on infection control/patient placement is presented.
Discussion and/or Conclusion(s): CPE propose a significant risk to patients in hospitals worldwide. It is important to prevent CPE's becoming endemic in Scottish healthcare facilities and screening identified groups of patients, allowing those who are colonised to be isolated may help prevent spread. However, it is essential that methods for screening must be cost effective and acceptable to both patients and staff. Although individually more expensive, a rapid test has the potential to release staff resource and allow patients to be discharged from isolation facilities up to 6 days earlier.

ID: 4946

Carbapenemase producing Enterobacteriaceae – the trouble with screening

Emily Goldstein, Rory Gunson, Brian Jones, John Coia. *NHS Greater Glasgow and Clyde*

Background: Carbapenemase producing *Enterobacteriaceae* (CPE) are considered a significant public health threat, with prevalence increasing dramatically in the UK over the past decade. In 2004 there were only two CPE isolated, in comparison to 2014 in which >1600 CPE were detected in the UK, therefore interventions are urgently required to reduce transmission of these highly resistant organisms.
Active surveillance of CPE, allowing for early detection and implication of effective infection control procedures, is of paramount importance in healthcare settings. However, a variety of screening methods are being employed by different laboratories.
Aim(s)/Objective(s): In this study we aim to evaluate the utility of eight different screening methods to detect CPE in a panel of 125 *Enterobacteriaceae* isolates.
The following methods were investigated: multiplex real-time PCR, modified Hodge test, Rapidec Carba NP, two chromogenic agars (CarbaSmart and SuperCarba), MacConkey agar with a 10 µL meropenem disc, MIC by both Vitek and Etest.
Discussion and/or Conclusion(s): The ideal screening method should provide rapid, highly sensitive results in addition to being non-labour intensive and cost-effective. Each method poses its own advantages and challenges, and only PCR resulted in a sensitivity and specificity of 100%.

ID: 4964

Is weekly therapeutic drug-level monitoring of Teicoplanin necessary in the OPAT setting?

Tim Hills[1], Md Smith[2], Rebecca Greenham[2], Arun Sareen[2]. *[1]Nottingham University Hospitals NHS Trust, [2]University of Nottingham*

Background: Teicoplanin is a once a day antibiotic often given to treat serious Gram positive infection. In 2013 an amendment to the dosing and monitoring advice contained in the Summary of Product Characteristics for Teicoplanin advised taking trough blood levels at least once a weekly.
Aim(s)/Objective(s): To assess the suitability of the teicoplanin therapeutic drug monitoring (TDM) recommendations in relation to audit results from a UK OPAT centre.
Method(s): Data from patients who received teicoplanin as part of the OPAT service was collected retrospectively July 2012 to February 2016 including dose, weight, serum creatinine, age, TDM data and levels, adverse events and clinical outcome.
Results: 29 patient-episodes had an initial steady-state trough level between 20 and 45.5 mg/L, had no changes to their on-going dosing regimen and received at least one follow-up teicoplanin levels at least 7 days after the initial level. The mean time between levels was 22 days (range 7–46). 28 of the 29 patient-episodes (97%) had follow-up levels between 20 and 60 mg/L with one having a trough level of 68 mg/L. This patient's calculated creatinine clearance (Cockcroft-Gault) reduced from 53.6 to 38.5 mL/min between the two levels. None of the 29 patient-episodes experienced adverse drug reactions. Overall, the mean trough level increased from 29.7 to 37.8 mg/L between the two levels.
Discussion and/or Conclusion(s): Results of our audit call into question the need for weekly TDM of teicoplanin for OPAT patients with stable renal function.

ID: 4982

Cost-effectiveness of outpatient intravenous antibiotic service using a Discrete Event simulation approach

Armando Vargas-Palacios[1], David Meads[1], Jane Minton[2], Judy Wright[1], Carolyn Czoski Murray[1], Elizabeth Mitchell[1], Claire Hulme[1], Angela Gregson[3], Philip Stanley[4], Maureen Twiddy[1]. *[1]University of Leeds, [2]Leeds Teaching Hospitals NHS Acute Trust, [3]Leeds Community Healthcare Trust, [4]Bradford Teaching Hospitals NHS Foundation Trust*

Background: Many patients who have an infection will require intravenous antimicrobial treatment. Some will be suitable for receiving their antibiotics in the community through OPAT (outpatient parenteral antimicrobial therapy) services. These services include: administration of the intravenous antimicrobial treatment in a hospital out-patient clinic; at home by general or specialist nurse; or patient self-administered following training. In the UK there is uncertainty regarding which service represents the best value for money.
Aim(s)/Objective(s): This study aimed to estimate the cost-effectiveness of these different OPAT services.
Method(s): A cost effectiveness decision analytic model was developed using a discrete event simulation technique. The model estimated costs and outcomes using quality adjusted life years (QALYs). OPAT services were simulated including nurses and consultation room capacity for a given population at risk.
Results: For short term infection, hospital outpatient administration was the most expensive service and provided negligible QALY gains compared to services provided by nurses visiting at home. Administration at home by a specialist nurse was estimated to be the most cost-effective service. For long term infections, whilst patient self-administration was the cheapest option, specialist nurse administration offered the most QALY gain resulting in a combination of the two services being the most cost-effective configuration.
Discussion and/or Conclusion(s): Nurse administration and patient self-administration of intravenous antimicrobial treatment were the most cost-effective strategies. However a lack of service capacity will result in treatment delays, greater health risks and increased costs which eventually impact on service cost-effectiveness.

ID: 5052

The causative organisms and antimicrobial resistance seen in asymptomatic and symtomatic renal transplant recipients

Rebecca Bamber[1], Harriet Hughes[2], Shafi Malik[3], Vinod Mathrani[4].
[1]Microbiology Dept, University Hospital of Wales, [2]Public Health Wales, [3]Univerity Hospital of Wales, [4]University Hospital of Wales

Background: There is little current UK data on the types and resistance profiles of the infecting urinary pathogens, and no standard approach to investigation and treatment of these patients. Some data has been published from the USA, but this cannot be extrapolated to our local population.

Aim(s)/Objective(s):

- To detail the culture results from renal transplant outpatients, both symptomatic and non-symptomatic with the aim of guiding future therapy
- Ensure that our current SOP was being followed and that this was providing useful information to clinicians. Detail the resistance profiles of the organisms, with particular reference to the potential impact of the routine use of co-trimoxazole prophylaxis

Method(s): The results of the initial pilot study revealed:

- 11% of samples were not identified anywhere on the request form as transplant patients and were therefore not processed using the correct SOP
- 78% of patients were asymptomatic despite significant growth on urine samples.
- The spectrum of organisms found was unusual (only 26% *E. coli*, for example)
- Multi-drug resistance was more common than in the routine population

We introduced of a "transplant" barcode sticker. This made it possible to collect a far larger data set over the next 6 months.

Results: 445 urines collected over a 6 month period following sticker introduction. Analysis for:

- Organism grown
- Resistance patterns
- Efficacy of transplant SOP

Discussion and/or Conclusion(s): Results suggest that transplant patients do benefit from a specific SOP for handling routine urines and that antibiotic guidelines may need altering to reflect the pathogens affecting this group.

ID: 5057

Clindamycin resistance rates of Group B Strep (GBS) in perinatal maternal samples in an East London Hospital – an under-recognised resistance problem

Alleyna Claxton. *Homerton University Hospital NHS Foundation Trust*

Background: Early onset neonatal Group B Streptococcus disease (EOGBS) is the most frequent cause of severe infection in new born infants. To reduce the risk, national guidance states that all women who have GBS detected from vaginal swabs/urine samples in their current pregnancy should be offered intrapartum antibiotic prophylaxis (IAP) during labour. Antibiotics for penicillin-allergic women are problematic due to GBS resistance to clindamycin. The current guidance (2012) states GBS clindamycin resistance rates of c.10% in England & Wales (Health Protection Agency data 2009).

Aim(s)/Objective(s): To evaluate the current GBS clindamycin resistance rates in peri-natal women in an East London Hospital.

Method(s): Winpath was searched for the antibiograms for GBS isolated from vaginal swabs/mid-stream urine samples (MSUs) for women attending the hospital's maternity services from April 2015 to April 2016. The prevalence of GBS clindamycin resistance was calculated using this data.

Results: GBS was isolated from 98 vaginal swabs and 26 MSUs. The GBS isolates were clindamycin resistant in 27 out of 124 isolates – a resistance rate of 21.8%.

Discussion and/or Conclusion(s): In our hospital, the GBS clindamycin resistance rate is double that stated in the national guidance. However, awareness among our Obstetricians is low that the GBS antibiogram should be checked before prescribing clindamycin for IAP for penicillin-allergic women and a glycopeptide antibiotic should be used as an alternative if clindamycin resistance is detected or not determined, despite this being stated in our antibiotic policy.
Local clindamycin resistance rates for GBS in maternity samples should be reviewed to inform GBS IAP antibiotic choices for penicillin-allergic women and Obstetricians should be made aware of this antibiotic resistance issue.

ID: 5067

Antimicrobial susceptibility and molecular epidemiology of extended spectrum beta-lactamase producing Enterobacteriaceae in Hamad Medical Corporations, Qatar

Mazen Sid Ahmed[1], Anand Deshmukh[1], Devendra Bansal[2], Emad Ibrahim[1], Ali Sultan[3]. *[1]Hamad Medical Corporation, [2]Weill Cornell-Medicine Qatar, [3]Weill Cornell Medicine-Qatar*

Background: Emergence of extended spectrum beta lactamase (ESBL)-producing isolates has important clinical and therapeutic implications. A high prevalence of ESBL-producing Enterobacteriaceae has been reported in literature from various clinical samples.

Aim(s)/Objective(s): The present study was undertaken to evaluate the prevalence of ESBL-producing Enterobacteriaceae, as well as the molecular characterization and the antimicrobial susceptibilities in patients admitted in Intensive Care Units (ICUs) at Hamad Medical Corporations (HMC), Doha, Qatar from November 2012 to October 2013.

Method(s): A total of 629 Enterobacteriaceae isolates were included in the study. Identification and susceptibility was done by Phoenix (Becton Dickinson) and the ESBL-producers were confirmed by double disk potentiation as recommended by CLSI. Molecular analysis for the ESBL-producers was performed using polymerase chain reaction (PCR).

Results: 109 isolates (17.3%) were confirmed as ESBL-producers and all were sensitive to meropenem in routine susceptibility assay. Most of ESBL producers (99.1%) were resistant to amoxicillin/clavulanic acid and ceftriaxone and 93.6% to cefepime. Among ESBL producing genes, prevalence of bla_{CTX-M} (66.1%) was highest, followed by bla_{SHV} (53.2%) and bla_{TEM} (40.4%).

Discussion and/or Conclusion(s): Present study shows high prevalence of ESBL-producing Enterobacteriaceae within the ICU facilities at HMC, Qatar and emphasizes the need for judicious use of antibiotics and implementation of strict infection control measures.

ID: 5068

Clinical data and antimicrobial susceptibility of multidrug resistance *Pseudomonas aeruginosa* isolates in Qatar

Emad Ibrahim[1], Mazen Sid Ahmed[1], Jana Jass[2], Suleiman Abu Jarir[1], Khalid Zahraldin[1]. *[1]Hamad Medical Corporation, [2]Orebro University*

Background: *Pseudomonas aeruginosa* is the 2nd most frequent pathogen isolated from health care associated pneumonia, skin and soft tissue infection. There is insufficient data on epidemiology of multidrug resistance *P. aeruginosa* (MDR-PA) available in Qatar.

Aim(s)/Objective(s): The present study aiming to determine antimicrobial susceptibilities, molecular epidemiology and risk factors of MDR-PA from patients, Hamad Medical Corporations (HMC), Doha, Qatar.

Method(s): Antimicrobial susceptibility testing: By Phoenix and results were confirmed by E-test. Descriptive analysis of the risk factors and clinical outcome of every file of MDR-PA positive patients were collected.

Results: Overall prevalence of MDR-PA was 8% (205/2552). Majority 74.6% were male, age range 1.5–90 years with a mean age of 45.75 years (SD = 62.58). 64% of patients >50 years, 68% patients non-Qatari, and majority 74.0% were inpatient.

Among the infected patients within last 90 days, 85% exposure to antibiotics, and 67% have history of MDR. 97% were hospital acquired. Among the patients of MDR-PA, 56% were colonization and 44% were infection.
The overall, 96.6% MDR-PA isolates shown resistance to cefepime, 91.2% ciprofloxacin, 90.7% piperacillin/tazobactam, 90.2% meropenem, 73.2% gentamicin, 58% amikacin, 54.6% tobramycin, and only 3.4% to colistin.
Clinical outcome: Overall 60% were cured, 36% died and 4% relapsed.
Discussion and/or Conclusion(s): Our study showed a relatively low prevalence (8%), but there were five isolates resistant to all antibiotics tested in Qatar (Pandrug-resistance). Colistin shows high sensitivity (96.6%) and can be used for managing severe patients with suspected infections with MDR-PA.

ID: 5082
Using a simple Point-Prevalence Survey to define appropriate antibiotic prescribing in hospitalised children across the United Kingdom

Myriam Gharbi[1], Katja Doerholt[2], Stefania Vergnano[3], Julia Anna Bielicki[3], Stéphane Paulus[4], Esse Menson[5], Andrew Riordan[4], Hermione Lyall[6], Sanjay Valabh Patel[7], Jolanta Bernatoniene[8], Ann Versporten[9], Maggie Heginbothom[10], Herman Goossens[9], Mike Sharland[3]. *[1]Imperial College London, [2]St George's Hospital NHS Trust, [3]St. Georges University of London, [4]Alder Hey Children's NHS Foundation Trust, [5]Evelina London Children's Hospital, [6]St Mary's Hospital Imperial College Healthcare NHS Trust, [7]Southampton Children's Hospital, [8]University Hospitals Bristol NHS Foundation Trust, [9]University of Antwerp, [10]Public Health Wales*

Background: The National Health Service England, Commissioning for Quality and Innovation for antimicrobial resistance aims to reduce the total antibiotic consumption and the use of broad-spectrum antibiotics in secondary care. However, robust baseline antibiotic use data are lacking for hospitalised children.
Aim(s)/Objective(s): To describe and explain the prescription patterns of antibiotics within and between paediatric units in the UK and provide a baseline for antibiotic prescribing for future improvement using CQUIN AMR guidance.
Method(s): Point prevalence survey (PPS) in 61 paediatric units across the UK. The standardised study protocol from the Antimicrobial Resistance and Prescribing in European Children (ARPEC) project was used. All inpatients under 18 years-old were included except neonates.
Results: A total of 1247 (40.9%) of 3047 children hospitalised on the day of the PPS were on antibiotics. The proportion of children receiving antibiotics showed a wide variation between district general and tertiary hospitals, with 36.4% (33.4–39.4) and 43.0% (40.9–45.1) of children prescribed antibiotics respectively. About a quarter of children on antibiotic therapy received either a medical or surgical prophylaxis with parenteral administration being the main prescribed route for antibiotics (>60% of the prescriptions for both type of hospitals). General paediatrics units were high prescribers of critical broad-spectrum antibiotics, i.e. carbapenems and piperacillin-tazobactam.
Discussion and/or Conclusion(s): We provide a robust baseline for antibiotic prescribing in hospitalised children in relation to current national stewardship efforts in the UK. Repeated PPS with further linkage to resistance data need to be part of the antibiotic stewardship strategy to tackle the issue of suboptimal antibiotic use in hospitalised children.

ID: 5117
Gram-negative bacteraemia – a retrospective audit

Arpit Vyas[1], Dina El-Zimaity[2], Essam Rizkalla[2]. *[1]University Hospitals of Leicester, [2]Kettering General Hospital*

Background: Gram-negative bacteraemia (GNB) is associated with high mortality rates. Administering appropriate antibiotic treatment promptly affects overall prognosis and outcome.
Aim(s)/Objective(s): This retrospective audit aimed to review the isolates, investigations, management and mortality of hospital patients with GNB at Kettering General Hospital, England.
Method(s): This retrospective audit covered a two month period 01.01.2016 to 29.02.2016. All patients with GNB from an existing database were included (n = 60). We defined GNB as a confirmed gram-negative organism from a blood culture. We defined a mortality associated with GNB as any patient deceased by 31.03.2016.
Data was collected using the hospital t-path software, discharge letters, the hospital haematology and biochemical database and patient notes where possible. Data was analysed using a Spreadsheet (Microsoft Excel 2010).
Results: The results show there were 20 (33%) cases of GNB associated mortality. The most common empirical antibiotic of choice was Tazocin monotherapy (54% of cases). On average, Microbiology called within 1.1 days with the ID of organism and 1.9 days with sensitivity for the organism. This lead to antibiotic changes in 25% of cases. The most common organism was *E. coli* and urinary tract infection was the most common presumed source of infection. GNB showed high resistance rates for amoxicillin (55%), co-amoxiclav (37%) and trimethoprim (34%). In 25% of cases, a urine sample was not sent for culture.
Discussion and/or Conclusion(s): GNB is associated with high mortality in hospital patients. Urine samples for culture and sensitivity must be sent for all cases, especially as *E. coli* is the most common causative organism. To re-audit in 6 months.

ID: 5121
Closed-loop controller systems for the precision delivery of vancomycin: An in silico proof-of-concept

Akash Philip, Timothy Rawson, Luke Moore, Alison Holmes, Pantelis Georgiou, Pau Herrero. *Imperial College London*

Background: Wide inter- and intra-individual pharmacokinetic (PK) variability has been observed in vancomycin therapy. We developed and investigated, *in-silico*, two closed loop-systems for precision antimicrobial delivery of vancomycin against defined PK-PD targets.
Method(s): A Proportional-Integral-Derivative (PID) controller and an Iterative Learning Controller (ILC) were designed to control continuous and intermittent vancomycin infusions, respectively using therapeutic drug monitoring levels. One- and two-compartment PK models obtained from 24 patients receiving vancomycin were used to evaluate the controllers. Variables such as weight, clearance, ethnicity, gender, and age were considered. Intra-day variability of clearance and sensor error were simulated to produce more realistic *in-silico* conditions. For the PID controller, a continuous vancomycin sensor, was assumed. A 24-hour Area-Under-the-Curve(AUC):Minimum-Inhibitory-Concentration (MIC) (AUC:MIC) > 400 was defined as success target for both controllers. The PID controller was evaluated using the two-compartment model and the set-point (i.e. plasma concentration) was periodically adjusted (e.g. 6 hourly) in order to achieve the overall 24-hour target.
The ILC controller was tested using the one-compartment model, a 12-hour sampling time, a 1000 mg initial dose, and a trough level set-point of 10 mg/L.
Results: The PID controller achieved the set-point (AUC:MIC > 400) for all 24 individuals in less than 5 hours. For the ICL controller, 22/24 simulated individuals achieved AUC:MIC > 400. 2/22 individuals had AUC:MIC > 700 that may be associated with toxicity.
Discussion and/or Conclusion(s): Both the PID and ILC controller simulations attained required PK-PD targets. The PK profiles obtained were within acceptable ranges observed in clinical practice. This provides evidence to support the potential feasibility of using closed-loop systems for antimicrobial delivery.

ID: 5135

Carbapenemase-producing organisms in NHS Lothian – rapid and reliable detection and confirmation

Geoff Toner[1], Kate Templeton[1], Fiona Hamilton[1], Clark Russell[2].
[1]*NHS Lothian,* [2]*University of Edinburgh*

Background: Carbapenemase-producing Organisms pose an increasing clinical threat globally. Increasing resistance to carbapenems (often considered the last line in antibiotics in the treatment of gram-negative infections) has led to the requirement for rapid and robust methods for the analysis of carbapenemase activity in these organisms.
Aim(s)/Objective(s): From September 2014, NHS Lothian has been performing in-house multiplex real-time PCR for OXA-48, VIM, NDM, KPC and IMP carbapenemase-producing organisms alongside Rapidec Carba NP testing and detection of growth on ChromID CARBA SMART media. The sensitivity and specificity of these assays were assessed over a 24 month period.
Method(s): This review detailed the investigation of 81 isolates from the period September 2014 to Aug 2016 including 38 carbapenamase-positive isolates and 43 carbapenemase-negative isolates.
Results: The sensitivity and specificity of the in-house PCR to detect the OXA-48, VIM, NDM, KPC and IMP ("big 5") targets was assessed to be 100% and 100%. The chromogenic screening agar ChromID CARBA SMART had a sensitivity of 97.3% and a specificity of 95.3% for detection of carbapenemase-producing organisms. The Rapidec Carba NP had a sensitivity of 97.3% and a specificity of 97.6%. Two OXA-23 producing isolates and two IMI-producing isolates were all positive by Rapidec Carba NP and characterised by ARMRL Colindale.
Discussion and/or Conclusion(s): The overall compilation of Carbapenemase-producing Organisms over the 24 month period in NHS Lothian was NDM (21%), OXA-48 (29%), VIM (24%), IMP (11%), KPC (5%), OXA-23 (5%) AND IMI (5%). A robust, reliable and rapid workflow for laboratory detection of Carbapenemase-producing organisms has been validated for use in NHS Lothian.

ID: 5175

Surveillance of antifungal resistance patterns in oral *Candida* infection

Noha Seoudi, Wala Belhaj. *QMUL*

Background: Oral microbiology investigation forms an important role in managing orofacial infections and patient care. Recently, the Public Health England (PHE) updated their oral mucosal standards for microbiology investigations (SMI). *Candida* infection is one of the most frequent oral infections that require proper diagnosis, for optimum management especially with the increased immunocompromised population and the reported emergence of antifungal resistance. Therefore, this study analysed the antifungal resistance in oral *Candida* infection.
Aim(s)/Objective(s): To analyse the antifungal resistance pattern in oral *Candida* infection reported by one of the oral microbiology laboratory in a dental hospital in the UK.
Method(s): Data from oral microbiology laboratory reports was collected electronically retrospectively in a two-year period (2014–2015). Subsequently, Oral *Candida* reports were studied and the sensitivity patterns were analysed.
Results: In the period between the 1st of January 2014 to the 31st of December 2015, a total of 2051 oral mucosal swabs received, only 29% (594/2051) of these swabs grew yeasts, 95.6%(568/594) of the yeast isolates were identified to species level. Susceptibility tests were performed for 9.5% (54/568) of the reported *Candida*. *Candida* was reported 100% sensitive to Ambizome, Itraconazole, Nystatin, Caspofungin and voriconazole, and 95% to Fluconazole and Echinocandin. Resistance was reported only in non-albicans *Candida* (*Candida glabrata, Candida krusei* and *Candida guilliermondii*).
Discussion and/or Conclusion(s): This study highlights that *Candida* isolated from oral infection remains very sensitive to the commonly used antifungal agents. However, sensitivity testing is still justified in cases of failure of treatment, immunocompromised patients and infection with non-albicans *Candida*.

ID: 5176

Investigating new cases of Enteroccoci conferring Optr-A mediated linezolid resistance from Scotland

Joanna Walker[1], Anne Marie Karcher[1], Michael Lockhart[2], Ben Parcell[1].
[1]*NHS Grampian,* [2]*National Services Scotland*

Background: Presently less than one percent of Gram positive organisms have Linezolid resistance. This resistance can result from mutations in chromosomal genes. Since 2012 there has been a Scottish national alert flagging newly identified plasmid mediated transferable mechanisms via the cfr gene and recently the Optr-A gene. The Optr-A gene encodes an ABC transporter which confers resistance to oxazolidinones and phenicols.
We have identified three separate Optr-A mediated Linezolid resistant *Enterococcus faecalis* isolates from urine samples in NHS Grampian from 2014 to 2016. It is extremely rare to identify this resistance mechanism.
Aim(s)/Objective(s): To describe these three cases and investigate risk factors for acquiring these infections and identify potential links between patients
Method(s): To review lab system records, and Vitek 2 sensitivities and typing for comparison; to collate clinical information and establish whether the patients were managed for acute episodes of urinary infection; and to identify epidemiological risk factors for acquiring these isolates including past medical histories, hospital admissions, links to farming, and travel histories including to Ireland.
Results: The results from the lab system search and the case histories from GP interviews will be described.
Discussion and/or Conclusion(s): Plasmid mediated mechanisms are of considerable public health importance due their potential to transfer and confer resistance to other strains and species.

Topic: Antimicrobial stewardship

ID: 4464

The role of point of care tests in antibiotic stewardship for urinary tract infections in a resource limited setting on the Thailand-Myanmar border

Lauren Chalmers, Rose McGready, François Nosten, Jessica Cross, Cindy S. Chu, Aung Pyae Phyo, Margreet Trip, Clare Ling, Verena Carrara, Wanitda Watthanaworawit, Lily Keereecharoen, Borimas Hanboonkunupakarn. *Shoklo Malaria Research Unit (SMRU), Mahidol-Oxford Tropical Medicine Research Unit, Faculty of Tropical Medicine, Mahidol University, Thailand*

Background: Published literature from resource-limited settings is infrequent, although urinary tract infections (UTI) are a common cause of outpatient presentation and antibiotic use. Point-of-care test (POCT) interpretation relates to antibiotic use and antibiotic resistance.
Aim(s)/Objective(s): We aimed to assess the diagnostic accuracy of POCT and their role in UTI antibiotic stewardship.
Method(s): One-year retrospective analysis in three clinics on the Thailand-Myanmar border of non-pregnant adults presenting with urinary symptoms. POCT (urine dipstick and microscopy) were compared to culture with significant growth classified as pure growth of a single organism >10(5) CFU/mL.
Results: In 247 patients, 82.6% female, the most common symptoms were dysuria (81.2%), suprapubic pain (67.8%) and urinary frequency (53.7%). After excluding contaminated samples, UTI was diagnosed in 52.4% (97/185); 71.1% (69/97) had a significant growth on culture, and >80% of these were *Escherichia coli* (20.9% produced extended-spectrum β-lactamase (ESBL)). Positive urine dipstick (leucocyte esterase ≥1 and/or nitrate positive) compared against positive microscopy (white blood cell >10/HPF, bacteria ≥1/HPF, epithelial cells <5/HPF) had a higher sensitivity (99% vs. 57%) but a lower specificity

(47% vs. 89%), respectively. Combined POCT resulted in the best sensitivity (98%) and specificity (81%). Nearly one in ten patients received an antimicrobial to which the organism was not fully sensitive.
Discussion and/or Conclusion(s): One rapid, cost-effective POCT was too inaccurate to be used alone by healthcare workers, impeding antibiotic stewardship in a high ESBL setting. Appropriate prescribing is improved with concurrent use and concordant results of urine dipstick and microscopy.

ID: 4469
Development of an antimicrobial stewardship peer review system for the East of England Pharmacy Infection Network

Emma Cramp. *Hinchingbrooke NHS Hospital*

Background: There have been a number of UK national guidelines to support Antimicrobial Stewardship pulished recently. The diversity of these resources, given that they have been produced by different expert groups, and at different time points, makes it challenging for teams to establish which guidance to follow. In response to this, the recommendations from these national resources were reviewed and collated into one complete AMS tool to provide clarity to enable the recommendations to be followed. The intention is to use the tool to enable a peer review of AMS activities in acute NHS Trusts in the East of England region.
Aim(s)/Objective(s): To develop a tool to facilitate the peer review of antimicrobial stewardship activities in acute hospitals in the EoE.
Method(s): Guidance from national documents relating to antimicrobial stewardship were reviewed and used to formulate a draft tool. This tool was circulated to the EoE regional antimicrobial pharmacist's network for comment. The draft tool was used as part of a pilot peer review visit at two acute hospitals.
Results: Feedback received from the participants of the pilot peer review informed the publication of the final peer review tool. The tool was able to identify gaps in antimicrobial stewardship practice at each site.
Discussion and/or Conclusion(s): The next stage of implementation will be to adopt a peer review process using the tool across the East of England region. We hope that this system will provide a unique and systematic review of AMS activities and lead to recommendations for improvement and sharing of best practice throughout the region.

ID: 4515
Surgeons when it comes to managing cutaneous abscesses know about your ISAs (Incisions, Swabs and Antibiotic stewardship)

Richard Pilkington[1], Jonathan Moore[2], Luke Banbury[3]. [1]*Health Education North East,* [2]*Dept of Microbiology, Gateshead NHS Trust,* [3]*Foundation Dr, Queen Elizabeth Hospital Gateshead*

Background: Cutaneous abscesses are commonly encountered in clinical practice. Conventional wisdom dictates that incision and drainage (I+D) is the treatment of choice. The role of antibiotics and microbiological sampling at the time of drainage is less well established. Our hospital has a successful pathway to identify and manage patients requiring surgical intervention.
Aim(s)/Objective(s): We evaluate what microbiology samples are sent and how useful these results are, as well as considering what therapy patients on this pathway receive with the intention of improving the pathway and antibiotic stewardship.
Method(s): 109 cases of I + D were reviewed. For each case, we identified if swabs were taken and if antibiotics were prescribed and then analysed the culture results.
Results: Of 109 I + D carried out (66 perianal, 24 abdominal, 16 axilla/breast and 3 lower limb), swabs were taken in 100 cases. 37% of samples were culture negative. As expected, Gram negative and anaerobic flora were most frequently isolated form perianal swabs and Gram positive flora from other sites. Varied antibiotic practice was noted.
Discussion and/or Conclusion(s): The mainstay of treatment for cutaneous abscess is surgical I + D. Our hospital pathway works well in identifying patients requiring I + D and conducting this surgery. However, presently samples are sent in the majority of cases and antibiotic practice variable. We propose that our pathway is developed to provide a selective framework for cases where microbiology work up is likely to be most beneficial and to improve antibiotic stewardship both before and after I + D to make best use of precious resources.

ID: 4520
Implementing an antimicrobial stewardship training and mentorship programme and encouraging key nurse led 'antibiotic conversations'

Frances Kerr, Paula Smith, David Watson, Steve McCormick. *NHS Lanarkshire*

Background: Antimicrobial resistance is a recognised issue. Nurses with more patient contact than other health professionals are in a key position to influence safe, effective prescribing and administration of antibiotics.
Aim(s)/Objective(s): To implement a ward based antimicrobial stewardship programme for nurses highlighting key opportunities for intervention, encouraging 'antibiotic conversations' and acting as effective safety nets.
Method(s): Ward buzz session ran over 6 weeks from May – June 2015. Materials and training were tested separately. Training was focused on antibiotic policies and key opportunities to initiate antibiotic conversations. Pre/post training questionnaires were used to assess the impact of training and nurse confidence levels. Paired T-test was used to assess impact.
Results: 13 nurses were trained and 12 pre/post questionnaires were returned. 83% (n = 10) of nurses said it changed their practise. 100% would recommend training to colleagues.
A statistically significant increase in confidence in initiating conversations ($p = 0.046$) was observed. Pre-training 75% of nurses had ≤ 2 conversations per week, post-training 67% had ≥ 3 conversations.
A statistically significant increase in confidence assessing vancomycin levels ($P = 0.005$) was demonstrated. No significant change in confidence with gentamicin was seen ($p = 0.054$).
Overall nurses were more confident at querying antibiotic prescribing, a clear safety benefit for patients.
Discussion and/or Conclusion(s): Although the sample size was small, nurses showed increased awareness of antibiotic policies and increased confidence in using them, resulting in increased nurse initiated antibiotic conversations. Nurse feedback was very positive, they felt strongly that this training would benefit their colleagues.
An action plan is being formulated to ensure rollout to all nursing staff.

ID: 4545
European Antibiotic Awareness Day (EAAD) activities across Scotland: Views and experiences of the community pharmacy team

Antonella Tonna[1], Jacqui Sneddon[2], Anita Weidmann[3], Derek Stewart[3]. [1]*Robert Gordon University School of Pharmacy and Life Sciences,* [2]*Scottish Medicines Consortium,* [3]*Robert Gordon University*

Background: EAAD is a European wide public health initiative encouarging responsible use of antibiotics amongst the general public. Community Pharmacy teams across Scotland are supported to partake in EAAD through activities coordinated by the Scottish Antimicrobial Prescribing Group (SAPG). In 2014, this included using a community pharmacy version of a self help guide published by the Royal College of General Practitioners and distributed to all community pharmacies.
Aim(s)/Objective(s): To explore the views and experiences of community pharmacy teams across Scotland of using this self help guide.

Method(s): Qualitative, semi-structured in-depth telephone and face-to-face interviews were undertaken with a purposive sample of community pharmacy team members, including pharmacists and dispensers. An interview schedule, was developed, validated and piloted. Interviews were audio-recorded and transcribed verbatim. Data were analysed thematically using the Framework Approach.
Results: Twenty seven employees consented and were interviewed. Twenty participants were pharmacists with nineteen employees working mainly in a large chain across five regions, 14 had been in practise for up to five years. Most interviewees thought that the pharmacy was an ideal place to engage patients in an antimicrobial stewardship initiative with a need for a multi pronged approach. Although the tool was perceived to be useful, few were aware it existed or had any experience in using this. A lack of training around antimicrobial stewardship was also identified.
Discussion and/or Conclusion(s): It is recommended that EAAD tools and other materials need to be more effectively disseminated and pharmacists require more opportunities for specialised training on antimicrobial stewardship.

ID: 4683
The role of the community pharmacist in delivering the 5-year antimicrobial resistance strategy

Gill Hawksworth[1], Phil Howard[2], Jake Mills[1], Bahareh Yazdani[1], Sophie Devine[1], Emily Clifford[1]. *[1]University of Huddersfield, [2]Leeds Teaching Hospitals NHS Trust, Leeds*

Background: This study analyses approaches community pharmacies are currently undertaking to adhere to the Department of Health antimicrobial resistance strategy 2013.
Aim(s)/Objective(s): To determine the delivery by community pharmacists of the antimicrobial resistance strategy, pharmacist's views on challenging GP's about antibiotic prescribing and point of care testing for early detection of infections.
Method(s): This study required and received ethics approval. Following consent, a questionnaire was sent out in January 2016 to participating community pharmacists across Calderdale and Kirklees.
Results: Of the 50 questionnaires received, 28 pharmacists (56%) were aware of their local antibiotic guidelines and 38 (76%) did not monitor local antibiotic prescribing from their GPs, whereas 15 (30%) never ask patients what an antibiotic is for. Qualitative data from the study showed pharmacists thought this question too sensitive but would discuss if written on a prescription for antibiotics. Only 23 (46%) pharmacists always check for allergies, 32 (64%) explained the dose, 31 (62%) explained about completing the course, 26 (52%) explained about the avoidance of sharing antibiotics and there is support from 37 (74%) for point of care testing, 45 (90%) for expansion of a vaccination programme and 38 (76%) for more emphasis on hand washing.
Discussion and/or Conclusion(s): Potential practice improvements by community pharmacists include the indication on an antibiotic prescription, a checklist including allergies of patients, counselling (avoiding sharing), general hygiene and patient self-help guides. The study also suggests diagnostic services are something community pharmacists would develop which may show further implementation of the 5-year antimicrobial strategy.

ID: 4685
Patient's views of community pharmacists delivering the 5-year antimicrobial resistance strategy

Gill Hawksworth[1], Phil Howard[2], Jake Mills[1], Bahareh Yazdani[1], Sophie Devine[1], Emily Clifford[1]. *[1]University of Huddersfield, [2]Leeds Teaching Hospitals NHS Trust, Leeds*

Background: This study analyses patient's views on the effectiveness of community pharmacists delivering the 5-year antimicrobial resistance strategy.
Aim(s)/Objective(s): To determine views of specific members of the public about having the indication for their antibiotic on prescription. To establish patients' views on antimicrobial resistance, importance of adherence and use of left over antibiotics. To investigate patient views on trust in healthcare professionals giving advice on antibiotics and views on NHS 'treating your infection' leaflets.
Method(s): This study received ethical approval. Consent from 10 pharmacies allowed data to be collected from patients obtaining a prescription for antibiotics in January 2016. Patients received a questionnaire, a participant information leaflet and NHS 'treating your infection' leaflet.
Results: Of the 121 questionnaires, 83 patients (69%) saw community pharmacists before their GP for cold/flu, 90 (74%) stopped antibiotics before completing the course, 20/90 (30%) felt better, 16/90 (7%) had side effects, 48 (40%) flushed leftovers down the toilet.
One hundred (83%) patients supported their indication on their prescription but for eg. HIV, chlamydia, 18 (18%) changed their mind with 91 (75%) saying they knew about antimicrobial resistance via the media, however 81 patients (67%) didn't trust this source. The NHS self-help guide was favoured by 92 (76%) and 104 (86%) supported community pharmacy access to their record.
Discussion and/or Conclusion(s): A check list of community pharmacy antibiotic counselling points would improve adherence to the 5-year antimicrobial strategy, ensuring relevant information is from trusted sources. The indication on antibiotic prescriptions at the patient's discretion, would help to improve antibiotic monitoring and counselling.

ID: 4698
First birthday; Review of the Queen Elizabeth University Hospital, Glasgow's Infection Consult Service

Fiona Robb[1], Lee Stewart[1], Alisdair MacConnachie[1], Erica Peters[1], Beth White[1], John Yates[1], Ray Fox[1], Thomas Evans[1], Andrew Seaton[1]. *[1]NHS Greater Glasgow & Clyde*

Background: In June 2015 following secondary care reorganisation in NHS Greater Glasgow and Clyde (NHSGGC), the infection consult service previously provided on four separate hospital sites amalgamated and moved to the new 1400 bed Queen Elizabeth University Hospital.
Aim(s)/Objective(s): These consults offer ward-based infection education, promote prudent antimicrobial prescribing and support clinical colleagues optimise infection investigation and management. They support the wider antimicrobial stewardship agenda in NHSGGC, which combines persuasive and restrictive strategies to promote safe, effective and prudent antimicrobial use.
Method(s): The service comprises ward rounds undertaken jointly by an infectious diseases consultant and an antimicrobial pharmacist, supported by enhanced communication with laboratory-based clinical microbiology. Referrals are received pre-consult (by telephone/page/email) or ad-hoc directly from clinical teams during the rounds.
Referrals include patients;
- prescribed (e.g. meropenem, piperacillin-tazobactam, co-amoxiclav)
- prescribed potential high risk agents (e.g. aminoglycosides, linezolid)
- where diagnostic uncertainty exists
- identified through microbiology e.g. Bacteraemia or *Clostridium difficile* infection.

Results: Data were collected from 150 consult ward rounds over 12 months, 1155 patient reviews were recorded; 707 new referrals/448 return visits. Interventions included;
- Clinical review and advice on investigation with no therapy change; 501 (43.4%)
- IVOST to oral therapy; 170 (14.7%)
- rationalised therapy +/– IVOST; 162 (14.0%)
- de-escalate therapy; 106 (9.2%)
- escalate therapy; 103 (8.9%)
- stop therapy; 83 (7.2%)
- transfer OPAT/ID ward; 30 (2.6%)

Discussion and/or Conclusion(s): Following the health board's reorganisation, the infection consults remain an important service in the new hospital and continue to support NHSGGC's antimicrobial stewardship agenda.

ID: 4700
Does 16S PCR really contribute to antimicrobial stewardship?

Sinead O'Donnell, Karen Burns, Fidelma Fitzpatrick, Lillian Rajan, Mairead Skally, Edmond Smyth, Hilary Humphreys. *Beaumont Hospital, Dublin 9, Ireland*

Background: 16S rRNA PCR (16S PCR) is utilised in clinical microbiology to identify organisms from culture negative clinical specimens, with the potential to optimise empiric antimicrobial management. Selected critical specimens were referred to a UK laboratory for 16S PCR on a case-by-case basis and after review of local culture results.
Method(s): We investigated if 16s PCR influenced antimicrobial management over a one year period (2015), by conducting a retrospective review of specimens sent for 16S PCR. Specimen type, result turnaround time (TAT) and the clinical impact of a positive result were evaluated.
Results: Seventy-eight specimens were sent from 60 patients, with an average TAT of five days (range 1–11). A large proportion (35, 45%) were from neurosurgical patients and included; CSF (17), bone flap (5) and intracranial material (13).
Overall, positive results were received on 33 specimens (42%) from 28 patients (46%). Of those, treatment information was available for 24 (86%), with de-escalation to a narrower spectrum agent upon receipt of positive 16S PCR possible for five (20%).
Of 32 patients, from whom 45 specimens were sent, with DNA not detected, treatment information was available in 21 (66%), with two patients having antimicrobials discontinued upon receipt of the negative result.
Discussion and/or Conclusion(s): 16S rRNA PCR has a role in antimicrobial stewardship for complex infection requiring lengthy treatment courses, whereby providing evidence of presence of microbial DNA may support de-escalation decisions or absence of microbial DNA may support decisions to discontinue empiric treatment in selected patients.

ID: 4701
Younger generation views – community pharmacists delivering the 5-year antimicrobial resistance strategy

Gill Hawksworth[1], Phil Howard[2], Jake Mills[1], Bahareh Yazdani[1], Sophie Devine[1], Emily Clifford[1]. *[1]University of Huddersfield, [2]Leeds Teaching Hospitals NHS Trust, Leeds*

Background: This study determined University students' current understanding of antimicrobial resistance and issues related to the work of community pharmacists implementing the NHS England 5-year antimicrobial resistance strategy.
Aim(s)/Objective(s): To determine students views on having the reason for their infection on a prescription, the importance of handwashing, their knowledge on antimicrobial resistance, importance of adherence, use of left over medicines and to what extent they trust health care professionals when advising on antibiotic use.
Method(s): This study received ethical approval. Questionnaires were handed out to University of Huddersfield students at a stand promoting awareness of antimicrobial resistance on Antibiotic awareness day November 2015.
Results: From 90 questionnaires, 54.4% (n = 49) students missed and/or stopped before the antibiotic course ended, 72.2% (n = 65) correctly identified antibiotics solely effective against bacterial infections and a chi-squared test determined healthcare/applied science students were more likely to correctly identify this showing a statistically significant result ($p = 0.038$) with a small effect (Phi = 0.219). For cold/flu symptoms only 66.7% (n = 67) students saw a pharmacist before GP however 61.1% (n = 55) support the cause of infection on their prescription with 21 of these feeling uncomfortable for personal conditions such as chlamydia, HIV and thrush. Handwashing was important for 70.9% (n = 61) who used good hand washing technique.
Discussion and/or Conclusion(s): Students' knowledge on antimicrobial resistance needs improving, many students were not taking their antibiotics correctly. Community pharmacists could increasing compliance of antibiotic use with further counselling, signposting to informative websites, and provision of leaflets on hand washing technique. However many students are unwilling to see a pharmacist before a GP.

ID: 4707
Impact of pharmacy-led stewardship rounds at a London Teaching Hospital

Laura Whitney, Ghadeer Muqbill, Matthew Laundy. *St George's University Hospitals NHS Foundation Trust*

Background: In 2013–14 we were required to reduce hospital-acquired Clostridium difficile infection (CDI) by 27%. The year began with 12 cases in 6 weeks; significantly above trajectory. Root cause analyses (RCAs) were completed alongside review of ward-based antibiotic prescribing. These identified scope to optimise prescribing, particularly treatment review.
Aim(s)/Objective(s): Intervention was required to reduce HA-CDI through improved stewardship by:
- Raising stewardship on the pharmacy agenda
- Providing additional junior pharmacist supervision and external scrutiny of prescribing
- Increasing documented antimicrobial reviews
- Improving documentation relating to stewardship by pharmacists

Method(s): In May 2013 education on stewardship and the recent RCAs was provided to pharmacists. Senior pharmacists were tasked to perform monthly ward stewardship visits, supported by further education and referral of complex cases to the stewardship MDT. Activity is reviewed, collated and discussed at pharmacy directorate meetings.
This approach is supported by a comprehensive stewardship strategy within the Trust.
Results: This intervention significantly increased the number of stewardship encounters (149 patients reviewed monthly by pharmacy and 123 by the MDT). Pharmacist-led rounds had a lower intervention rate (31%vs46%) and made different intervention types, most commonly improving prescription documentation, and dose adjustment, with similar rates of IV to PO switch (6%vs8%).
CDI rates were significantly reduced (by 53% in 2013/14) and have remained under trajectory.
Documented clinical review has increased from 77% to 90%.
Discussion and/or Conclusion(s): The rounds have positively contributed to stewardship within the Trust. Work in 2016/17 will focus on understanding clinical variation in these stewardship rounds both in the number of patients reviewed and the intervention rates.

ID: 4725
Does electronic prescribing facilitate antimicrobial stewardship

Laura Whitney, Matthew Laundy. *St George's University Hospitals NHS Foundation Trust*

Background: The slow implementation of electronic prescribing and medicines administration (EPMA) has been identified as a barrier to stewardship in the UK.
Aim(s)/Objective(s): To identify how electronic prescribing has facilitated stewardship at a large London teaching hospital.
Method(s): EPMA was introduced sequentially in our Trust; first in paediatrics, then cardiology and neurosciences using the Cerner system (Kansas, US). A delay in further role out has lead to EPMA being used alongside paper medical records for 2 years, which offers us a unique opportunity to analyse the effects of implementation on stewardship metrics and activities.

Results: Here we will report the effect of the implementation of EPMA on adherence to the UK antimicrobial stewardship guidelines (start smart, then focus) and compliance with Trust guidelines and policies. We describe the effects on the MDT stewardship rounds, use of "protected antimicrobials", and the audit and feedback programme within the Trust.
We also discuss the stewardship enablers built into the system and identify future work required to further improve the utility of the system.
Discussion and/or Conclusion(s): Implementation of EPMA has had significant affects on stewardship activities within the hospital. Further work is required to optimise its use.

ID: 4729
Investigation of the utility of the ICNET NG Clinical Surveillance Software to record interventions made during hospital Antimicrobial Stewardship Wardrounds

Anne Duguid, Edward James. *NHS Borders*

Background: The benefits of multidisciplinary wardrounds in promoting good antimicrobial stewardship have been previously described. Antimicrobial Stewardship (AMS) Wardrounds require access to current data on the patients under their review and should have a secure system of recording their activity for future reporting. In this regard the usefulness of the ICNET NG system in surveillance by hospital Infection Control and Prevention Teams has been well established.
Aim(s)/Objective(s): This study investigated the potential to extend the use of the system to hospital AMS wardrounds.
Method(s): Data on patients referred to the AMS wardround at a general hospital were recorded using the ICNET NG "live staging" system. The reasons for referral were classified into one of three categories (alert antimicrobials, aminoglycoside courses >3 d, clinical pharmacist request). Outcomes after AMS wardround were classified into one of five categories (continue, change, stop, IV to oral switch, referral for outpatient antibiotic therapy (OPAT). The system was qualitatively compared to the previous paper-based method by users
Results: Data on patients referred to the AMS wards round over a period of 6 months was reviewed. Users' experience of using the ICNET software suggested benefits of the electronic system in terms of accessibility to relevant patient data and ease of activity reporting
Discussion and/or Conclusion(s): The ICNET NG Clinical Surveillance software can be used as a patient monitoring and recording tool for AMS wardrounds.

ID: 4744
Evaluating the prescribing of carbapenems and piperacillin/tazobactam in acute hospitals in NHS Scotland

Jacqueline Sneddon[1], Alison Cockburn[2], Abdulrhman Mohana[3], Siân Robson[1], Alex Mullen[3], Marion Bennie[3], William Malcolm[4], R. Andrew Seaton[5]. *[1]Healthcare Improvement Scotland, [2]NHS Lothian, [3]University of Strathclyde, [4]NHS National Services Scotland, [5]NHS Greater Glasgow and Clyde*

Background: Guidance from the Scottish Antimicrobial Prescribing Group on use of carbapenems and piperacillin/tazobactam (piptaz) was implemented through incorporation into local guidance in 2014.
Aim(s)/Objective(s): Our aim was to establish the extent to which this local guidance was being translated into clinical practice.
Method(s): A bespoke point prevalence study (PPS) was performed in acute hospitals during October 2015 using a validated web-based tool to determine whether prescribing complied with local guidance. Anonymised data from all patients prescribed these antibiotics was collected, input to the PPS website and local reports generated. Data for all boards were then aggregated to create national reports.
Results: The PPS was completed by 13 of the 15 health boards and 478 prescriptions were analysed. Results showed that compliance with prescribing policies for use of meropenem, the most frequently used carbapenem, was high but compliance varied considerably for piptaz. Documentation of indication for use was recorded in 90% of meropenem prescriptions but was less well documented for piptaz use. Documentation of a review or stop date for both meropenem and piptaz varied greatly (0–100%) but was generally low. Board-level data have allowed identification of boards with high compliance with these measures, and sharing of good practice.
Discussion and/or Conclusion(s): This study demonstrates variation in practice across Scotland and is the second stage of an improvement programme to optimise the use of meropenem and piptaz. Further qualitative work is ongoing to evaluate clinician behaviour in use of these antibiotics to inform a national improvement plan.

ID: 4745
Development of pharmaceutical care as part of antimicrobial stewardship intravenous to oral switch (IVOS) ward-rounds

Alison Cockburn, Esperanza Palenzuela, Jenny Carson. *NHS Lothian*

Background: IVOS ward-rounds were implemented in NHS Lothian acute hospitals in 2014 as a means of improving antimicrobial stewardship. The contribution of the Antimicrobial Pharmacists' on these ward-rounds to achievement of improved antimicrobial prescribing has not been formally assessed before.
Aim(s)/Objective(s): The aim of this study was to assess the effectiveness of the Antimicrobial Pharmacists' contribution to achievement of improvements in antimicrobial stewardship as part of the IVOS ward-rounds programme in NHS Lothian.
Method(s): All pharmaceutical care interventions were recorded by the Antimicrobial Pharmacists on eight IVOS rounds. The interventions were reviewed by NHS Lothian's Antimicrobial Team (AMT) and risk assessed for possible adverse outcomes for patients. The results were feedback to the medical staff as part of an antimicrobial stewardship education programme to help improve safe antimicrobial prescribing.
Results: A total of 240 patients were reviewed during the eight IVOS rounds. 46 additional interventions and 29 referrals to medical staff were made by the pharmacist. The majority of the pharmaceutical care interventions were assessed as being moderate to high risk for possible adverse patient outcomes.
These interventions were used to inform an antimicrobial stewardship education programme which was delivered to the 4 wards where the IVOS study was undertaken.
Discussion and/or Conclusion(s): Documentation and assessment of pharmaceutical care interventions on IVOS ward-rounds is a novel approach to improvement of antimicrobial stewardship by medical staff. Review of the Antimicrobial Pharmacists' interventions and subsequent development of an education programme for junior medical staff on antimicrobial stewardship has facilitated achievement of improved antimicrobial prescribing.

ID: 4750
Antimicrobial Stewardship: assessing the knowledge, attitudes and perceptions of future prescribers

Mohammed Al-Talib[1], Eben Jones[1], Martin Llewelyn[2]. *[1]Brighton and Sussex University Hospitals Trust, [2]Brighton and Sussex Medical School*

Background: Antimicrobial resistance is recognised as a major threat to global health, with inappropriate prescribing identified as a key factor in promoting resistance. With the threat of a 'post-antibiotic era' looming, it is the next generation of doctors who will be at the forefront of the battle against antimicrobial resistance.
Aim(s)/Objective(s): We sought to explore the knowledge, attitudes and perceptions among fourth year medical students at Brighton and Sussex Medical School (UK) regarding antimicrobial stewardship.
Method(s): We distributed a knowledge, attitudes and perceptions survey to fourth year medical students completing their formal Infectious Diseases module. The surveys were completed during teaching session and then formed the basis for discussion.
Results: There were a total of 91 respondents over five separate sessions from April 2015 – March 2016. Just 36% of students were familiar with the term 'antimicrobial stewardship'. Students

strongly agreed that antibiotics are overused in the UK and that resistance is a problem in the UK, but were neutral with regards to resistance being a problem in their hospital. Only 9% felt confident in prescribing antibiotics. Specific areas of weakness included de-escalation of antibiotics, dosing, and transitioning from IV to oral antibiotics, as well as appropriate prescribing in the context of known resistance.

Discussion and/or Conclusion(s): Our findings suggest that students perceive resistance as a national/international problem rather than a local problem, and that future prescribers lack knowledge and understanding of antimicrobial stewardship required to counter the spread of resistance. Further studies are required to clarify the generalisabilty of these findings and guide future medical school curricula.

ID: 4754

An audit to assess the influence of procalcitonin on patient management after providing 24/7 cover of procalcitonin testing

Chandanie Mendis Ramasundara, Kordo Saeed, Bruce Wake. *Hampshire Hospitals NHS Foundation Trust*

Background: Bacterial sepsis is a major course of morbidity and mortality. Procalcitonin (PCT) ia a useful guide for the clinicians to take correct decisions on antibiotic prescribing to improve patient outcome by reducing emergence of resistence and health care costs.

Aim(s)/Objective(s): To assess the indications and how early provision of PCT results influence patients' management and outcome.

Method(s): Details of 130 PCT episodes were collected from 104 patients admitted to Basingstoke and North Hampshire Hospital (BNHH). Patients were followed prospectively for 7 days to assess the outcome.

Results: The majority of patients were between 40–90 years (95%). 62% of them were males.

The main indications for PCT were to support the diagnosis or exclusion of bacterial infection [n-60, (46%)] and to assess the response to treatment [n-33, (25%)]. Only 8% of PCT were done for earlier stopping of antibiotics when a course already started.

In 37% of episodes, the clinicians were continued the same antibiotics. In 27% of episodes antibiotics were withheld and in 9% were stopped. De-escalated only in 3 episodes.

Two patients who have not started antibiotics died and 7 were not improved. Patients died, not at the result of infection. All de-escalated patients were improved. 75% of PCT episodes had an impact on patients' management according to the BNHH Micro guide PCT results interpretation criteria.

Discussion and/or Conclusion(s): Higher percentage of PCT episodes had an impact on patients' management. Majority of patients were improved within 7 days. The early and regular provision of PCT results help clinicians to take appropriate decisions regarding antibiotic prescribing.

ID: 4766

Audit of antimicrobial prophylaxis in adult patients undergoing neurosurgical and spinal surgeries at Newcastle Upon Tyne Hospitals NHS Foundation Trust

Harish Reddy[1], Manjusha Narayanan[2]. *[1]Freeman Hospital, Newcastle Upon Tyne Hospitals NHS Foundation Trust, [2]Newcastle Upon Tyne Hospitals NHS Foundation Trust*

Background:

- Wound infection of incised skin or soft tissue during operations is common, but incidence can be reduced by the use of antibiotics for surgical prophylaxis. But if used inappropriately, it can be detrimental
- Carrying out an audit in this area will provide an indication of the quality of antibiotic prescribing in practice and would highlight areas for potential improvement
- This was a new audit following introduction of protocol for neurosurgical and spinal surgeries

Aim(s)/Objective(s):

- To study quality of adherence to hospital protocol for antimicrobial prophylaxis and explore reasons for non-adherence
- Promote good record keeping and awareness of good prescribing practice
- Objective evaluation of antimicrobial prescribing quality, suitable for on-going prescriber feedback

Method(s):

- The standard compared in this audit was Newcastle Upon Tyne neurosurgical and spinal surgery prophylaxis protocol, which have been developed based on current best evidence
- Audit was conducted over 2-week period and data was obtained from theatre list
- Audit data was obtained from case note review, e-records and Pathology software system

Results:

- Choice of antimicrobial prophylaxis was as per the guidelines in only 60%
- Only 7% of patients received antibiotics at the right time
- Small proportion (5%) of patients received inappropriate additional doses of antibiotics

Discussion and/or Conclusion(s):

- Inappropriate administration of antibiotics increases prevalence of antibiotic-resistant bacteria, and predisposes patient to infection with organisms like *C. difficile*. It is hoped that findings of this audit will emphasize importance of adherence to trust antimicrobial prophylaxis protocol
- Feedback and further audits might encourage surgeons to undertake their own data collection on a rolling programme basis, which helps evaluate improvement in prophylactic antibiotics prescription
- Emphasise the importance of adherence to timing of antibiotic instillation.

ID: 4771

Evaluation of the role of the Antimicrobial Management Team Nurse in achieving improvements in antimicrobial stewardship

Alison Cockburn. *NHS Lothian*

Background: Within the Antimicrobial Management Team (AMT) in NHS Lothian a nurse was appointed to perform clinical auditing of antimicrobial use and education of nurses and prescribers. New antimicrobial prescribing guidelines were implemented within the Board in April 2015 to reduce broad spectrum antibiotic usage and reduce Clostridium difficile infection (CDI). During the routine audit cycle, issues with inaccuracies with gentamicin prescribing procedures was identified and an audit undertaken by the AMT Nurses to investigate this situation.

Aim(s)/Objective(s): The aim of this study was to evaluate the role of the AMT Nurse in achieving improved antimicrobial stewardship related to gentamicin administration and prescribing.

Method(s): Antibiotic prescribing on 18 medical and surgical wards was audited to assess adherence to the antibiotic prescribing guidelines and procedures for gentamicin prescribing. Education was subsequently provided for nursing staff on gentamicin administration and prescribing. Additionally, a gentamicin dosing wheel was created and implemented to assist nurses in calculating blood sample timings. A staff survey and further audit was then performed.

Results: The audit showed that 90% of prescriptions contained errors involving documentation, sampling or administration of gentamicin. Following implementation of the education programme the error rate dropped to 13%. Improvements in nurses' level of knowledge regarding gentamicin prescribing and administration were also achieved.

Discussion and/or Conclusion(s): This study showed that the AMT nurse has an effective role within the AMT assisting the implementation of policies and guidelines, monitoring practices, enabling knowledge sharing and providing education on antimicrobial stewardship.

ID: 4772

NHS Greater Glasgow and Clyde (GG&C): antibiotic point prevalence studies 2009 to 2015

Ysobel Gourlay[1], Michael Da Silva Neto[2], Karen Downie[2], Janice Maguire[2], Fiona Robb[2], Rachael Rodger[2], Lee Stewart[2], Brian Jones[3], Andrew Seaton[4]. *[1]Greater Glasgow & Clyde, [2]Pharmacy GG&C, [3]Microbiology GG&C, [4]Infectious Diseases GG&C*

Background: NHS GG&C provides healthcare to 1.2 million people with acute care delivered through 6 (previously 9) adult hospitals. Following the 2008 introduction of a cephalosporin, co-amoxiclav, quinolone and clindamycin restrictive antimicrobial guideline the antimicrobial management team (AMT) have conducted annual antibiotic point prevalence surveys (PPS) in each acute hospital.
Aim(s)/Objective(s): To annually monitor antibiotic use in all acute adult hospitals in GG&C.
Method(s): >3000 patients including >900 antibiotic-treated patients have been surveyed annually across medical and surgical units (excluding adults in critical care and children).
Results: The proportion on antibiotics has increased from 27.7% (2009) to 35.9% (2015) with an increasing proportion receiving IV therapy (from 36.1% to 42.7%) whilst median IV antibiotic duration has remained 3 days. Recording of antibiotic indication and appropriateness of agent have improved from 81.7% to 90.3% and 86.9% to 90.4% respectively. Improvements in dosing and frequency of gentamicin and vancomycin have also been observed and have followed quality improvement initiatives.
Discussion and/or Conclusion(s): The annual PPS has provided useful qualitative, longitudinal prescribing data which has complemented routinely collected usage data. The data has enabled the AMT to highlight clinical areas and clinical scenarios where antibiotic use may be sub-optimal and has informed healthcare worker education and allowed the AMT to appropriately target prescribing interventions.

ID: 4777

Dose banding gentamicin by patient height improves initial dose accuracy

Neil Powell. *Royal Cornwall Hospital Trust*

Background: A review of gentamicin found suboptimal initial dosing. An evaluation of dose banding by height was conducted to determine whether it improved accuracy.
Aim(s)/Objective(s): To determine whether dose banding gentamicin by patient height, coupled eGFR improves dosing accuracy.
Method(s): 95 consecutive patients were included; actual body weight, height, eGFR and gentamicin dose at initiation. Actual doses administered were compared to calculated doses using ideal body weight and eGFR.
A table dosing gentamicin by patient height and eGFR was developed. Gentamicin dose banding was then introduced with protocols set up on the electronic prescribing system. Fifty gentamicin prescriptions were reviewed two months later.
Results: 31 of 95 (33%) administered gentamicin doses were within 10% of the calculated dose. Of the remaining 64 doses, 35 were more than 10% above (range up to 80% above calculated dose) and 29 doses were 10% or more below the calculated dose (range up to 50% below the calculated dose).
Dose banding by height and eGFR was introduced. A review of 50 patients revealed 33 had gentamicin prescribed according to the dose banding chart, of these 23/33 (70%) were within 10% of the calculated dose. 8/33 were above this (by up to 30%) and one patient 40% below the calculated dose. Of the 17 initial doses not prescribed according to the dose banding chart 5/17 (30%) received a correct dose were within range, 12 doses were between +70% and −50% of target dose.
Discussion and/or Conclusion(s): Dose banding gentamicin by patient height resulted in more patients receiving the correct initial gentamicin dose.

ID: 4823

Measuring potential unintended consequences of interventions to reduce primary care antibiotic use: an exemplar of NHS Scotland Infection Intelligence Platform

William Malcolm[1], Guy Mcgivern[2], Charis Marwick[3], Kim Kavanagh[4], Jacqui Sneddon[5], Nicholas Reid[6], Alison Macdonald[7], Jean Sneddon[8], Marion Bennie[8]. *[1]NHS National Services Scotland: Health Protection Scotland, [2]Information Services Division, NHS National Services Scotland, [3]Population Health Sciences Division, School of Medicine, University of Dundee, [4]Department of Mathematics and Statistics, University of Strathclyde, [5]Scottish Antimicrobial Prescribing Group, Scottish Medicines Consortium, Glasgow, [6]Pharmacy Department, NHS Ayrshire & Arran, [7]Area Antimicrobial Pharmacist, NHS Highland, [8]Information Services Division, NHS National Services Scotland*

Background: Reducing unnecessary antibiotic use is a priority for theScottish Antimicrobial Prescribing Group (SAPG). Clinicians are concerned that initiatives to reduce antibiotic use could result in some patients with serious infections not being treated.
Aim(s)/Objective(s): Using individual level linked data to assess whether reductions in total antibiotic use in primary care have been associated with specific unintended harm.
Method(s): Patients admitted to hospital with peritonsillar abscess, mastoiditis or community acquired pneumonia (potential markers for under-treatment in community) were identified from national hospital activity data. Using the NHS Scotland Infection Intelligence Platform cases were linked to patient-level community prescribing data to measure antibiotic exposure in the 30 days prior to admission.
Results: Between April 2010 and March 2014 there were 73,981 patients admitted with indicator infections.
In patients admitted with indicator conditions there was a 1.9% increase in the proportion that received antibiotics in the 30 days prior to admission over the study period, despite a 0.8% decrease in the proportion of the whole population who received antibiotics in primary care.
Discussion and/or Conclusion(s): There is no evidence SAPG interventions to reduce unnecessary antibiotic use have resulted in patients with serious infections respiratory tract infections not receiving antibiotics. This study found increased antibiotic use in patients with indicator infections.
This should provide reassurance to clinicians and support further improvements in prescribing in primary care. Regular repetition can be conducted to monitor the impact of changes in prescribing to reassure clinicians and allow early identification of any emerging unintended harm.

ID: 4824

Investigating orthopaedic surgical prophylaxis changes and post-op acute kidney injury in NHS Grampian – using NHS Scotland Infection Intelligence Platform

Eilidh Fletcher[1], William Malcolm[2], Charis Marwick[3], Jacqui Sneddon[4], Gwen Bayne[1], Andrea Patton[4], Jean Sneddon[1], Marion Bennie[1]. *[1]Information Services Division, NHS National Services Scotland, [2]Health Protection Scotland, NHS National Services Scotland, [3]Population Health Sciences, School of Medicine, University of Dundee, [4]Scottish Antimicrobial Prescribing Group, Scottish Medicines Consortium, Glasgow*

Background: To support reduction of *Clostridium difficile* infection (CDI) the Scottish Antimicrobial Prescribing Group recommended that NHS boards in Scotland restrict antibiotics associated with a high risk of CDI. In June 2010 NHS Grampian changed its policy for antibiotic prophylaxis in orthopaedic surgery to include flucloxacillin and gentamicin. Recent studies found increased post-operative acute kidney injury (AKI) following similar changes.
Aim(s)/Objective(s): Using individual level linked data to examine rates of post-operative AKI before and after policy change in NHS Grampian.

Method(s): Patients who underwent an orthopaedic surgical procedure, with prophylaxis recommended, from 01/06/2008 to 31/05/2012 were selected. Cases were linked to local creatinine data and to national patient level hospital activity, community prescribing and Scottish Renal Registry data. Segmented regression analyses of interrupted time series were used to evaluate changes in level and trend of AKI rates associated with the intervention and estimate effect sizes.
Results: There was a significant increase in AKI rate trend following policy change ($\beta = 0.28$; 95%CI, 0.03 to 0.53; $p = 0.028$) in trauma patients, equating to an increase of 0.28 cases of AKI/100 procedures/month and a relative intervention effect at 24 months of 150% (95% CI 25% to 250%). There was no significant change in AKI rate among elective patients.
Discussion and/or Conclusion(s): We found that a change in orthopaedic antibiotic prophylaxis policy in NHS Grampian was associated with an increase in post-operative AKI. This is consistent with observations in other boards and supports the new recommendation away from this policy made by SAPG in 2012.

ID: 4832
Use of iVents as a metric of Antimicrobial Stewardship (AMS) at Cambridge University Hospitals (CUH) Trust

Harriet Cook, Christianne Micallef, David Enoch, Reem Santos, Sani Aliyu. *Cambridge University Hospitals Trust*

Background: CUH introduced Epic EMR system in October 2014. A key feature of Epic is the intervention reporting module ('iVent') which allows pharmacists to communicate any interventions and recommendations they have made. We investigated the use of iVents specifically to document AMS interventions.
Aim(s)/Objective(s):
1. To investigate the types of AMS interventions and classify types and clinical impact of intervention
2. To assess whether there are differences in AMS interventions made between clinical areas and pharmacist grades.

Method(s): A report was generated collating all AMS iVents recorded by pharmacists over a one year period. A peer-review group comprising antimicrobial pharmacists and consultant microbiologists was consulted to decide on suitable categories for data analysis. iVents were then sorted according to these categories and assigned values for their potential clinical impact. This group also reviewed a random sample of 50 interventions to assess agreement for categories and severity and whether the intervention made was clinically appropriate.
Categories of intervention included administration advice, dose optimisation, course length optimisation, patient counselling, therapeutic drug monitoring (TDM), choice of agent advice, vaccination referrals, IV to Oral Switch, Supply Issues and stopping unnecessary prescriptions.
Results: Preliminary data from a one-month period (April 2016) demonstrated that:
1. 503 interventions were made
2. the most common AMS intervention is for antimicrobials requiring TDM and the least common patient counselling and IV to oral switching
3. most interventions are made on intensive care wards and the fewest on neurology wards
4. number of interventions made increases with grade of pharmacist
5. most interventions have 'medium' clinical impact

ID: 4840
Personalised feedback of antibiotic prescribing data to primary care teams

Jacqueline Sneddon[1], William Malcolm[2], Marion Bennie[2], Helen Storkey[3], Terry McLaughlin[2], James Smith[2], Charis Marwick[4], Bruce Guthrie[5], Sean Macbride-Stewart[6], Dilip Nathwani[4]. *[1]Healthcare Improvement Scotland, [2]NHS National Services Scotland, [3]NHS national Services Scotland, [4]NHS Tayside, [5]University of Dundee, [6]NHS Greater Glasgow and Clyde*

Background: In Scotland feedback of prescribing data has proved successful with GPs for high risk medicines and dental practitioners for antimicrobial. A similar approach was designed to complement other interventions to reduce unnecessary antibiotic use by GPs.
Aim(s)/Objective(s): This study aimed to establish a programme to provide GP practices with quarterly reports on their own antibiotic prescribing data along with benchmarking information.
Method(s): A study steering group was established and funding secured for creation of data reports. The pilot phase involved 50% of practices in four health board areas, randomly selected using a stratified sampling frame, receiving the report. Details of these practices were obtained and automated email messaging set up.
Results: Practices will receive quarterly reports containing their rates of antibiotic prescribing compared to local and national benchmarks along with suggested actions and details of support resources. The first report focussed on total antibiotic use and included key messages about improving use of antibiotics for respiratory tract infections. Reports were emailed directly to GP Practices along with a letter from the Chief Medical Officer. The next three reports will focus on urinary tract infection, risk of Clostridium difficile infection and skin and soft tissue infections. Following a time series analysis of changes in prescribing rate in the intervention practices compared to control practices we plan to implement the intervention across all GP practices in Scotland.
Discussion and/or Conclusion(s): This automated feedback intervention is an attractive addition to our stewardship programme as it is supported by good evidence and can be implemented nationally at relatively low cost.

ID: 4846
The nursing influence: Antimicrobial stewardship in Community Hospitals

Jo McEwen[1], Charis Marwick[2], Dilip Nathwani[1]. *[1]NHS Tayside, [2]Dundee University*

Background: Multidisciplinary antimicrobial stewardship programmes are essential in optimising antimicrobial use and minimising associated collateral damage. Many antimicrobial stewardship initiatives have primarily targeted doctors and pharmacists, however the potential contribution that nurses could make in this area has not yet been fully explored.
Aim(s)/Objective(s): The primary aim of this initiative was to enhance nursing knowledge around antimicrobial stewardship by focusing on the key areas of nursing influence. A secondary focus was to encourage appropriate urine sampling in the older adult population and those with indwelling urinary catheters through the promotion of the Scottish Antimicrobial Prescribing Group UTI management resources.
Method(s): Educational programmes were delivered to all community hospital nursing teams in NHS Tayside over a 12 month period. Questionnaires were issued pre and post intervention to assess the impact of the intervention.
Results: Comparisons between the pre-intervention and post-intervention questionnaire demonstrate an improvement in nursing knowledge in relation to antimicrobial stewardship and infection management. This was statistically significant in six of the fourteen questions ($p = \leq 0.01$).
There was a statistically significant reduction in urine samples submitted for culture after the intervention, from mean 20.9 to 14.9 per 1000 OBD per month (difference 6.0, t-test $p = 0.009$).
Discussion and/or Conclusion(s): Nurses are the constant in the delivery of patient care, therefore, as a profession they are ideally placed to enhance antimicrobial management within the multidisciplinary team. Through education and awareness nurses can significantly impact on infection outcomes and contribute to optimising antimicrobial treatment whilst delivering high quality, safe and patient focussed care.

ID: 4880

Influence of empirical antimicrobial guidelines on piperacillin & tazobactam consumption in Acute Trust in East of England (EoE) region

Tejal Vaghela[1], Netta Tyler[2], Rachel Leff[3], Claire Allen[4], Emma Cramp[5], Ting Yau[6], Currie Naomi[7], Shayi Shali[8], Dawn Whitbourn[9], David Ladenheim[10]. *[1]West Hertfordshire Hospitals NHS Trust Watford General Hospital, [2]Papworth Hospital NHS Foundation Trust, [3]Luton & Dunstable Hospital NHS Foundation Trust, [4]Colchester University Hospital NHS Foundation Trust, [5]Hinchingbrooke Health Care NHS Trust, [6]Mid Essex Hospitals Services NHS Trust, [7]Bedford Hospitals NHS Trust, [8]Princess Alexandra Hospitals NHS Trust, [9]Norfolk and Norwich University Hospitals NHS Foundation Trust, [10]East and North Hertfordshire NHS Trust*

Background: The recommendation of Piperacillin & Tazobactam (PTZ) as first line empirical therapy for clinical infections varies across acute Trusts in the EoE region.
Aim(s)/Objective(s): We studied the relation between PTZ consumption rate and the clinical indications with PTZ being recommended as first line empirical therapy.
Method(s): 10 acute Trusts provided PTZ consumption data (expressed as DDD/1000 admissions) for 2015/16. ESPAUR PPS Survey 2011 results showed that five clinical indications (Respiratory, Skin and Soft Tissue/Bone/Joint, Urinary Tract, Sepsis and Gastrointestinal indications) accounted for 90% of antimicrobial use. We reviewed first line empirical PTZ recommendations for these five indications for each of acute Trust in the region. PTZ consumption data and antimicrobial guidelines were compared and analysed.
Results: The results showed that Trusts with higher (6/6 Trust) and lower (3/4 Trust) than average PTZ consumption recommended PTZ as first line therapy for the majority of clinical indications (=>3/5 indications).
Discussion and/or Conclusion(s): Our results show that the empirical guidelines do not influence PTZ consumption data. Other factors such as duration of PTZ use, dosage used (Three times a day vs Four times a day) and guideline compliance may influence the consumption data. Further analysis which includes these factors would be useful to understand the different PTZ consumption data within the region.

ID: 4926

A Novel, NICE teamwork approach for the antimicrobial stewardship in a teaching hospital

Milind Khare, Deborah Gnanarajah, Wijitha Weerakoon, Julia Lacey. *Royal Derby Hospital*

Background: 'Start Smart – Then Focus' – Antimicrobial Stewardship Toolkit for English Hospitals was introduced in March 2015 by Public Health England. NICE guideline for Antimicrobial Stewardship came in August 2015.
Aim(s)/Objective(s): To review effectiveness of continuing weekly antibiotic audits by clinicians from April 2015 onwards.
Method(s): The audits are carried by medical staff auditing all patients on an antimicrobial on a particular day, either on a weekly or monthly basis depending on past performance. Audits are forwarded to the antimicrobial pharmacist who reviews them in conjunction with the consultant microbiologist.
Audit criteria are (1) Antibiotic choice is in line with Trust guidelines OR culture and sensitivity results OR there is a documented justified reason for deviation from the guidelines. (2) There is a stop or review date on the prescription. (3) Antibiotic treatment is reviewed 48–72 hours after starting and the prescribing decision documented added for 2016/17 antimicrobial CQUIN.4) Appropriate samples sent for cultures and sensitivity testing
Results: There was an increase in the overall number of audits completed in May 2016, with the highest number since October 2015. Results improved in May 2016, with the target for stops dates being achieved and appropriateness improving from 80% to 83%. Sending of samples for culture and sensitivity fell slightly to 78%, however, this was still a big improvement on previous results.
Discussion and/or Conclusion(s): Continuing weekly audits by clinicians and review of feedback and action plan is a time consuming mammoth task for the team and has led to establishment of good antimicrobial stewardship practice.

ID: 4936

Review of high dose broad spectrum antibiotic use in NHS Lothian primary care

Simon Hurding, Carol Philip, Maria McMenemy, Angela Timoney. *NHS Lothian*

Background: Reduction in the use of broad-spectrum antibiotics is an important priority for antimicrobial stewardship. NHS Lothian has been slower to reduce use and one factor may be recommendations for prolonged courses of broad-spectrum antibiotics by secondary care.
Aim(s)/Objective(s): This study looks at prescribing data to identify whether or not extended courses of broad-spectrum antibiotics are a significant contributory factor to overall use
Method(s): The Prescribing Information System for Scotland provided a six year time series analysis, comparing NHS Lothian with the other NHS Boards for overall antibiotic, and broad-spectum use. Prescribing Information System identified prescribing of prolonged courses of broad-spectrum antibiotics. Current Lothian Joint Formulary (LJF) clinical indications were reviewed and the expected resultant prevalence calculated. This was compared with current use. The amount of antibiotics prescribed for longer duration than LJF recommendations was analysed.
Results: NHS Lothian remains the lowest total user of antibiotics in primary care. There has been much slower reduction in broad-spectrum use, but it is now below the Scottish average. 10% of prescriptions were for longer than 14 days, the recommended longest duration in the LJF. The majority of these prescriptions were for 21 days, with only 0.8% of all co-amoxiclav prescriptions being for longer than 28 days.
Discussion and/or Conclusion(s): Analysis of PIS data confirms that there is some prescribing of prolonged courses of broad-spectrum antibiotics, but not at a significant level. Prescribing duration of co-amoxiclav is mostly in line with the LJF, and at an expected level for the clinical conditions indicated for treatment.

ID: 4958

Antimicrobial stewardship ward rounds – Are we making a difference?

Hala Kandil, Hala Kandil, Tejal Vaghela. *West Hertfordshire Hospitals NHS Trust*

Background: Antibiotic stewardship ward round is key to promote appropriate antibiotic use.
Aim(s)/Objective(s): The aim of this study is to evaluate the impact of the interventions made by antimicrobial stewardship team (AST) during their ward rounds on antimicrobial consumption and clinical outcome in a large district Hospital.
Method(s): Twice weekly antibiotic stewardship ward round (ASW) was introduced in April 2016. Information on patients on antibiotics was collected from pharmacy records. Outcome of AST interventions over two month period were analysed. Monthly antibiotic consumption per 1000 admissions was monitored. Compliance with NG Quality standard 121 Statement 4 was audited. Data on clinical outcome and readmission within 28 days were also collected.
Results: We reviewed 157 courses of antibiotic. The most commonly prescribed antibiotic during this period was tazocin (23.5%) followed by augmentin (21.6%). Approximately 88.5% of prescribed antibiotics were compliant with the trust antimicrobial guideline. AST stopped 54.7% of antibiotic courses, specified stop date for 19.7%, optimised dose in 2%, switched 5% to PO, de-escalated 7% & escalated 1.5%. More than one of the previous intervention was recommended for

5.7% of the courses. Out of 47 antibiotic courses audited, 42.5% met NG QS while it was not applicable in 40.5% of cases.
Total antibiotic and tazocin consumption were significantly reduced from a baseline of 4472 and 252 DDD/1000 admissions respectively prior to intervention to 4211 (7%) and 170 (23%) DDD/1000 admissions post intervention.
Discussion and/or Conclusion(s): Our ASW proved to be effective in optimisation antibiotic therapy and significantly reducing antibiotic consumption over short period without compromising patient care.

ID: 4969
Amikacin concentrations and target ranges for mycobacteria infections

Tamara Cairney[1], Alison Thomson[1], Lock Xu Bao[1], Fiona Robb[2].
[1]University of Strathclyde, [2]NHS Greater Glasgow and Clyde

Background: Guidelines for amikacin use in multi-drug resistant mycobacterial infection recommend 15 mg/kg once daily (OD) or 25 mg/kg thrice weekly (TW).
Aim(s)/Objective(s): To determine whether guideline doses achieve peaks of 35–45 (OD) or 65–80 mg/L (TW) and troughs <5 mg/L.
Method(s): The following data were extracted for patients with a mycobacterial infection and at least one amikacin dose and peak concentration: age; weight; height; creatinine concentration; amikacin doses, concentrations and times. A MAP Bayesian pharmacokinetic analysis provided individual estimates of amikacin volume of distribution (V) and clearance (CL), which were used to predict end of infusion (1 h) and trough amikacin concentrations using guideline dosage regimens.
Results: Data were available from 83 patients (49 male) of whom 51 received OD and 32 TW dosing. Ages ranged from 19–79 years, weights from 36–94 kg and estimated creatinine clearance from 28–158 mL/min. Doses ranged from 330 to 1750 (OD) and 800 to 2250 mg (TW). CL and V estimates ranged from 0.5–10.4 L/h and 8.6–44 L, respectively. Using these parameters, OD dosage regimens were predicted to achieve 14% of concentrations below, 34% within and 52% above the target peak and the TW regimen 28% below, 34% within and 39% above the target peak. Predicted pre-dose troughs were >5 mg/L for 6% of OD doses and 5% of TW doses (48 h post dose). High troughs were observed in patients with poor renal function.
Discussion and/or Conclusion(s): Amikacin guidelines for mycobacterial infections achieve high peak concentrations but patients with renal impairment require longer dosage intervals.

ID: 4974
The RAPID project: A clinical decision tool to support antibiotic stewardship in acute respiratory infections

Jasmin Islam[1], Marco Cotrufo[1], Wendy Munro[2], Catherine Sargent[3], Katherine Hurt[4], Juliet Wright[5], Sally Curtis[6], Martin Llewelyn[7].
[1]Brighton and Sussex University Hospitals Trust, [2]Department Acute Medicine, Brighton and Sussex University Hospitals Trust, [3]Department of Infection & Microbiology, Brighton and Sussex University Hospitals Trust, [4]Deaprtment of Respiratory Medicine, Brighton and Sussex University Hospitals Trust, [5]Brighton and Sussex Medical School, [6]Deaprtment Microbiology, Brighton and Sussex University Hospitals Trust, [7]Department of Infection & Microbiology

Background: Antimicrobial resistance is a major public health risk and excessive antibiotic use is recognised as a major driver of resistance. UK Antimicrobial Stewardship guidance 'Start Smart Then Focus' encourages clinicians to undertake active 'review & revision' of prescribed antibiotics 48 hours after initiation.
Aim(s)/Objective(s): We developed and piloted an intervention to support 'review and revise' prescribing decisions in acute respiratory infection (ARI), which remains the commonest indication for antibiotics.
Method(s): Options for a simple, evidence-based 'RAPID' (Reducing unnecessary antibiotic prescribing in dyspnoea) decision tool were developed, before being iteratively reviewed and refined by a multidisciplinary working group. Stop criteria incorporated clinical observations, biomarkers and radiology. Antibiotic prescribing was reviewed at baseline and on day 2 of admission for unselected patients over 45 days before and 35 days during the intervention. Clinical teams were responsible for applying defined stopping criteria.
Results: Across both time-points, 318 patients were prescribed ARI antibiotics. Criteria for stopping antibiotics at 48 hrs were defined as: a normal chest radiograph, day2 average NEWS score ≤4 and CRP ≤ 100. Antibiotics were prescribed unnecessarily in 35/144 patients (24.3%) in the pre-intervention phase. During the intervention phase, 38/174 prescriptions should have been stopped according to the RAPID criteria (21.8%) but only one fifth were actually stopped.
Discussion and/or Conclusion(s): Even with good stake-holder engagement use of a stand-alone clinical decision tool did not reduce antibiotic prescribing in the acute medical setting. Safely reducing unnecessary antibiotic prescribing is likely to require more resource intensive interventions such as dedicated stewardship ward-rounds.

ID: 4980
Retrospective evaluation to antimicrobial stewardship programs integrated with nosocomial infection control in patients with spontaneous bacterial peritonitis

Bin Gao[1], Shu Feng[2], Jing Qian[3], Wei Lu[4]. *[1]Tianjin 4th Center Hospial, [2]Nosocomial Infection Management Department, Zunyi 1st People's Hospital, Guizhou Province, [3]Nosocomial Infection Management Department, Tianjin Second People's Hospital, [4]Tianjin Second People's Hospital, China*

Background: Inappropriated prescribing was a matter of salient concern in China.
Method(s): To recruit all cirrhotic patients with primary or spontaneous bacterial peritonitis (SBP) according to ICD10 using administrative data in a tertiary hospital from January 2006 to December 2014. ASP integrated into nosocomial infection control (NIC) was implemented in the institute at the same time. Those with ascitic polymorphonuclear leukocytes (PMNs) count <250 cells/mm^3, or with clinical and laboratory data suggesting secondary peritonitis or other infections, or with antimicrobial use before 2 weeks before treatment of SBP, or with hepatocellular carcinoma, or with discharged <5 days after the treatment, without ascetic fluid test before antimicrobials use to SBP were excluded The clinical outcomes of them were evaluated.
Results:

1. There were 1,110 episodes of cirrhotic with SBP collected from administrative data during the investigation. The percentage of those patients whose PMNs count >250 cells/mm^3 in the ascitic fluid in the recruited SBP were increased from 27.4% in the first triennium (2006–2008) to 38.4% in the second (2009–2011) and 59.3% in the third (2012–2014).
2. There were 386 episodes of SBP identified.
    - The majority initial prescribed antibiotic was fluoroquinolone and the 3rd generation of cephalosporin in the first 2 triennium (90.3%, 77.8% respectively) and beta-lactam antibacterials/enzyme inhibitors in the last one (67.9%), P = 0.00.
    - Antimicrobial treatment longer than 10 days was decrease from 81.2%, to 52.7% and 33.6% respectively, P = 0.00.
    - 30-day mortality was slightly lower (1%, 9.9% and 9.2%, P = 0.86).

Discussion and/or Conclusion(s): Adoption to ASP and NIC combination model in China was slow, but promising.

ID: 4985
Diagnosis and management of urinary tract infections (UTI) in adults over 65 years of age in a large district hospital

Eleni Mavrogiorgou, Hala Kandil, Prema Singh, Tejal Vaghela. *West Hertfordshire NHS Trust*

Background: Obtaining microbiological samples from patients prescribed antibiotics and reviewing their treatment when result become

available is one of the Quality standards (QS) recommended in NICE antimicrobial stewardship guidelines.
Aim(s)/Objective(s): The aim of this study is to audit compliance with NICE QS statement 4 in relation to presumptive diagnosis of UTI and to find out whether microbiological samples were taken before starting antimicrobial therapy.
Method(s): This study was carried out in care of elderly wards in a large district hospital over a two week period. All patients prescribed antimicrobials for urinary tract infection were identified daily by the ward based pharmacist over the study period. Microbiological results were collected and interpreted by microbiologist. Clinical notes were reviewed and data was analysed.
Results: We identified 28 patients on antimicrobials for UTI. The median patient age was 85 years old (71–97). Our study showed that 57% had urine dip while 86% of the patients had a urine culture done. Seventy nine (79%) were on the appropriate antimicrobial treatment based on the current culture results. C-Reactive protein (CRP) was raised (>20 mg/L) in 82% of the patients.
Discussion and/or Conclusion(s): Our results showed that compliance with the trust antimicrobial guidelines and NQ standards was achieved in the majority of cases. Raising awareness of the staff to the importance of microbiological investigations is key to ensure appropriate antibiotic use.

ID: 4988
Monitoring antimicrobial prescribing, review of monthly point prevalence audits

Iain Hayden, Mehmet Pilot, Sultana Begum, Kirsten Khonyongwa, Surabhi Taori, Nergish Desai. *King's College Hospital NHS Foundation Trust*

Background: Monthly point-prevalence audits have been conducted at King College Hospital (KCH) since 2010 and at Princess Royal University Hospital (PRUH) from 2014. Trust-wide reports are produced and discussed at Infection Control Clinical Leads meetings. Results are fed back to individual teams at Divisional governance meetings and included on performance scorecards.
Aim(s)/Objective(s): To drive improvements in antimicrobial stewardship.
Method(s): Junior doctors at KCH and pharmacists at PRUH record compliance with KPIs once a month (targets in brackets):
1. Indication(s) recorded (90%)
2. Stop/Review date recorded (90%)
3. IV to oral switch not overdue (95%)
4. Prescribed according to guidelines (90%)

Spreadsheets are submitted to the Surveillance Team for collation.
Results: Numbers of patients audited at KCH varied between 2,050 and 2,879 per quarter with an average of 38% on antimicrobials. At PRUH between 478 and 1472 patients were audited per quarter with an average of 27% on antimicrobials.
Indications were recorded for over 95% (KCH) and 67% (PRUH). At KCH, Stop or Review compliance decreased by 5% between the first quarter and third quarter of 2014 but, was consistently above 90% in 2015. At the PRUH this ranged between 54.5% and 79.1%.
Discussion and/or Conclusion(s): This method of auditing at a 1500 bedded NHS Trust has been sustained for 5 years and rolled out to the second site on acquisition. Divisional Clinical Leads take ownership and champion the program locally. The performance management program ensures these KPIs are high on the Trust agenda. Scores are higher when junior doctors perform audits and electronic prescribing is used (KCH).

ID: 4991
Serum procalcitonin testing can help in achieving antibiotic CQUIN in UK hospitals

Yann Gelister[1], Kordo Saeed[2], Matthew Dryden[2], Alan Abid[3]. *[1]University of Southampton, [2]Hampshire Hospitals NHS Foundation Trust, Royal Hampshire County Hospital, [3]University of Portsmouth*

Background: Serum procalcitonin (PCT) is a more specific and sensitive biomarker for detecting bacterial infection compared to CRP and white cell count. We report on the use of PCT measurement as a diagnostic tool to support clinical decision making around antibiotic use in patients suspected of infection.
Aim(s)/Objective(s): The aim of this study was to audit the use of serum PCT measurement in relation to antibiotic prescribing in a hospital setting.
Method(s): Patients on medical and surgical wards (excluding ICU/HDU) who had undergone PCT testing were audited during a 3 week clinical attachment in microbiology. Antibiotic prescribing decisions were reviewed from the notes within 24 hours of PCT results in accordance with Hampshire Hospitals' Guidelines.
Results: Using the threshold of 0.25 mcg/L, 34 of 69 PCT results were elevated and 35 were negative. In 21 out of 34 (61.7%) elevated results, a clinical diagnosis of bacterial infection was supported and patients started, continued, or escalated antibiotics. In 26 of 35 (74.3%) negative PCT results, antibiotics were appropriately either withheld (68.6%) or stopped (5.7%).
Discussion and/or Conclusion(s): We believe these findings to be clinically important as PCT results can aid clinicians in decision making regarding the withholding or cessation of antibiotics. This in turn reduces unnecessary prescriptions of "just in case" antibiotics. Serum PCT measurement can help achieve hospital antibiotic CQUIN targets and, importantly, reduce selective pressure and antimicrobial misuse in the rising era of antibiotic resistance.

ID: 4993
United Kingdom antibiotics: CQUIN a challenge to clinicians?

Alan Abid[1], Yann Gelister[2], Natalie Parker[3], Taryn Keyser[3], Kordo Saeed[3], Matthew Dryden[3], Sophie Lewis[3]. *[1]University of Portsmouth, [2]University of Southampton, [3]Hampshire Hospital Foundation Trust*

Background: Many patients admitted to hospital develop life threatening infections which require antibiotics. In the acute setting, clinicians may not always consider the consequence of prescribing broad spectrum antibiotics leading to potential antibiotic resistance. There is an increasing pressure on hospitals to reduce the use of broad spectrum antibiotics as well as antibiotics as a whole, especially following the new financial implications created by the CQUIN framework.
Aim(s)/Objective(s): The aims were to assess the use of Piperacillin-Tazobactam (Tazocin) within the Royal Hampshire County Hospital and the compliance of clinicians with expert advice and/or prescribing guidelines.
Method(s): A real life audit was carried out by identifying patients prescribed Tazocin through the use of the electronic prescribing software, JAC. Over an 8 day period 36 patients were found and a case note review performed to assess the reasoning and circumstance of antibiotic prescription.
Results: 27 patients (75%) were prescribed Tazocin according to trust guidelines or following advice from microbiology, 9 (25%) were not deemed compliant. Within the sample the majority of diagnoses were of an intra-abdominal or respiratory nature, in 39% and 36% of cases respectively. 26 prescriptions (72%) did not have a stop date.
Discussion and/or Conclusion(s): Clinicians did not follow local protocol in 25% of cases irrespective of clinical appropriateness. Stop dates were included in a small proportion of prescriptions. Although the CQUIN can be a challenge, the findings here suggests it is potentially achievable by improving compliance with local guidelines and expert microbiology advice.

ID: 4995
E-prescribing efficiencies in PPS

Orla Geoghegan, Tracy Lyons, Mark Gilchrist, Bo Ye. *Imperial College NHS Healthcare Trust*

Background: Point prevalence surveys (PPS) can demonstrate strengths and areas for improvement within antimicrobial stewardship (ASP) programmes but are inherently labour-intensive. Imperial College Healthcare NHS Trust has undertaken PPS since 2002. In 2015/16 electronic prescribing (e-prescribing) was introduced, providing an opportunity to reassess delivery of PPS.
Aim(s)/Objective(s): We aimed to evaluate how the introduction of e-prescribing affected PPS in terms of ease of data collection and human resources.
Method(s): All inpatients scheduled to receive anti-infectives on the day of data collection were included in the February 2016 study. Antimicrobial pharmacists noted time taken to audit each clinical area and any significant ASP interventions made before analysis of results.
Results: Of 84 wards (1267 patients) reviewed, 36 retained paper-based systems, 4 utilised specialist intensive care prescribing programmes and 44 had moved to e-prescribing. Whilst overall antimicrobial prescribing indicators remained similar to previous years, the average PPS time taken per ward (hh:mm) was reduced from 1:07 for paper-based areas to 00:24 for e-prescribing locations (00:32 in intensive care areas). On paper-based wards, interventions identified were around dose optimisation whereas those identified via electronic systems mainly concerned course duration.
Discussion and/or Conclusion(s): Electronic record and prescription systems have dramatically reduced the time taken to undertake PPS. Even greater efficiency improvements are anticipated in future, following Trust-wide adoption of electronic prescribing.
Interventions identified on paper systems involved dose optimisation whereas these were not seen within e-prescribing areas. It is hypothesized that in-built e-prescribing user support influenced the interventions identified.

ID: 5016
Progress towards achieving antimicrobial prescribing standards in medical wards at Aberdeen Royal Infirmary

Fiona McDonald, Gillian Macartney, Rashmi Subbarao-Sharma. *NHS Grampian*

Background: In NHS Grampian the Antimicrobial Management Team co-ordinate annual antibiotic point prevalence audits across all acute hospitals, as recommended by the Scottish Antimicrobial Prescribing Group.
Aim(s)/Objective(s): To monitor compliance with local antimicrobial guidelines, against agreed audit standards.
Method(s): Data was collected by pharmacists using a standard data collection form over 2 days in November/December each year. The Antibiotic Pharmacists, in liaison with Medical Microbiologists, assessed whether antibiotic prescribing was 'appropriate'. Compliance against audit standards was calculated. A report summarising the results for all medical wards was disseminated to clinical staff each year and individualised reports sent to wards with the lowest rates of compliance with the audit standards.
Results:

- Percentage of indications documented in medical notes/drug chart improved from 88% in 2010 to 98% in 2015. (Audit Standard (AS) ≥95%)
- Percentage of antibiotic prescriptions with duration/stop/review date documented in medical notes/drug chart improved from 30% in 2010 to 65% in 2015. (AS ≥80%)
- Percentage of indications where review of antibiotics was documented within last 48 hours in medical notes improved from 80% in 2013 to 94% in 2015. (AS ≥80%) (Data was not collected in 2010.)
- Percentage of indications where prescribing was appropriate improved from 87% in 2010 to 92% in 2015. (AS ≥95%)
- Percentage of doses administered improved from 93% in 2014 to 96% in 2015. (Data not collected in 2010 or 2013.) (AS ≥95%)

Discussion and/or Conclusion(s): Between 2010 and 2015 there have been improvements across all of the audit standards, with a significant improvement for documentation of duration/stop/review dates and documented reviews.

ID: 5022
Antimicrobial Stewardship (AMS) activities in English Community Health Services (CHS) Trusts

Diane Ashiru-Oredope[1], Sejal Hansraj[1], Mary Akpan[2], Nada Atef Shebl[2], Raheelah Ahmad[3], Susan Hopkins[1]. *[1]Public Health England, [2]University of Hertfordshire, [3]Imperial College London*

Background: The implementation of the national toolkits TARGET and SSTF, led by PHE is listed as one of strategic actions for implementing the UK 5 year Antimicrobial Resistance (AMR) Strategy. The implementation of these toolkits has previously been assessed in CCGs and Acute Trusts.
Aim(s)/Objective(s): To gain an understanding of current AMS activities in CHS Trusts.
Method(s): In February 2016, an online survey was distributed to the 26 English CHS Trusts. This was a voluntary service evaluation by healthcare professionals; ethics approval was not required.
Results: 77% of CHS Trusts responded to the survey; of these, 25% (5% in CCGs and 94% in Acute Trusts) had a substantive pharmacy post focussed on AMS. 50% of responding CHS Trusts had an AMS committee (18% in CCGs; 94% in Acute Trusts).
85% of responding CHS Trusts had an antimicrobial formulary (99% in CCGs; 93% in Acute Trusts), while 55% had empirical antibiotic guidelines in place (73% in CCGs; 83% in Acute Trusts).
Other key findings include that 70% of responding CHS Trusts had an antimicrobial policy in place (99% in CCGs; 93% in Acute Trusts), while 90% indicated that they were aware of TARGET, and of these, 11 had formally reviewed it. With SSTF, 75% of CHS Trusts reported being aware of SSTF and of these, 10 had formally reviewed it.
Discussion and/or Conclusion(s): Study results demonstrate that AMS guidance has been focused on initiatives to improve its implementation in primary and secondary care. Further work is required to promote AMS delivery in CHS Trusts.

ID: 5031
Protected antibiotic use at the Central Manchester NHS Foundation Trust: findings from a prospective antibiotic stewardship intervention

Giorgio Calisti, Rob Shorten, Louise Sweeney, Mihaela Petric, Catherine Child, Benjamin Farrington, Caroline Templeton, Kelly Alexander, Ahmed Qamruddin. *Central Manchester University Hospitals NHS Foundation Trust*

Method(s): As part of our Antimicrobial Stewardship strategy, we reviewed daily all pharmacy requests for protected antibiotics (i.e., meropenem, ertapenem and linezolid) in our Trust. We reviewed the case notes, drug chart and laboratory information system to evaluate the rationale for starting the protected antibiotic and whether the prescription was appropriate or not.
The appropriateness of the prescription was discussed in a daily clinical meeting attended by Medical Microbiology Doctors and Antibiotic Pharmacists. The possible outcomes of the multi-disciplinary discussion were:

- Stop the protected antibiotic without starting a new antibiotic in substitution.
- Switch the protected antibiotic to a non-protected alternative
- Continue the protected antibiotic.

Results: The most commonly used protected antibiotic was meropenem, followed by linezolid and ertapenem. The protected antibiotic was started as an escalation in most patients and a discussion with Microbiology was documented in half of the cases.
The most common indication for starting the protected antibiotic was the recent isolation of a MDR organism not covered by the

non-protected option, whilst allergy to penicillin was a contributing factor in choosing a carbapenem in around 20% of patients.
The prescription was judged as appropriate in approximately 3/4 of all cases. Treatment de-escalation or stopping the whole antibiotic therapy was recommended for all patients receiving an inappropriate prescription and in some of the patients receiving an appropriate prescription.
Discussion and/or Conclusion(s): Our study shows that a proactive and multi-disciplinary strategy of reviewing every prescription of protected antibiotic can lead to marked reduction in the use of these precious options.

ID: 5048
Stewardship opportunities in the treatment of urinary tract infection using oral fosfomycin. Much more to be learnt

Helmi Sulaiman, Aqtab Mazhar Alias, Shu Jiun Khoo, Saufi Irzat Che Yusoff. *University of Malaya*

Background: Fosfomycin (FM) was first introduced following the fermentation of Streptomyces strain in 1969. Following its unique position for uncomplicated UTI, its appropriate use is of paramount importance to mitigate the emergence of resistance.
Aim(s)/Objective(s): We aim to look at the current practice of prescription in our large outpatient clinic.
Method(s): This is a retrospective study carried from April 2015 to May 2016 in primary care clinics affiliated to University Malaya Medical Centre, Malaysia. We recruited any patients above 12 years old who received single dose oral FM. We divided the patients into guideline compliant (GC) and non-guideline compliant (NGC) groups based on available consensus.
Results: 100 patients were recruited from a list of 139. The median age was 54.6 (IQR 15–88) and female predominates (81%). 57 of the subjects had at least one co-morbidity and hypertension predominates (40%). There were 91 NGC occurrences. Reasons for NGC were asymptomatic bacteriuria/ABU (18, 19.7%), acute pyelonephritis (13, 14.2%), complicated UTI (16, 17.6%) and inappropriate investigations (urine culture (21, 23.1%) and ultrasound of kidney (4, 4.3%)). Urine analysis was the commonest test performed (87, 97%). FMT was prescribed wrongly in 66 subjects (wrong indications).
Discussion and/or Conclusion(s): The data above illustrates the dire need for education in term of UTI management by the primary care physicians. The misuse of FM was common and not in accordance to the guideline. The additional investigations may be reflective of "non-uncomplicated" nature of UTI. In addition, the lack of susceptibility data on FM against the local contemporary urinary isolates should be addressed.

ID: 5053
QASI-2: Measuring the quality of Antimicrobial Stewardship

Andrew Berrington[1], Rachel Bruce[2], Amy Penni[2]. [1]*City Hospitals Sunderland NHS FT,* [2]*City Hospitals Sunderland NHSFT*

Background: It is not straightforward to measure how good we are at antimicrobial stewardship. Real outcome measures like 'infections cured' or 'resistance pressure' are elusive. Surrogate outcome measures like antibiotic consumption metrics are tendentious and confounded by other factors. So usually we measure process, typically by audit of antimicrobial prescribing.
But audit is easy to do badly and difficult to do well: decisions are spread out in time and place as new information emerges, objective standards are difficult to set and we need to be careful that we are auditing stewardship specifically rather than medical practice more generally. The typical 'compliance audit' is unlikely to capture these complexities.
We have developed an audit tool that assigns a score out of 10 to the decisions made at initiation ('start Smart′) and a score out of 5 to the decisions made as treatment continues. We have refined this over several years and have now piloted its use in a systematic programme of audit and feedback on our Integrated Assessment Unit and back-of-house medical wards.
Aim(s)/Objective(s): To describe deployment of our QASI-2 tool in a pilot systematic audit programme designed to assess the feasibility of the QASI-2 approach and to measure the quality of antimicrobial prescribing in our medical unit.
Method(s):
QASI-2: key aspects of the tool
Results:
Summary charts describing 322 initiation audits and 369 continuation audits
Data on time taken to perform QASI-2 audits
Discussion and/or Conclusion(s):
Useful and feasible approach though time consuming
Acceptable to clinical teams – good engagement
Importance of defining what constitutes a course.

ID: 5081
Development of a Clinical Decision Support (CDS) mobile app for antimicrobial prescribing

Jacqueline Sneddon[1], Ann Wales[2], Dilip Nathwani[3]. [1]*Healthcare Improvement Scotland,* [2]*NHS Education for Scotland,* [3]*NHS Tayside*

Background: Development of clinical decision support (CDS) is a priority for Scottish Government to give clinicians easy access to decision support tools and relevant guidance at the point of care. Antimicrobial prescribing was identified as a 'quick win' to demonstrate CDS as national evidence-based guidance, treatment algorithms and a robust clinical networks were already available.
Aim(s)/Objective(s): To develop a national antimicrobial app through collaboration between the Scottish Antimicrobial Prescribing Group and NHS Education for Scotland.
Method(s): A proposal was developed, funding secured from Scottish Government, a developer appointed via a tendering process and a multi-professional clinical reference group established.
Results: The app was launched in August 2016 available to download free via app stores for use on any mobile device.
The app includes:
- Dosage calculators for gentamicin and vancomycin (registered with the Medicines and Healthcare Products Regulatory Agency)
- Antibiotic guidance for primary care and hospitals customised by each health board
- A decision aid to support management of urinary tract infection in older people
- An audit tool to support data gathering and reporting for local and national improvement work

Discussion and/or Conclusion(s): This bespoke national app provides customised local guidance and CDS tools to enable clinicians to use antibiotics safely and effectively across all care settings. The unique audit component will support improved practice through timely audit and feedback of key prescribing measures. An evaluation of its impact is underway using an outcomes chain model and contribution analysis.

ID: 5113
Thinking beyond tazocin: improving antibiotic prescribing in cancer care

Anastasia Theodosiou, Kieran Hand, Tat Shing Yam, Hayley Wickens. *University Hospital Southampton*

Background: Excessive broad-spectrum antibiotic use is associated with adverse outcomes, including *Clostridium difficile* and antibiotic-resistant infection. Oncology inpatients are susceptible to infection due to cancer and chemotherapy-associated immunocompromise, but use of broad-spectrum antibiotics is not always warranted.
Aim(s)/Objective(s): This project aims to identify and tackle barriers to appropriate antibiotic prescribing in oncology inpatients at

Southampton General Hospital. In doing so, we hope to reduce inappropriate use of broad-spectrum antibiotics.
Method(s): Over one week, all twenty oncology inpatients who had received at least 72 hours of antibiotics were identified (excluding haematological cancer patients and those receiving stem cell transplant). We audited antibiotic choice and duration, investigations to identify infection source and severity, compliance with local guidelines, and outcomes of antibiotic reviews. The results were disseminated, and good practice guidelines were produced and incorporated into the Trust's application-based antibiotic policy.
Results: Tazocin was used in 55% of patients, with no clear justification in 46% of these. Nearly 70% of patients received long antibiotic courses (>7 days), and no changes were made in 70% of antibiotic reviews. There was inadequate use of documentation, cultures to guide antibiotic prescribing, and of tools to assess infection risk (e.g. MASCC score not used in any patient with febrile neutropenia) or severity (e.g. blood lactate measured in only 36% of patients).
Discussion and/or Conclusion(s): Inappropriate broad-spectrum antibiotic use was associated with inadequate assessment of infection risk, source and severity. By educating and empowering clinicians to improve these domains, we hope to reduce inappropriate antibiotic use (re-audit pending at the time of writing).

ID: 5122
Evaluating behaviour change as part of Antimicrobial Stewardship interventions; a review of UK state-of-the-art conferences

Adam Tsao[1], Ann Tivey[1], Timothy M. Rawson[2], Esmita Charani[2], Mark Gilchrist[3], Luke Moore[2], Alison Holmes[2]. *[1]Imperial College School of Medicine, [2]Imperial College London, [3]Imperial College Healthcare NHS Trust*

Background: To improve the quality of antimicrobial stewardship (AMS) interventions the application of behavioural sciences supported by multidisciplinary collaboration has been recommended. We analysed major UK scientific research conferences to investigate the level of AMS behaviour change intervention reporting.
Method(s): Leading UK 2015 scientific conference abstracts for 30 clinical specialties were identified and interrogated by four researchers. All AMS and/or antimicrobial resistance (AMR) abstracts were identified using validated search criteria. Abstracts were then independently reviewed by three researchers with reported behavioural interventions categorised using the behaviour change wheel framework described by Michie and colleagues.
Results: Overall, conferences ran for 110 days with >57,000 delegates. 311/12,313 (2.5%) AMS-AMR abstracts (oral and poster) were identified. 118/311 (40%) were presented at the UK's infectious diseases/microbiology conference. 56/311 (18%) AMS-AMR abstracts described behaviour change interventions. The commonest abstract reporting behaviour change interventions were quality improvement projects [44/56 (79%)]. In total 71 unique behaviour change functions were identified. Policy categories; "guidelines" (16/71) and "service provision" (11/71) were the most frequently reported. Intervention functions; "education" (6/71), "persuasion" (7/71), and "enablement" (9/71) were also common. Intervention categories "incentivisation" and "coercion" and policy categories "fiscal" and "legislation" were not reported in any identified abstracts.
Discussion and/or Conclusion(s): Despite the benefits of behaviour change interventions on antimicrobial prescribing, very few AMS-AMR studies at UK state-of-the-art conferences report implementing them in 2015. AMS interventions must focus on promoting behaviour change towards antimicrobial prescribing. Greater emphasis must be placed on non-infection specialties to engage them with the issue of behaviour change towards antimicrobial use.

ID: 5132
An audit of appropriate sampling for culture prior to starting intravenous antibiotics in acute admissions at St. James' University Hospital, Leeds

Amy Baggott, Miles Denton. *Leeds Teaching Hospitals Trust*

Background: Frequently the opportunity for obtaining critical microbiological specimens appears to be missed prior to starting intravenous antibiotics in acute admissions to hospital.
Aim(s)/Objective(s): By gaining an accurate picture of current practice, a strategy to improve practice might then be developed.
Method(s): 100 patients on intravenous antibiotics were reviewed on the medical and surgical admissions wards at St. James University Hospital in a series of "spot checks" over a period of three weeks.
Data was then analysed to primarily see how many patients had blood cultures obtained prior to intravenous antibiotics being commenced.
Secondary analyses were carried out to identify if any demographic or diagnostic features or adverse treatment outcomes were associated with samples not being taken.
Results: Only 52 patients had blood cultures taken prior to the first dose of antibiotics.
25 patients had no cultures taken at all.
Being apyrexial on admission was associated with a failure to take cultures, as was presenting with biliary sepsis and also being admitted to the surgical ward.
25% of blood cultures taken before antibiotics were positive compared to 13% of blood cultures taken after antibiotics.
Length of stay was increased for those who had cultures taken after antibiotics had been given, relative to those who had cultures taken first.
Four patients died, none of whom had cultures taken before antibiotics.
Discussion and/or Conclusion(s): Current practice falls far short of the standard. This audit helps identify areas to focus interventions and education on. It also demonstrates the negative impact on patient outcome that failure to sample appropriately causes.

ID: 5134
Foundation doctor-led audit and education as an effective intervention to promote antimicrobial stewardship at Royal Bolton Hospital

C. Subudhi, Aideen Carroll, Jonathan Evans, Emma Clare Hughes, Rhian Proffitt, Alex Smith, Andrew Steele, Samim Patel. *Royal Bolton Hospital, Bolton NHS Foundation Trust*

Background: In view of rapidly emerging antibiotic-resistant bacteria, there is a growing need for antibiotic stewardship programmes. It is important that interventions to improve stewardship target foundation doctors, as they comprise a significant proportion of antibiotic prescribers.
Aim(s)/Objective(s): This study aims to evaluate improvements in the quality of antibiotic prescribing following foundation doctor-led educational interventions at Royal Bolton Hospital.
Method(s): At Royal Bolton Hospital, quarterly audits are carried out in conjunction with the microbiology department. The audit standards, based on Public Health England's guidance, are as follows:
- Standard 1: Compliance with trust guidelines.
- Standard 2: Indication for treatment written in patient case notes.
- Standard 3: Indication for treatment written in antibiotic section of prescription charts.
- Standard 4: Stop/review date documented in patient case notes by 48–72 hours.
- Standard 5: Stop/review date documented on prescription charts by 48–72 hours.

Using data collected from this audit, foundation doctor-led teaching sessions will be designed and delivered to improve safe prescribing of antibiotics by fellow foundation trainees.

Results: Four quarterly audits have been completed during the course of the academic year 2015–2016. Average compliance across the five standards for these quarters was 76%, 74%, 81% and 78%, respectively. Overall annual compliance with the above standards was 77.25%. Following the delivery of teaching sessions, the above standards will be re-audited. Targets set for 2016/2017 and 2017/2018 are 85% and 95% compliance, respectively.
Discussion and/or Conclusion(s): Despite previous interventions, compliance with prescribing standards has remained relatively static. Following formal education through peer-to-peer teaching, an improvement is expected, sufficient to meet the desired targets.

ID: 5147
Multidisciplinary development of initial treatment guidance of adult patients with suspected sepsis in the community health setting

Rhian Manley, Steve DuBois, Mike Paynter, Karen Anderson, Liz Berry, Paul Aldwinkle, Claire Nettleton. *Somerset Partnership NHS Foundation Trust*

Background: Acuity and complexity of patients treated in community health services have increased dramatically as pressures on all NHS services escalate. In rural Somerset high risk patients presenting with suspected sepsis may require initial treatment in geographically dispersed and potentially isolated Minor Injuries Units or community hospitals where:
- transfer to acute trusts could result in unacceptable delays in treatment initiation
- principles of patient-centred care support appropriate avoidance of unnecessary hospital transfers.

Aim(s)/Objective(s): Development of a sepsis treatment pathway in rural community health service settings which:
- provide prompt and safe care to septic patients and optimise outcomes within confines of the commissioned service model
- implement and maintain good medicines governance for, initially unfamiliar, high risk medicines
- promote appropriate antibiotic stewardship in line with local strategies and local resistance

Method(s): A prospective review of the process undertaken and lessons learnt when developing antibiotic guidance for sepsis by a multidisciplinary clinical team.
Results: Development of a robust uniform pathway across geographically dispersed and sometimes disparate service settings, proved challenging. Safe and timely treatment of sepsis using high risk drugs, not traditionally administered in community health service (e.g. gentamicin, teicoplanin and vancomycin), required novel approaches and considerations.
Discussion and/or Conclusion(s): The legacy of the historical NHS community health service operating model includes limited access to medical prescribers, clinical pharmacy services, consultant microbiology support, rapid diagnostic testing and other infrastructure routinely available in acute hospital settings. Resources for developing local and national antibiotic guidelines require review to ensure that the current gaps identified through this process are acknowledged and mitigated.

ID: 5158
Barrier and facilitators of antimicrobial guidelines adherence in dentistry: knowledge and attitude assessment tool

Noha Seoudi, Zhang Xu. *QMUL*

Background: Antimicrobial stewardship is one of the most important strategies to tackle the increasingly serious threat of antimicrobial resistance globally. The Faculty of General Dental Practitioners (FGDP) and the Public Health England (PHE) issued guidelines to regulate the use of antimicrobials in primary dental care. However, poor adherence was reported in the literature. Barriers to guidelines adherence are expected to be different according to the local setting. Therefore, analysing these barriers is a very important step before developing the antimicrobial stewardship intervention.
Aim: To develop a validated knowledge and attitude assessment tool assessing barriers and facilitators to guidelines adherence.
Method: A questionnaire was developed based on Mitchi's behaviour change wheel to assess capability, motivation and opportunity in relation to the dental antimicrobial prescribing habits. The knowledge part of the questionnaire was modified from a previously published tool (Palmer et al., 2001). After a peer review and consultation stage, a pilot audit was conducted. To validate the tool the results of the pilot was compared to the results of a prospective antimicrobial prescribing patterns audit in the same setting.
Result: 30 participants took part in the questionnaire and 200 antimicrobial prescription episodes were also audited. There were no statistical significant difference in the concordance rate with the national and local guidelines when comparing the questionnaire and the prospective audit.
Conclusion: We aim to present the newly developed knowledge and attitude assessment tool, which can be used to audit antimicrobial prescribing patterns and identify the best local antimicrobial stewardship interventions in dentistry.

Topic: Clinical cases

ID: 4452
Mitral valve endocarditis secondary to *Paenibacillus provencensis*

Ana-Catarina Pinho-Gomes, Abdul Nasir, Sajjad Mirza, Isaac Kadir. *University Hospital of South Manchester*

Background: Despite the recent advances in diagnostic and therapeutic strategies, infective endocarditis remains challenging to treat and thus associated with bad prognosis in terms of morbidity and mortality, particularly when uncommon microorganisms are involved.
Method(s): We report the first case of infective endocarditis caused by *Paenibacillus provencensis*, a very rare Gram-negative spore-forming rod.
Results: A mitral valve vegetation was incidentally discovered by intraoperative transoesophageal echocardiography in a 70-year old lady undergoing aortic valve replacement. Empirical antibiotic treatment for infective endocarditis with gentamicin and teicoplanin was started. The precise identification of the causative agent relied on genotypic characterisation with 16S rDNA gene sequencing. Microbiologic culture was subsequently performed to obtain the antimicrobial susceptibility profile and adjust the antibiotic regimen accordingly. The patient was treated with a 4-week course of vancomycin and meropenem, followed by a further 2 weeks of daptomycin due to the identification of vancomycin-resistant enterococci in a rectal swab. After a long in-hospital stay, the patient eventually recovered clinically and biochemically and transthoracic echocardiogram demonstrated a well functioning mitral valve without residual lesions from the endocarditis.
Discussion and/or Conclusion(s): This is, to the best of our knowledge, the first report showing that *Paenibacillus provencensis* can be a pathogen in humans and that a member of the genus Paenibacillus may be involved in native valve endocarditis. This case also emphasis the importance of 16S rDNA gene sequencing by real-time polymerase chain reaction, as a rapid and accurate method to identify microorganisms, like Paenibacillus, which can be missed by conventional microbiology investigations.

ID: 4539
A case of brucellosis in a patient heading for liver transplantation

Shradha Bhagani, Adrian Kennedy, Phil Stanley, Paul McWhinney, Sulman Hasnie, Riccardo Guintini, Ben Jeffs. *Bradford Royal Infirmary*

Background: A 48 year old woman was admitted to hospital in October 2015 with symptoms of fever, intermittent diarrhoea and

hepatic encephalopathy. She had a history of cirrhosis secondary to autoimmune hepatitis and it was initially thought that her illness was secondary to decompensation that would necessitate liver transplantation. She was born in Pakistan and had lived in the UK since 2007 last visiting Pakistan from May to July 2015.
Results: Routine laboratory results demonstrated worsening liver function, pancytopenia and hyponatremia. Blood cultures were positive for what was finally proved to be Brucella abortus. Serology was positive for Brucella IgM/IgG. A sample from August 2015 was retrospectively tested and was negative.
Discussion and/or Conclusion(s): Following confirmation of brucellosis she was treated with 6 weeks of ciprofloxacin and 2 weeks of gentamicin. She has had a good response and 6 months later remains well with only mild encephalopathy at times. Human brucellosis remains rare in the UK. This case highlights the need to consider it in those patients who present with pyrexia of unknown origin and have travelled to an endemic area. Due to her liver condition her treatment regimen was chosen to avoid rifampicin. The initial concern she might require a liver transplant has abated.

ID: 4560
A case of visceral leishmaniasis and the avoidance of a planned splenectomy

Peter Johnson, Adrian Kennedy, Phil Stanley, Paul McWhinney, Sulman Hasnie, Riccardo Guintini, Ben Jeffs. *Bradford Royal Infirmary*

Background: Visceral leishmaniasis is a rare illness to present in the UK although it should be considered in the differential when there is an appropriate travel history. A 76 year old male retired civil engineer had been under the haematologists for investigation of pancytopenia since November 2015. He presented with symptoms of weight loss, night sweats, loss of appetite and lethargy. He had a background of Psoriatic Arthritis for which he took Methotrexate. His travel history included holidays to North America, Morocco and more recently Spain. Lymphoma was considered a likely diagnosis with evidence of splenomegaly on imaging. He was listed for a splenectomy after repeated splenic biopsies came back showing only reactive changes.
Results: His Leishmania serology came back strongly positive (Leishmania DAT Positive at a titre of 409,600 and Leishmania K39 test: Antibody to Leishmania K39 antigen: positive) a few days prior to his planned splenectomy.
Discussion and/or Conclusion(s): Visceral Leismaniasis was considered the most likely diagnosis. He was treated with standard liposomal amphotericin B 3 mg/Kg (5 days). At latest follow up he has made a good recovery. His platelet count is now normal and haemoglobin and white cell count are improving. Leishmania was not considered in the initial differentials and it was a few months before his serology was performed. Although the majority of cases occur in countries such as Bangladesh, Brazil, India and Sudan it is also endemic in the Mediterranean area. Consideration should be given for this diagnosis if there is an appropriate travel history especially in an immunosuppressed individual.

ID: 4575
A rare cause of epiglottitis

Elan Tsarfati[1], Karen Macsween[1], Guy Vernham[1], Panos Asimakopoulos[1], Diane Lindsay[2]. *[1]NHS Lothian, [2]Scottish Haemophilus, Legionella, Meningococcus and Pneumococcus Reference Laboratory, Glasgow*

Background: A 72 year old Australasian holidaymaker was brought by ambulance to A + E complaining of severe, abrupt onset abdominal pain, present for 6 hours, and a sore throat for 4 days. On examination she was febrile 39.1°C, and was holding her neck. Her throat appeared normal with no cervical lymphadenopathy, but her anterior neck was tender. She was tachyopneic 40/min, saturation 95% on air, with HR 87 and BP 140/76. There was central and right upper quadrant abdominal tenderness. CXR showed a small right pleural effusion, also seen on CT abdomen which also demonstrated consolidation, but no other cause for her pain. Over three hours she became hoarse; complaining of "a frog in my throat". Nebulised adrenaline, intravenous ceftriaxone and dexamethasone were administered. A CT neck revealed significant soft tissue swelling and thickening of the epiglottis. Her airway was immediately secured and she was transferred to intensive care. Blood cultures were positive the following day with Gram-negative diplococci, later identified as *Neisseria meningitidis*. She was extubated within 24 hours, and completed 7 days of IV ceftriaxone before discharge. The Scottish Reference Laboratory confirmed the *N. meningitidis* serogroup Y with a rare MLST type for Scotland. Since 2014 Scottish figures show serogroup Y accounts for 15% of *N. meningitidis* isolates, is invasive in 79% of cases (CSF, eye or blood culture), and affects older adults mean 66 years of age (range 1–89) and female > male (16F:8M). Serogroup Y is only rarely implicated in epiglottitis, with only a handful of cases previously reported.

ID: 4677
Unusual pneumonia after a road traffic accident

Amelia Joseph[1], Shiu Soo[2]. *[1]Nottingham University Hospitals/Health Education East Midlands, [2]Nottingham University Hospitals*

Background: A 19 year old male was admitted after being trapped in a car that crashed into a rural ditch. Whilst emergency services worked to free him, he became submerged underwater.
Aim(s)/Objective(s): On arrival to hospital he had severe respiratory compromise requiring endotracheal intubation. Computer tomography revealed bilateral alveolar opacities with air bronchograms suggestive of aspiration. Bronchial washings were obtained and piperacillin-tazobactam was commenced empirically. A beta-haemolytic oxidase-positive Gram-negative organism grew on blood agar after 24 hours. Biochemical identification confirmed the organism was Aeromonas hydrophilia; the isolate tested resistant to piperacillin-tazobactam and sensitive to ciprofloxacin and meropenem.
Method(s): After review on Intensive Care by the Microbiologist, piperacillin-tazobactam was switched to intravenous ciprofloxacin. The patient deteriorated with respiratory failure, sepsis and diarrhoea. Meropenem was added after repeat bronchial washings. A mould grew on blood and Sabouraud agar, identified by microscopy as *Aspergillus fumigatus*.
Results: Voriconazole was commenced and within 72 hours he had significantly improved. However profuse watery diarrhoea continued. Auramine staining of a stool sample revealed Cryptosporidium cysts, later identified as *Cryptosporidium hominis*. Following continued improvement, he completed fourteen day courses of meropenem, ciprofloxacin and voriconazole. His diarrhoea slowly settled and he was discharged home a week later.
Discussion and/or Conclusion(s): The mechanism of the trauma in this case led to several water-borne infections. In reported literature on near-drowning, Aeromonas species is the commonest cause of early-onset pneumonia. *Pseudoallescheria boydii* is the commonest fungal infection, usually with a delayed presentation. Aspergillus infection has been reported in a small number of cases and usually has a poor prognosis.

ID: 4703
A case report of Whipple's disease with neurological and ocular features

Katherine Watson, Julie Samuel, Peh Sun Loo, William Innes, Bridget Griffiths, Shahzad Shikoh. *Newcastle upon Tyne Hospitals NHS Foundation Trust*

Background: A 47 year old man presented with progressive weight loss, lymphadenopathy, back pain, visual disturbance, myoclonus and poor memory.
Aim(s)/Objective(s): Due to progressive physical deterioration the patient was admitted for investigation. A number of differentials were considered including malignancy, lymphoma and sarcoidosis. On

examination he was cachectic with palpable inguinal lymph nodes. Neurological examination revealed myoclonic jerks of the arm and reduced upwards gaze but normal power and reflexes. The patient complained of ocular pain, photophobia and floaters in the vision. Examination of the eyes revealed a non-descript intermediate uveitis.
Method(s): Numerous investigations were performed including an upper gastrointestinal endoscopy and biopsy. Histology of the duodenal biopsy showed features highly suggestive of Whipple's disease. Fixed paraffin curls from the duodenal biopsy were positive for Tropheryma whipplei by 16S rRNA PCR. PCR of CSF was also weakly positive.
Results: The patient was treated with 2 weeks of intravenous co-trimoxazole due to penicillin allergy, then oral co-trimoxazole planned for at least 1 year. His symptoms started improving and weight increased by day 10 of treatment.
Discussion and/or Conclusion(s): Whipple's disease is extremely rare and difficult to recognise. This patient fit the characteristic demographics being a middle-aged Caucasian male. He did not complain of diarrhoea, the most common feature of Whipple's disease, but this may have been masked by opioids taken for back pain. His neurological and ocular symptoms are recognised but rarer features of Whipple's disease.
This case highlights the importance of taking appropriate biopsy samples, clinical awareness of Whipple's disease and identifying pathognomonic features on histology.

ID: 4742
An uncommon complication of a common infection

Aneeka Chavda, Poonam Kapila, Abhinav Kumar. *Sherwood Forest Hospitals NHS Foundation Trust, King's Mill Hospital*

Background: We report a case of a 55 year old Turkish male with a background of ulcerative colitis who presented with a two week history of increasing shortness of breath. He progressively deteriorated despite being treated with broad spectrum antibiotics and unfortunately died. Evidence of phagocytosis on blood film along with high serum ferritin (14,519 microgram/mL) and multi organ failure led to diagnosis of haemophagocytic syndrome (HPS). Four days after his death, the respiratory samples tested positive for *Mycobacterium tuberculosis*. HPS due to *Mycobacterium tuberculosis* is uncommon and only a handful of cases have been reported predominantly in the immunocompromised.[1]
HPS is an aggressive and life-threatening syndrome of excessive immune activation; the excessive inflammation is thought to be caused by a lack of normal down regulation of activated macrophages and lymphocytes.[2] Infection is a common trigger, both in those with a genetic predisposition and in sporadic cases. Prompt initiation of treatment is essential for the survival of affected patients. Often the greatest barrier to a successful outcome is a delay in diagnosis, which is difficult because of the rarity of this syndrome, the variable clinical presentation and the lack of specificity of the clinical and laboratory findings.
References
1. Brastianos PK *et al.* Tuberculosis-associated haemophagocytic syndrome. *The Lancet Infectious Diseases*. 2006;6:447–454.
2. Larroche C. Pathogenesis of hemophagocytic syndrome (HPS). *Autoimmun Rev*. 2004;3:69–75.

ID: 4749
The drugs don't work; linezolid + rifampicin

Fiona Robb, Lee Stewart, Nitish Khanna, Erica Peters. *NHS Greater Glasgow & Clyde*

Background: Patient JJ was admitted to NHS Greater Glasgow & Clyde (NHSGGC) with confusion, fever and acute kidney injury requiring dialysis. He had a complex medical history including Type II diabetes and heart failure requiring previous coronary artery bypass graft, metalic aortic valve (AV) replacement and a pacemaker. Two sets of blood cultures grew *Staphylococcus aureus*; resistant to penicillin but sensitive to flucloxacillin, rifampicin, linezolid and clindamycin. A transthoracic echocardiogram revealed an AV vegetation and aortic root abscess. Cardio-thoracic surgeons decided surgery was not possible. The patient was referred to the infection consult team who diagnosed *Staphylococcus aureus* endocarditis and recommended 6 weeks intravenous (IV) antibiotics (IV flucloxacillin, IV synergistic gentamicin and oral rifampicin) followed by life-long oral antibiotics; rifampicin and linezolid. However there was concern that rifampicin may interact with linezolid resulting in sub-therapeutic plasma concentrations.
Aim(s)/Objective(s): The aim was to identify if recommended therapeutic steady-state linezolid plasma concentrations were obtained when co-administered with rifampicin.
Method(s): Linezolid was introduced whilst Patient JJ was still receiving the initial IV antibiotic therapy plan. Linezolid levels, 2 hr post dose (Cmax) and trough (Cmin), were obtained and sent to the antimicrobial reference laboratory for analysis.
Results: Linezolid plasma concentrations were reported; Cmax-8.9 mg/L and Cmin-0.8 mg/L. The recommended optimal steady-state Cmax and Cmin linezolid concentrations for the treatment of endocarditis are approximately 15–27 mg/L and 2–7 mg/L respectively.
Discussion and/or Conclusion(s): As a result linezolid was stopped due to concerns of possible clinical failure. Following completion of IV antibiotic therapy Patient JJ was discharged home on indefinite oral rifampicin and clindamycin.

ID: 4755
A rare case of *Ureaplasma urealyticum* pulmonary infection

Harish Reddy[1], Samuel Julie[2]. [1]*Freeman Hospital, Newcastle Upon Tyne Hospitals NHS Foundation Trust,* [2]*Newcastle Upon Tyne Hospitals NHS Foundation Trust*

Background: *U. urealyticum* is a commensal of genito-urinary tract and sometimes causally linked to disseminated infections in newborns, patients with hypogammaglobulinemia, renal transplant, lymphoma or those undergoing rituximab treatments.
Aim(s)/Objective(s): To highlight the rarity of disseminated infection, in this case of lung abscess possibly secondary to epidydimo-orchitis in a patient with follicular lymphoma receiving rituximab.
Method(s): Case: A 51-year old male with follicular lymphoma, on chemotherapy, was admitted with right groin infection and pelvic collection following orchidectomy secondary to epidydimo-orchitis/ruptured testis/scrotal abscess 3 weeks earlier. Urology team performed incision and drainage of abscess. Patient failed to respond on standard antibiotics requiring ITU admission for sepsis. He developed right lung consolidation/cavitation and abscess.
Results: *U. urealyticum* was detected by 16S PCR from pleural fluid. Antibiotics were changed to moxifloxacin for 8 weeks, followed by complete resolution of clinical symptoms.
Discussion and/or Conclusion(s): Ureaplasmas are well-known agents of non-gonococcal urethritis, post-partum fever/abortion, chorioamnionitis and neonatal sepsis. Infection outside urogenital tract is extremely rare in adults. Hypogammaglobulinemia seems to be a risk factor for invasive ureaplasma infection, as demonstrated by various case reports, especially following rituximab treatment. Because Ureaplasma was isolated only from pleural fluid, it is impossible to determine the primary source of infection. It is plausible that the combination of immunosuppression, epidydimoorchitis and surgery (orchidectomy and scrotal abscess drainage) could have led to haematogenous dissemination, resulting in lung abscess/pleural infection.
This case highlights a few diagnostic issues:
- Ureaplasma is a very rare cause of lung abscess, hence often not included in the differential diagnosis.
- Consider 16S PCR in IC patients with negative routine cultures.

ID: 4774

Post malaria neurological syndrome: Are steroids useful?

Farnaz Dave, Ashley Horsely, Andrew Ustianowski, Javier Vilar. *North West Infectious Diseases Unit @ North Manchester General Hospital*

Background: In 2015 the World Health Organisation estimated there were 214 million cases of malaria globally and 438,000 deaths attributable to this potentially life-threatening condition.[1] Between 1300 and 1800 malaria cases are reported each year in the UK, although it is estimated this only represents 65% of the total number of cases.[2] Post malaria neurological syndrome (PMNS) is a rare complication of severe malaria with a prevalence of 1.2 per 1000 in those treated for Plasmodium falciparum Malaria (PFM).[3] It is more common in severe malaria than uncomplicated malaria and has been associated with the use of mefloquine in malaria treatment.[3]

Discussion and/or Conclusion(s): We present a 67 year old Caucasian male returning from The Gambia with severe PFM, having not taken antimalarial chemoprophylaxis. He was treated with intravenous artesunate at a tertiary referral centre but required intubation, ventilation and haemofiltration. Following primary treatment and improvement he subsequently deteriorated, developing generalised weakness and increasingly confusion with a reduced Glasgow Coma Score (GCS). After extensive investigation and exclusion of alternative causes PMNS was diagnosed. He was treated with IV hydrocortisone due to his depressed GCS and absence of any contra-indications. He made a rapid clinical improvement and was discharged without neurological impairment. We explore the decisions leading to the use of corticosteroids in this case and similar presentations reported in the literature.

References

1. World Health Organisation. World malaria report 2015. Accessed 22/6/16 http://www.who.int/malaria/publications/world-malaria-report-2015/en/
2. Cathcart *et al.* Estimating unreported malaria cases in England: a capture-recapture study. *Epidemiol Infect* 2010;138(7):1052e8.
3. Nguyen *et al.* Post-malaria neurological syndrome. *The Lancet*. 1996;348(9032):917–921.

ID: 4788

Case of an HIV positive gentleman with a drug resistant HSV-2 hypertrophic penile ulcer

Sarah Wright, Stephen Woolley, Meg Boothby. *Department of HIV and GU Medicine, University Hospitals Birmingham NHS Foundation Trust*

Background: Herpes simplex virus (HSV) is the most common sexually transmitted disease in HIV positive heterosexuals in the UK. The virus has two main strains: HSV-1 and HSV-2, the latter being the most common strain to cause recurrent genital ulceration. Viral re-activation is closely related to the degree of immunosuppression that HIV confers to the patient: severely immunocompromised patients can develop atypical lesions and recurrences with resistant HSV strains.

Aim(s)/Objective(s): We present the case of a 47 year old, HIV positive gentleman with recurrent HSV-2 penile ulceration which is only responsive to foscarnet.

Discussion and/or Conclusion(s): The patient was diagnosed with HIV in 2003 with a baseline nadir CD4 count of 0 cells/mm^3. Antiretroviral therapy was commenced upon diagnosis, although with variable patient compliance thereafter. The patient has experienced multiple, valaciclovir responsive episodes of genital ulceration since his HIV diagnosis. A severe episode of penile ulceration in 2011 required addition of thalidomide therapy for six weeks to produce complete ulcer resolution. The patient subsequently received high dose valaciclovir prophylaxis for the following two years but required two further eight week courses of thalidomide for severe ulcer recurrences. Unfortunately, there was only partial response to thalidomide in 2014 and no response in 2016. After treatment failure in 2014, the ulcer was biopsied which confirmed HSV-2 infection with no malignant cell transformation. On both occasions of thalidomide failure the patient received intravenous foscarnet therapy (35 and 42 day courses respectively) which successfully produced complete re-epithelialisation of the ulcer.

ID: 4794

***Mycobacterium lentiflavum* causing unilateral cervical lymphadenitis in a previously healthy child: a case report**

Ruth Waldron[1], Helen Creigton[1], Isabelle Delaney[1], Mary Herzig[1], Ivan Keogh[1], Martin Cormican[2]. [1]*University College Hospital Galway,* [2]*National University of Ireland, Galway*

Background: *Mycobacterium lentiflavum* is ubiquitous in the environment including drinking water in some settings. It is increasingly recognised as a species associated with non-tuberculous mycobacterial (NTM) lymphadenitis in previously healthy children. The species is similar in many respects to *M. avium*, *M. simiae* and *M. genevase*. It is possible that it may not have been consistently differentiated from these.

Aim(s)/Objective(s): We report a case of *Mycobacterium lentiflavum* in a three year old immune-competent child with chronic unilateral cervical lymphadenopathy that failed to respond to beta lactam therapy.

Method(s): She had two sequential ultrasounds of her left neck mass, which showed a centrally necrotic mass with a slight increase in size over four weeks.

Results: Routine blood investigations were unremarkable. An MRI neck showed enlarged matted and centrally necrotic left upper cervical lymphadenopathy. She had surgical incision and drainage of her cervical lymph node. Histology reported necrotic tissue mixed with inflammation, suggestive of infection. Acid fast bacilli were not seen on initial microscopy using Ziehl-Neelsen stain. Culture was positive for mycobacteria other than tuberculosis (MOTT) identified as *Mycobacterium lentiflavum* in a reference laboratory. It tested resistant to rifampicin and susceptible to clarithromycin. She was further treated with clarithromycin post-surgical excision of her lymph node with complete resolution of her symptoms.

Discussion and/or Conclusion(s): NTM including *M. lentiflavum* should be considered in otherwise healthy children with chronic unilateral cervical lymphadenopathy. It is uncertain to what extent the epidemiology, clinical course, management and outcome is related to the specific infecting species of NTM.

ID: 4799

Discitis: A rare complication of urosepsis following urological intervention

Keith Yuen, Melis Altunel, Adeel Anwar, Sulman Hasnie, Philip Stanley. *Bradford Royal Infirmary*

Background: A 71-year-old man developed symptoms of systemic infection and generalised body aches five weeks following a trans-urethral resection of prostate (TURP) for previous retention of urine. Blood and urine cultured Morganella species. He was treated accordingly with piperacillin/tazobactam for one week. Good clinical response was observed but ongoing symptoms, now predominantly lower back pain, necessitated a second admission. Although there was no systemic sepsis and inflammatory markers remained normal, a magnetic resonance imaging of the spine confirmed a discitis at the level of his L2 vertebra. Biopsy/aspiration of the spine was not pursued to avoid delay in the initiation of antimicrobial treatment and our patient made a full recovery of symptoms with ertapenem for 6 weeks, and a repeat MRI nine months following the onset confirmed complete resolution of discitis.

Discussion and/or Conclusion(s): Bacteraemia following urological intervention is not unusual, especially for those who had previous instrumentation and indwelling catheters, which predispose colonisation of bacteria in the lower urothelial tract. Patients presenting with urosepsis associated with non-specific symptoms following urological procedures need prompt symptom specific investigations

to diagnose uncommon manifestations of bacteraemia in order to avoid delay in treatment and to improve prognosis. It would also be reasonable to monitor the patients if symptoms are unusual and lingering. In the era of aging population needing more urological interventions alongside increasing antibiotic resistance we are likely to see a greater incidences of Gram negative sepsis following urological intervention and clinicians need to be vigilant in the diagnosis and treatment of complications.

ID: 4806

PVL toxin positive *Staphylococcus aureus*: Two cases of invasive bone infection at a Specialist Orthopaedic Hospital

Leanne Cleaver, Simon Warren, Damien Mack, Shara Palanivel. *NHS*

Background: Panton-Valentine Leucocidin (PVL) toxin produced by *Staphylococcus* aureus has long been reported as a virulence factor that contributes to non-invasive infections such as recurrent boils and furuncles. There have also been case reports of invasive infections such as osteomyelitis and necrotising pneumonia.
Aim(s)/Objective(s): Here we report two patient cases at a specialist orthopaedic hospital with invasive PVL positive methicillin-sensitive *S. aureus* strains.
Method(s): Patient 1 was a 6 year old female with a 4 week history of right lateral thigh pain and subsequent diagnosis of osteomyelitis by computed tomography scan. There was a family history of recurrent boils.
Patient 2 was a 42 year old female with a history of continuing left triceps pain and a subsequent diagnosis of humeral osteomyelitis on magnetic resonance imaging. There was a family history of recurrent abscesses.
Results: Patient 1 was managed with surgical debridement, six weeks of intravenous ceftriaxone and oral rifampicin, and decolonisation of patient and household contacts with naseptin and chlorhexidine.
Patient 2 was managed initially with ultrasound guided drainage of a triceps abscess and six weeks of oral flucloxacillin. The patient is still undergoing care for a second abscess in the femur; therefore decolonisation has not yet been initiated.
Discussion and/or Conclusion(s): Here we highlight that while PVL *S. aureus* can cause non-invasive infection, it can also cause deep seated infection. We reinforce the importance of obtaining a full personal and family history in order to identify patients at risk of PVL *S. aureus* in bone and joint infections and the public health implications this has for further prevention.

ID: 4814

Adverse effects of disseminated Mycobacterium chimaera infection treatment – a case of intolerance to two antimicrobial agents of choice

Vjeran Cajic, Goarana Kovacevic, Pritwish Banerjee. *University Hospitals Coventry and Warwickshire NHS Trust*

Background: Post-cardiac surgery disseminated Mycobacterium chimaera infections (DMCI) are associated with high mortality even when treated with antimicrobial agents of choice. Treatment is challenging due to limited effectiveness of few available agents, the need for lengthy administration of antimicrobials, and their numerous adverse effects (AE).
Aim(s)/Objective(s): To review the adverse effects of treatment of choice for DMCI and alternative therapeutic options.
Method(s): We present a patient with DMCI and severe AEs to rifabutin, ethambutol, and amikacin.
Results: In our experience the alternative agents for treatment of DMCI were significantly inferior to standard regimen.
Discussion and/or Conclusion(s): AEs can render standard treatment of DMCI inappropriate. The remaining antimicrobial options are not supported by clinical experience and may need to include novel treatment strategies.

ID: 4849

Diagnosing pulmonary Kaposi's sarcoma in HIV patients – An interesting case

Stephen Woolley[1], Sarah Wright[2], Kaveh Manavi[2]. [1]*Royal Navy University Hospitals Birmingham NHS Trust,* [2]*University Hospitals Birmingham NHS Trust*

Background: A 33 yo transgender female with a six year history of HIV presented to her regular HIV Clinic with four months history of increasing shortness of breath and increasing haemoptysis. Her CD4 Count was 459 cells/mm^3 and she had an undetectable HIV viral load (<40 copies/mL). Her Anti-retroviral regime was Triumeq. She had completed four cycles of liposomal Doxorubicin for cutaneous Kaposi's sarcoma (KS) which was diagnosed in September 2014. She was treated for a right upper lobe lung infection in November 2015, however a repeat chest x-ray showed a right hilar mass which was confirmed by a CT-Thorax. An Endobronchial Ultrasound was performed however it was abandoned. A repeat Bronchoscopy was only able to obtain two small tissue samples before the procedure was abandoned. Immunocytochemistry for HHV-8 showed clear strong staining in some of the spindle cell foci found in the biopsy. In conjunction with the BAL (bronchoalveolar lavage) HHV-8 DNA PCR result of 150 copies/mL, she was referred for management of pulmonary KS. BAL HHV-8 DNA PCR is not routinely sent.
Discussion and/or Conclusion(s): KS is an angioproliferative tumour associated with HHV-8. It has been reported that detection of HHV-8 PCR in patients with pulmonary KS was highly specific (95%) and a positive predictive value of 78%.[1] The incidence of KS has reduced significantly with combination ARV therapy. This case is interesting as the patient is not immunosuppressed, has a fully suppressed HIV viral load and had a course of chemotherapy for cutaneous KS before the pulmonary presentation of KS.

ID: 4869

An unusual case of dog bite in the asplenic patient

Priyanka Yadhunanthanan[1,2], Mohamed Majeed[2]. [1]*Addenbrookes Hospital Cambridge,* [2]*Cambridge University Hospitals NHS Trust*

Background: We report a case of life threatening gram negative septic shock with multi organ failure following a dog bite in an asplenic patient.
Aim(s)/Objective(s): A 42 year old gentleman was admitted with septic shock of uncertain source.
Method(s): He had a four week history of back pain, frontal headache, loose stools and few days history of worsening petechial rash over the left leg and right forearm. He had splenectomy following sports injury when he was young and confirmed missing his last set of vaccinations.
Results: His lactate was 6.6 mmol/L on admission and the blood culture grew gram negative bacilli. CT scan and Ultra sound scan did not suggest any suspicious lesions. He went on to develop multi organ failure with disseminated intra vascular coagulation, acute liver failure and atrial fibrillation. It was noted in the Intensive Care unit that he had a right index finger abrasion with black margins and was confirmed by the patient as a dog bite injury before the onset of his illness.
Discussion and/or Conclusion(s): An overwhelming post splenectomy infection (OPSI) is rare and associated with a high mortality rate (40–70%). The most common organisms are encapsulated organisms such as Streptococcus pneumoniae (50–90%), Nisseria meningitides, Hemophilius influenzae and Streptococcus pyogens (25%). *Capnocytophaga canimorsus* is a commensal gram negative bacterium present in the saliva of dogs and this case informs us to consider *Capnocytophaga canimorsus* as an infective organism in association with dog bite injury.
The diagnosis was made as septic shock from possible Capnocytophaga canimoris organism.

ID: 4871

Group B streptococcal meningitis in a previously healthy adult male

Lucy Li, Sanjay Cheema, Nupur Goel. *West Middlesex University Hospital*

Background: Group B streptococcus (GBS) is an infrequent cause of meningitis in adults that usually affects elderly patients and those with serious underlying disease.[1] It is recognised as one of the leading aetiological agents of neonatal meningitis.

Case Presentation: We report a case of a previously healthy 26 year old male builder who initially presented with a 4 hour history of worsening severe headache, photophobia and confusion. Lumbar puncture results were consistent with bacterial meningitis and blood cultures grew GBS. The patient was initially treated with intravenous aciclovir, ceftriaxone and dexamethasone and completed a two week course of ceftriaxone making a rapid improvement within 48 hours.

To our knowledge, our patient represents one of the few reported cases of GBS meningitis in a previously healthy young male. We discuss genetic factors that may predispose certain people to develop meningitis with normally harmless microorganisms such as GBS.

Key messages

1. GBS is an infrequent cause of adult meningitis, but carries a high case fatality
2. GBS meningitis must not be considered exclusive to the peripartum infectious period or to patients with co-morbid illnesses
3. Further research is required to characterise any genetic predisposition to both bacterial and viral CNS infections.

Reference

[1] Jackson LA, Hilsdon R, Farley MM, Harrison LH, Reingold AL, Plikaytis BD, Wenger JD, Schuchat A. Risk factors for group B streptococcal disease in adults. *Ann Intern Med*. 1995;123(6): 415–20.

ID: 4874

A curious case of chorio-amnionitis

Jessica Johnson, Jane Democratis. *Wexham Park Hospital*

Background: Case: 29 year old Pakistani lady who presented at 26 weeks gestation with 1 week history of acute fever of unknown origin and PV bleeding. She was initially diagnosed with chorio-amnionitis and delivered prematurely at 27 weeks via caesarian section for foetal distress. Two days later she deteriorated with hypoxia, respiratory distress, ground glass changes on CT Chest, confusion and high protein, low glucose and lymphocytes on CSF analysis. She was transferred to ITU and the baby to the neonatal unit.

Discussion: Empirical treatment was started for listeria, TB, bacterial and viral CNS infection. TB was later identified on CSF PCR and eventually cultured from sputum, urine and CSF, consistent with miliary TB (defined as progressive, widely disseminated haematogenous TB). TB is one of the great chameleons of the ID world, and can be notoriously difficult to diagnose with unique diagnostic challenges present in pregnancy and in the neonate. Diagnosis during pregnancy affords opportunity for specific testing at birth to determine risk of vertical transmission. Congenital TB most commonly presents approximately 24 days after delivery. We suggest the following: prophylaxis should be initiated at birth with full investigation to exclude neonatal TB. All available samples should be cultured, including gastric lavage, mother's placenta and endometrial samples. If TB is confirmed then the baby should be fully treated for TB.

ID: 4882

Deadly zoonoses from cats and dogs: two case reports describing occult transmission of common pet commensals in a vulnerable elderly population

James Wilson[1,2], Shermayne Ng[3], Douglas Fink[4]. [1]*Imperial College Healthcare NHS Trust,* [2]*Hammersmith Hospital,* [3]*Charing Cross Hospital,* [4]*Hospital for Tropical Diseases*

Background: Bacteraemia secondary to *C. canimorsus* and *P. multocida* disproportionately affects the elderly and are associated with a 20–30% mortality rate.

Aim(s)/Objective(s): We present two elderly patients treated for sepsis from organisms typically associated with cat and dog bites. The cases highlight occult modes of transmission and the relative vulnerability of elderly patients to potentially deadly zoonoses.

Method(s): Retrospective review of case notes. Literature review of important zoonoses and age-related immune dysfunction.

Results: The first case describes a 70 year-old lady who has a background of epilepsy and lives with her Italian greyhound. The patient reports frequent dog licking, although denies bites or broken skin. She initially presents with a seizure secondary to hyponatraemia and on day 3 of admission becomes acutely unwell with fulminant sepsis and multi-organ dysfunction. *Capnocytophaga canimorsus* septicaemia is isolated from PCR of blood culture colonies. She makes a full recovery with IV piperacillin and tazobactam. *C. canimorsus* remains a rare cause of fulminant sepsis, with 13 cases previously described in the UK.

The second case describes an 84 year-old lady who presents with rapid onset cellulitis and sepsis associated with a shin laceration after falling against scaffolding. *Pasteurella multocida* is isolated in the blood culture. She is treated with IV ceftriaxone for severe sepsis and makes a full recovery. *P. multocida* is the most common isolate from dog and cat bite wounds however is seldom a cause of bacteraemia.

Discussion and/or Conclusion(s): We conclude with a brief review of the important pet zoonoses and explore the link between ageing and immune dysfunction.

ID: 4885

The case of the unexpected diabetic foot ulcer…ans

Gayti Islam[1], Laura Prtak[1], Joanne White[2], Norman Fry[2], Charlotte Featherstone[3], Rajiv Gandhi[1], Fionuala Creagh[1], Nachi Arunachalam[4]. [1]*Sheffield Teaching Hospitals Foundation Trust,* [2]*National Infection Service, Public Health England, London, UK,* [3]*Animal and Plant Health Agency (APHA),* [4]*South Yorkshire Health Protection Team, Public Health England*

Background: *Corynebacterium ulcerans* is a rare, but leading cause of toxigenic diphtheria in the UK; there is an increasing incidence of reported cutaneous diphtheria infections. We are the first to describe a case of toxigenic *C. ulcerans* associated with animal contact in a patient with diabetic foot infection.

Aim(s)/Objective(s):

- Present an indigenous case of toxigenic cutaneous *C. ulcerans* infection.
- Highlight the importance of laboratory advances in the identification of corynebacterium species.
- Discuss issues regarding management in the context of recently revised Public Health England guidance.

Method(s): Case description: a 58 year old woman presented to outpatients with evidence of an infected hallux ulcer with discussion including summary of existing literature.

Results: A swab isolated corynebacterium species, further identified as *C. ulcerans* by MALDI-TOF MS. Subsequently reference laboratory testing by PCR and Elek test confirmed the presence of the tox gene and toxin production. The patient was systemically well and managed with oral antibiotics in the community. The likely source was a domestic pet (dog/cat), despite both testing negative for *C. ulcerans*. No further cases or carriers were identified.

Discussion and/or Conclusion(s): We present an unusual case of cutaneous toxigenic *C. ulcerans* associated with diabetic foot infection. The use of MALDI-TOF MS enabled rapid and accurate identification of *C. ulcerans*. This technology has become more available in clinical laboratories and is likely to increase case ascertainment. Difficulties and delays in testing the suspected source animals were encountered due to issues surrounding costs. This is likely to remain problematic as *C. ulcerans* is not a notifiable disease in animals.

ID: 4886

A rare case of primary cervical spondylodiscitis due to *Streptococcus pneumoniae* in an immunocompetent patient

Harry Theron[1], Alice Bradley[2], Daniel Chan[3], Marina Morgan[4]. *[1]University of Exeter Medical School & Exeter Spine Unit, [2]Peninsula Medical School, [3]Royal Devon and Exeter NHS Foundation Trust & Exeter Spine Unit, [4]Royal Devon and Exeter NHS Foundation Trust*

Discussion and/or Conclusion(s): Presented is a very rare case of a primary spondylodiscitis due to *Streptococcus pneumoniae* affecting not only the cervical spine in a female patient with no immunosuppression or predisposing risk factors. She presented to spinal-clinic complaining of mid-cervical spinal pain with a flexion deformity, ataxia and bilateral arm pain suggestive of a C6 nerve root irritation. Apart from reporting a severe anaphylactic allergy to penicillin, her past medical history was unremarkable. MRI showed destruction of C5 and C6 as well as a partially liquefied pre-vertebral soft tissue mass compressing the cord for which she had emergency anterior cervical decompression and reconstruction surgery. Due to her penicillin allergy, and need to penetrate biofilm, an empirical combination of intravenous vancomycin, clindamycin and oral rifampicin was commenced, later changed to clindamycin and rifampicin when *S. pneumoniae* was isolated from tissues removed at operation. The isolates were sensitive to penicillin clindamycin, rifampicin and daptomycin. Shortly afterwards, development of a maculopapular rash attributed to clindamycin necessitated changing to oral rifampicin and intravenous daptomycin, both continued for 3 months as an outpatient from which she recovered well. The pneumococcus was serotyped as serotype 6C and is not currently covered by any of the available conjugate vaccines. The recognition of this emerging serotype raises the question as to whether or not the current pneumococcal vaccines need to be developed to include emerging strains such as this. This would appear to be the first reported case of pneumococcal osteomyelitis being treated with daptomycin.

ID: 4898

A case of pneumococcal endocarditis

Jo Quinn[1], Adrian Kennedy[2], Phil Stanley[2], Paul McWhinney[2], Sulman Hasnie[2], Riccardo Guintini[2], Ben Jeffs[2]. *[1]Bradford Royal Infirmary, [2]Bradford Teaching Hospitals*

Background: *Streptococcus pneumoniae* is a rare cause of infective endocarditis, with a high morbidity and mortality. A 53 year-old previously fit and well gentleman was admitted generally unwell and pyrexial with an aortic murmur and visual loss secondary to panuveitis.

Results: Trans-oesophageal echocardiogram showed evidence of aortic valve endocarditis. Five sets of blood cultures grew *Streptococcus pneumoniae*. Vitreous humour cultures showed no growth.

Discussion and/or Conclusion(s): He was treated with intravenous vancomycin and gentamicin, changed to intravenous benzylpenicillin after 2 days with sensitivities. He required a valve replacement on day 12 of admission. His endophthalmitis was empirically treated with intravitreal ceftazidime and benzylpenicillin plus oral steroids. Teicoplanin (10 mg/kg) once daily was started on day 25 to facilitate out-patient administration. The patient was treated with a total of four weeks of intravenous antibiotics, and made a good clinical recovery. Infective endocarditis due to *Streptococcus pneumoniae* mainly affects individuals without a previous cardiac history. It predominantly affects the aortic valve as in this case. Pneumococcal endocarditis is often associated with endophthalmitis and meningitis (Austrian syndrome). Our patient did develop endophthalmitis but there were no signs or symptoms of meningitis, and thus a lumbar puncture was not performed. There is often a high rate of valve destruction and need for valve replacement surgery as in this case. There is a relatively high mortality rate for pneumococcal endocarditis, particularly when associated with meningitis.

ID: 4903

Double vision

Chloe Walsh, Kavita Sethi, Jane Minton. *Leeds Teaching Hospitals NHS Trust*

Background: A 35 year old man who injected drugs presented to A&E with a painful thigh and double vision. He was admitted under surgery and had incision and drainage of a thigh abscess and received flucloxacillin. He underwent CT head to assess the double vision; this was normal. Over the next 48 hours, he continued to complain of double vision. He was haemodynamically stable and apyrexial. He went on to develop dysphonia, dysphagia and stridor. He was referred to Infectious Diseases and on review, he had bilateral ptosis, ophthalmoparesis, non-reactive pupils, dysarthria and flaccid paralysis of the neck, facial muscles and tongue.

Results: A clinical diagnosis of wound botulism was made and the patient was transferred to intensive care, where he received anti-toxin and was intubated. He had further debridement and received penicillin and metronidazole. He made good neurological recovery, with mild diplopia at discharge after 18 days. Culture of pus and tissue from the debridement confirmed *Clostridium botulinum* (type B).

Discussion and/or Conclusion(s): Wound botulism is a rare diagnosis, but well recognised in people who inject drugs (PWID). There were 227 cases in the UK between 2000 and 2015 and this case was one of a cluster of three recently reported to Public Health England. This patient presented with a classical afebrile, descending, flaccid paralysis; anti-toxin and debridement are the key to management. It is essential to maintain a high index of suspicion of wound botulism in PWID due to potentially fatal consequences when not recognised and to facilitate co-ordinated public health response.

ID: 4911

A rare case of infective endocarditis caused by Erysepelothrix rhusiopathiae

Wijitha Weerakoon, Milind Khare, Ann-Marie O'Meara, David Pickard. *Derby Teaching Hospitals NHS Trust*

Background: Erysepelothrix rhusiopathiae is a ubiquitous organism found in decaying nitrogenous waste. Infection in human is occupational related occuring as a result of contact with animals and their products and waste.

Human infection can be a mild cutaneous infection known as erysepeloid. Diffuse cutaneous form and a serious although rare complications with septicaemia and endocarditis have been reported.

Aim(s)/Objective(s): Clinical case review

Method(s): We report a 74 year old female patient who was diagnosed with infective endocarditis caused by Erysepelothrix rhusiopathiae. She presented with a history of being unwell on and off, febrile and lethargic for 6 weeks. She was anaemic and had temperature and a pan systolic mumur on examination.

Results: Echocardiography showed abnormal mitral valve leaflets with vegetation and possible perforation of the anterior leaflet and vegetation on the aortic valve. She was empirically started on intravenous amoxicillin & gentamicin after taking the blood cultures. Blood cultures isolated a gram positive bacilli which was resistant to vancomycin. The organism was identified as Erysepelothrix rhusiopathiae by VITEK and confirmed by the Reference Laboratory.

She was treated with high dose intravenous Benzyl penicillin for 4 weeks with a good outcome with no valve replacement.

No epidemiological risk factors found on this patient. She had no history of penicillin allergy.

Discussion and/or Conclusion(s): Rapid identification of Erysepelothrix rhusiopathiae from other gram positive organisms is critical in the appropriate management of infective endocarditis especially if the patient has a history of penicillin allergy.

ID: 4931

Invasive group B meningococcal disease: an unusual case of diarrhoea

Laura Cottom[1], Huma Changez[2], Andrew Smith[2]. *[1]Department of Medical Microbiology, Queen Elizabeth University Hospital, [2]Department of Microbiology, Glasgow Royal Infirmary, Glasgow*

Background: *Neisseria meningitidis* is a rare but important cause of meningitis and septicaemia. Invasive meningococcal disease is associated with significant morbidity and mortality, with the highest incidence of infection being seen in children (aged <5 years) and younger adults (aged 16–25 years).
Nausea, vomiting and diarrhoea are well-documented symptoms of meningococcal infection however presentation with predominantly gastrointestinal symptoms is rare, being recently described in the 2015 UK outbreak. The unusual presentation with diarrhoea was associated with Group W *N. meningitidis* in teenagers, which progressed to severe disease. To date only one case of fulminant meningococcemia associated with the primary presentation of gastroenteritis has been reported in an elderly patient.
Aim(s)/Objective(s): We report two cases of group B invasive meningococcal disease in elderly patients who presented with primarily gastrointestinal symptoms.
Results: In both cases, the patient had presented with an acute history of vomiting, diarrhoea and fever. One patient remained haemodynamically stable requiring minimal support, the other who had multiple comorbidities presented in septic shock requiring ITU support. Neither patient exhibited any other focus of infection and had no evidence of CNS infection.
Both patients had blood cultures taken on admission that were positive for *N. meningitidis*, later being identified as group B by molecular testing. Both patients were treated with IV Ceftriaxone 2 g BD for 7 days and made a good recovery being discharged home.
Discussion and/or Conclusion(s): Clinical manifestations of invasive meningococcal disease can vary. It is important as clinicians to be aware of atypical presentations to ensure prompt diagnosis and effective treatment.

ID: 4975

A diagnostic conundrum: the role of rapid molecular testing for *Mycobacterium tuberculosis* in detecting mixed infection with non-tuberculous Mycobacteria

Rosalind Saunders, Hemu Patel, Nelun Perera. *University Hospitals of Leicester NHS Trust*

Background: Co-infection with Mycobacterium tuberculosis (MTB) and non-tuberculous Mycobacteria (NTM) is rare, and is most frequently encountered among patients with human immunodeficiency virus infection (HIV). Detection of mixed MTB and NTM in clinical specimens by culture can be challenging and may pose difficulty.
Results: We present a rare case of mixed MTB and NTM infection where the rapid Cepheid GeneXpert® MTB/RIF polymerase chain reaction (PCR) on a primary sputum sample helped confirm a clinical diagnosis of pulmonary tuberculosis infection and directed the laboratory to carefully examine the culture isolates which ultimately confirmed the presence of both MTB and NTM.
Discussion and/or Conclusion(s): This case illustrates the utility of rapid molecular testing for MTB on a primary clinical sample that benefitted both the clinician and laboratory in resolving a diagnostic conundrum.

ID: 4987

Paediatric traumatic anaerobic wound infections

Elan Tsarfati, Olga Lucia Moncayo, Donald Inverarity, Christopher Jones, Hilal Bahia. *NHS Lothian*

A 12-year old male was referred plastics by a neighbouring Trust's emergency room after sustaining an avulsion injury of his left lateral thigh while zip-lining in the forest. The wound had both skin and fat necrosis with underlying infected haematoma. Immediate washout and debridement was undertaken with samples of tissue, swabs and fluid sent to microbiology lab for microscopy, culture and sensitivity and vacuum pump applied. The samples isolated *Staphylococcus aureus* as well as two Clostridia – one identified as a *C. sordellii* and the other as *C. botulinum* using API32 – both sensitive to metronidazole and co-amoxiclav. Public Health England Reference laboratory did not detect *Clostridium botulinum* neurotoxin A,B,E or F and both Maldi-TOF and 16s PCR confirmed the isolate as a *C. sporogenes*, a non-toxin forming *Clostridium* species which can be identified as *C. botulinum* using API32. The patient improved, had a skin graft and was sent home within 12 days. Clostridial wound infections after penetrating trauma are potentially deadly if not immediately debrided and appropriate antibiotics given. Initial management must include surgical debridement and antibiotic therapy. If neurological symptoms had developed it is crucial to have a supply of antitoxin and intensive care facilities available. It is also vital to engage reference laboratories in the identification of clinically significant isolates.

ID: 4989

A case of fulminant sepsis due to *Capnocytophaga canimorsus* in an immunocompetent patient

Amy Bond, Katrina Blackmore. *York Teaching Hospital*

Background: *Capnocytophaga canimorsus* is a slow growing, Gram negative bacillus that is a normal commensal of the dog oral cavity. Human infection is uncommon but may be severe, even in immunocompetent individuals, and is strongly associated with dog exposure or bite.
Aim(s)/Objective(s): We report a case of fulminant sepsis due to *C. canimorsus* in an immunocompetent patient and aim to increase awareness of this potentially fatal pathogen.
Method(s): A previously well 44-year-old male arrived in A&E by ambulance with an 18-hour history of diarrhoea, vomiting and sweating. On arrival he was tachypnoeic, tachycardic and hypotensive, with a petechial/pupuric rash on his upper body and lactate 13.5 mmol/L. He received cefotaxime for potential meningococcal sepsis within 15 minutes of arrival and subsequent doses of piperacillin-tazobactam, linezolid, gentamicin and human normal immunoglobulin. Despite intensive supportive treatment, he died 8 hours after arrival at hospital.
Results: The anaerobic bottle of admission blood cultures signalled positive after 28 hours incubation with Gram negative bacilli seen. The organism failed to grow, but *C. canimorsus* DNA was detected by 16S PCR. Review of hospital records revealed an A&E attendance in 2013 for a bite from his own dog.
Discussion and/or Conclusion(s): Infection with *C. canimorsus* most commonly manifests as systemic sepsis and can be indistinguishable from meningococcal disease. It is usually susceptible to first-line antimicrobials for severe sepsis, including third-generation cephalosporins and piperacillin-tazobactam, but may produce extended spectrum beta-lactamases. It is likely that empiric antimicrobial therapy was adequate in this case, but the patient succumbed to irreversible multi-organ failure and disseminated intravascular coagulation.

ID: 5003

n-MEN broke my patient's heart

Vivek Nayak[1], Kavita Sethi[2]. *[1]Leeds Teaching Hospitals NHS Trust Leeds General Infirmary, [2]Leeds Teaching Hospitals NHS Trust*

Background: A 66-year-old female with no past Medical/Surgical history presented with pleuritic chest pain and progressively worsening dyspnoea for the last 72 hrs. She denied fever or any other symptoms. No h/o recent travel or contact.
On examination, she was afebrile with stable haemodynamics and normal JVP. There were no audible murmurs or pericardial rub. Blood tests revealed raised inflammatory markers with evidence of AKI

and raised cardiac enzymes. The ECG showed diffuse ST elevation in chest leads. Chest x-day showed clear lung fields but minimally enlarged cardiac silhouette. Patient was treated for STEMI and transferred for PCI.

Method(s): On arrival at the tertiary care hospital, the dyspnoea had significantly worsened with haemodynamic instability. Blood biochemistry revealed worsening LFT, cardiac enzymes and AKI. Auscultation of chest revealed muffled heart sounds with tachycardia but no murmurs.

Coronary angiogram was normal. Echocardiogram showed a 5 cms thick collection in the pericardial sac. As patient was symptomatic, pericardiocentesis was performed. 300 mL pus aspirated via a pig tail drain. I.v. piperacillin-tazobactam 4.5 g b.d. was commenced after collecting blood culture.

Results: The biochemical analysis of the pericardial fluid revealed normal protein, very low glucose and raised LDH. Microscopy of the pericardial fluid showed 2 + polymorphs while the Gram stain showed Gram-negative cocci. Hence antibiotic switched to 2 g of i.v. ceftriaxone.

Patient was clinically stable on day 2 while blood parameters improved gradually over next 7 days. The blood cultures did not isolate any organism. Patient underwent surgical pericardiectomy and discharged home after completing total 8 weeks antibiotic therapy.

ID: 5017
Something in the air – diagnosis and outcome

Luke Bedford[1], Sani Aliyu[2], Ruth Kappeler[3]. *[1]Papworth NHS Foundation Hospitals Trust, [2]Addenbrooke's Hospital, [3]Papworth Hospital NHS Foundation Trust*

Background: A 72 year old caucasian male presented with a 3 days of increasing back pain. He had a past medical history of bladder calculi and excess alcohol intake. He reported no foreign travel history and no significant animal or occupational exposures. After admission the patient became confused and feverish, and was treated with 5 days of co-amoxiclav. This was escalated to piperacillin-tazobactam due to persisting fever. An MRI spine showed multi-level lumbar discitis and a psoas abscess. A transthoracic echocardiogram demonstrated a mitral valve lesion with severe mitral regurgitation.

Blood cultures during admission were negative, but were taken on antibiotic treatment. Urine microscopy did not indicate infection. Serology for coxiella and brucella was eventually negative.

The patient switched treatment to IV vancomycin and IV gentamicin, and was transferred to the local cardiothoracic surgery unit for assessment. The patient underwent valve replacement, and the excised valve was sent for microscopy and culture. The gram stain showed gram positive cocci.

Staphylococcus epidermidis was grown from broth cultures but direct cultures were negative. This was not felt to be consistent with the patient's presentation and the valve was referred for 16s PCR. This was positive for *Aerococcus urinae*.

Aerococci are a rare cause of endocarditis, and endocarditis with spinal infection has only been reported in one case of which we are aware. This provided a unifying diagnosis for the patient given his risk factors of bladder calculi, male gender and age.

The patient responded to 4 weeks of treatment with Benzypenicillin and gentamicin.

ID: 5021
Urinary tract infections after supra-pubic catheter insertion in spinal cord injury patients

Piera Santullo, Aga Louw, Fadel Derry. *National Spinal Injury Centre Stoke Mandeville*

Background: Urinary tract infections (UTIs) following catheter insertion is a very common complication and if not diagnosed promptly can lead in severe systemic infection and death.

Aim(s)/Objective(s): The purpose of this study was reviewing the incidence of UTIs after SPC insertion, to note the most common MSU result in patients with UTIs and to notice the relation between rate of UTIs and demographical factors and length of time between the injury and the SPC insertion.

Method(s): A retrospective study of SCI patients that had supra pubic catheter insertion in 2015 was conducted at the National Spinal Injury Centre. Data were collected from electronic medical records. For statistical analysis Minitab 14 was used.

Results: 64 patients were identified. Mean age was 60.5. The incidence of UTIs was 23% (15 out of 64). All the patients had prophylactic antibiotic. 12 patients with UTIs had midstream specimen of urine (MSU) collected. 7 patients had MSU sent after antibiotic commenced. Mixed growth was the most common MSU result. 43 procedures were done during the first admission to the spinal centre. Time from the injury was on average 5 months. No statistical association between occurrence of UTI and age, sex, and time from the injury.

Discussion and/or Conclusion(s): MSU collection pre antibiotic treatment is good practice and it should be a rule to limit the use of wide spectrum antibiotics. Culture tests are futile if taken after antibiotic therapy. UTIs was common in the population examined even using prophylactic antibiotic treatment. Future research should look at the prophylactic antibiotic use and effectiveness.

Topic: Clinical microbiology

ID: 4470
Determination and in silico study of new phylogenetic groups in enteropathogenic *E. coli* in children under five years of age

Taru Singh[1], Shukla Das[2], V. G. Ramachandran[2]. *[1]UCMS & GTBH, [2]UCMS and GTBH*

Background: Enteropathogenic *Escherichia coli* (EPEC) are a leading cause of infantile diarrhea. At present, *E. coli* populations are structured in seven major phylogenetic groups. Strains responsible for extraintestinal infection belong to phylogroups B2 or D than A or B1. Phylogroups E and F contain strains, of which O157:H7 is the best known member, and form a sister group to phylo-group B2 respectively. The phylogroup C is closely related but distinct from phylo-group B1.

Aim(s)/Objective(s): The aim of this study was to gain insight on the distribution of phylotypes in enteropathogenic *Escherichia coli* virulence genes and their association with clinical characteristics in children under five years of age suffering from diarrhea in Delhi, India.

Method(s): 80 diarrheagenic *E. coli* strains were isolated from children with diarrhea and examined for the presence of enteropathogenic *E. coli* by real time PCR after performing antibiotic susceptibility testing. A quadruplex PCR was performed to distribute isolates among seven phylogroups as described by Clermont *et al*, 2013. Statistical analysis was used for the comparison of the categorical data.

Results: 64 (80%) were found to be EPEC. There was predominance of phylogenetic group A (38) followed by phylogenetic groups B1 (14), D (4), F (3), B2 (2), C (2) and E (1). One isolate remain unclassified. In silico studies was performed to understand their relationships.

Discussion and/or Conclusion(s): Phylogenetic studies are important to improve the understanding of *E. coli* population and the relationship of strains and their hosts and disease and it established a link between phylogenetic group and virulence.

ID: 4498
Prevalence of antibiotic associated diarrhoea in UK spinal cord injuries centres

Piera Santullo[1], Mofid Saif[1], Naveen Kumar[2], Joy Chowdhury[2], Ineta Zobina[3], Sreedhar Kolli[1], Jean O'Driscoll[1], Ali Jamous[4], Samford Wong[1]. *[1]National Spinal Injury Centre Stoke Mandeville, [2]Robert Jones and Agnes Hunt Orthopaedic Hospital, Oswestry, [3]Welsh Spinal Cord Injuries Rehabilitation Centre, Rookwood Hospital, Cardiff, [4]Royal Buckinghamshire Hospital, Aylesbury*

Background: Little is known about the use of antibiotics and the extent of antibiotic associated diarrhoea (AAD) in spinal cord injuries (SCI) patients.
Aim(s)/Objective(s): The study aim was to (i) record the use of antibiotics; (ii) establish the prevalence of AAD and; (iii) assess if there is any seasonal variation with respect to antibiotic use and incidence of AAD.
Method(s): A retrospective study was conducted in three British SCI centres during October 2014 to June 2015. Data was collected using a standardised questionnaire. We define AAD as 2 or more watery stools type 5, 6 or 7 (Bristol stool scale) over 24 hours.
Results: Six-hundred-and-twenty-five adults (median age: 55 years, 31.5% female) with SCI (54.4% tetraplegia; 39.3% complete SCI) were included. Of 124 (19.8%) patients on antibiotics, the top three indications for antibiotics were urinary-tract infections, skin-infections and pressure ulcers infection. Twenty-one of 124 (16.9%) developed AAD. No statistical difference was observed on number of antibiotics, severity of SCI, use of proton-pump-inhibitors and H_2-blockers and use of laxatives in both groups. AAD was more common in the summer season when compared to spring, autumn and winter. (32.3%, 6.9%, 16%, 16.1%, $p = 0.04$). AAD was associated with older adults ($p < 0.01$); tetraplegia ($p < 0.01$); hypoalbuminaemia ($p = 0.02$) and elevated body-mass-index ($p = 0.02$). Urinary-tract-infection was more common during the autumn season ($p < 0.01$).
Discussion and/or Conclusion(s): This multi-centre study found AAD is common in SCI patients and maybe a risk factor for poorer outcome and increased hospital cost. Further study testing whether probiotics can reduce incidence of AAD is warranted, especially during summer season.

ID: 4513
Effect on *Staphylococcus aureus* removal and recovery of properties against skin damage by using new hand-cleansing formulation without sanitizers

Kentaro Asaoka[1,2], Shiro Endo[1], Yuki Suzuki[1], Satoru Komuro[3], Tadanobu Nemoto[4], Mitsuo Kaku[1]. *[1]Department of Infection Control and Laboratory Diagnostics, Internal Medicine, Tohoku University Graduate School of Medicine, [2]Department of Research and Development, Household Laboratory, Kao Corporation, [3]Geriatric Health Services Facility "Cosmos", [4]Izumi Orthopedic Hospital*

Background: *Staphylococcus aureus* (*S. aureus*) is known to form a biofilm and colonize on damaged skin of the hands.
Aim(s)/Objective(s): We investigated changes in the quantity of *S. aureus* on the hands and changes in skin damage when using a hand-cleansing formulation with potassium oleate but without a sanitizer (Formulation A), which is highly effective in removing *S. aureus* biofilm and causes minimal skin damage.
Design: Prospective, crossover, double-blind commissioning test.
Setting and participants: This study included 14 medical staff members at Geriatric Health Services Facility "Cosmos".
Intervention: The participants used two types of hand-cleansing formulations (Formulations A and B), each for 4 weeks. *S. aureus* of the hands was cultured from swab samples on agar plates. Surface Evaluation of scaliness (SEsc), an indicator of scaliness and dryness of keratin, was measured using a UV-microscope as a marker of skin damage.
Results: The quantity of *S. aureus* after using Formulation A for 4 weeks was $10^{1.08\pm0.05}$ colony-forming units (CFU)/mL, a statistically significant decrease from the quantity of *S. aureus* ($10^{1.59\pm0.19}$ CFU/mL) just before use ($P = 0.029$). Additionally, the SEsc after using Formulation A for 2 weeks (2.02 ± 0.59) was significantly lower than the SEsc 2 weeks before use (2.85 ± 0.48) ($P = 0.042$). With Formulation B, the quantity of *S. aureus* and the SEsc did not significantly change from before to after use ($P > 0.05$).
Conclusion: Formulation A removed *S. aureus* from the hands of participants, and skin damage on the hands improved. This presumably occurs because Formulation A gently removes *S. aureus* biofilm.

ID: 4558
An evaluation of the clinical utility of positive pneumocystis pneumonia PCR in a large teaching hospital

Isobel Ramsay, Huina Yang, Vanessa Wong, Jumoke Sule. *Addenbrookes Hospital*

Background: Pneumocystis pneumonia (PCP) therapy is not covered by empirical broad spectrum antibiotics used for treatment of pneumonia. A positive PCP-PCR result alone is not diagnostic of infection and may represent colonisation.
Aim(s)/Objective(s): To determine the clinical utility of a positive PCR result in guiding PCP therapy.
Method(s): PCP PCR is performed on all respiratory samples including sputum where requested using an in-house assay. CT value ≤35 is deemed positive.
The laboratory database was searched for patients with a positive result for a 12-month period ending September 2015. Demographic, clinical, diagnostic and therapeutic data that contributed to therapeutic decision making were collected from hospital information system.
Results: We identified 28 patients with a positive result: 27 were immunosuppressed, 1 unknown; 27 had abnormal chest radiology (CT or chest radiograph) with 8 mentioning PCP; samples from four of 19 patients sent for Grocott staining were positive.
Twelve of 28 patients started treatment before sample collection (median 2 days; range 1–7 days), 1 was on prophylaxis. Two were treated after sample collection before the result.
Following the positive result, 14 continued treatment, 9 started treatment and one prophylaxis. Twenty of 23 patients received ≥21 days of treatment. Three of the treated patients died during the hospital admission, 2 were discharged but died within 90 days from admission. The remaining 18 treated patients and all untreated patients survived over 90 days from admission.
Discussion and/or Conclusion(s): A positive PCR helped clinical decision making, with 82% of patients starting or continuing PCP treatment.

ID: 4678
Creatine kinase monitoring in patients receiving daptomycin

Jon Urch, Maha Albur. *North Bristol NHS Trust*

Background: In clinical studies increases in plasma creatine phosphokinase (CK) levels associated with muscular pains and/or weakness have been reported during therapy with daptomycin. The product license states that plasma CK levels should be measured at baseline and at least once weekly during therapy.
Aim(s)/Objective(s): Primary outcomes were (i) Compliance with recommendations of measurement of baseline and weekly CK levels; (ii) significant elevation (>5 times baseline) of CK leading to cessation of therapy.
Method(s): We conducted a retrospective study in a tertiary hospital in England using the pharmacy system to identify patients who had received daptomycin over three years. Baseline CK level was defined as measurement at any point either in the previous six months or on the day of first dose. For patients who had received more than 7 doses, a subsequent level would be expected at around 7 days (margin of error was 2 days).
Results: A total of 108 patients were identified with 117 different patient-episodes. Baseline CK levels were measured in 62 cases (53%) and 55 patients (47%) had no baseline levels. Sixteen patients (14%) had no CK levels measured at all. Eighty-one patients (75%) received more than seven doses of daptomycin and only 33 of these (41%) had a repeat CK level taken at the appropriate time of around a week after starting daptomycin therapy. There were four patients who had a high level during daptomycin treatment.

Discussion and/or Conclusion(s): It is important to monitor CK levels although elevated levels are rare during daptomycin therapy and may return to normal despite continuation.

ID: 4731
A patient with *Aggregatibacter aphrophilus* liver and brain abscesses

Clare Murphy[1], Hannah Soulsby[1], Sarah Macalister-Hall[2], Ronald Andrew Seaton[1], Teresa Inkster[1]. *[1]Greater Glasgow and Clyde NHS Trust, [2]NHS Greater Glasgow and Clyde NHS Trust*

Background: *Aggregatibacter aphrophilus* is part of normal oropharyngeal flora. It is a fastidious and slow growing gram negative coccobacillus and part of the HACEK group of organisms. It is associated not only with endocarditis but case reports have reported liver, brain and epidural abcesses along with bone and joint infections, pneumonia and empyema. Adhesin and virulence factors produced by this organism enable intracranial abscess formation. *A. aphrophilus* can be found in normal canine flora and brain abscesses have been reported in patients who have close contact with dogs.
Method(s): A 66 year old lady presented with 3 weeks of vomiting, diarrhoea and abdominal pain. Computer Tomography (CT) and Magnetic Resonance Imaging scan (MRI) of the abdomen demonstrated multiple liver lesions. Blood cultures grew *A. aphrophilus*. Following deterioration on day thirteen brain CT demonstrated multiple brain abscesses.
Results: This lady was treated with three months of ceftriaxone and six weeks of metronidazole. She then switched to oral amoxicillin 1g tds and completed a year of antibiotics in total. Repeat imaging six months after the end of treatment only showed "tiny flecks of persistent enhancement but no new lesions". She has remained well since completion of therapy.
Discussion and/or Conclusion(s): This case illustrates the importance of taking blood cultures prior to antibiotic administration and communicating clinical information to the microbiology laboratory. Good communication improves the likelihood of isolating fastidious organisms such as *A. aphrophilus* and thus optimising patient management.

ID: 4733
A review of group A streptococcal bacteraemias in Glasgow in 2015

Jenna Gillies, Mairi Macleod. *NHS Greater Glasgow and Clyde*

Background: Since the 1980's there has been a rise in cases of invasive Group A Streptoocci (*Streptococcus Pyogenes*) with associated morbidity and mortality.
Aim(s)/Objective(s): Our aim was to review all cases of Group A streptococcal bacteraemia in Greater Glasgow and Clyde in 2015 to determine the source, treatment plan, typing and mortality rates.
Method(s): Blood culture isolates and patient details were collected using the local Laboratory system "Telepath". Patients with one or more positive blood culture within a 14 day period were classed as a single episode. Electronic records patient records were reviewed.
Results: 49 episodes were identified (33 adult and 16 paediatric). The most common source identified in the adult cohort was cellulitis (36%) followed by no source identified (18%), septic arthritis (9%) and pneumonia (9%). In the paediatric cohort the most common source was skin infection associated with chickenpox (31%) followed by septic arthritis (19%), port mortem finding (13%) and tonsillitis (9%). In both adult and paeditric cohorts, 100% of the isolates were penicillin sensitive. 9% of the adult isolates were resistant to macrolides and clindamycin. 9% of the adult isolates tested against Doxycyline were resistant. All the paediatric isolates were sensitive to macrolides/clindamycin. The most common antibiotic regime was iv Benzylpenicillin and Clindamycin in both adults (33%) and children (71%). The 7 day mortality was 9% in adults and 12.5% in paediatrics. Emm type 1 was the commonest emm type in both groups.
Discussion and/or Conclusion(s): Our findings showed a wide variety of sources and typing/mortality rates in keeping with the rest of Europe.

ID: 4773
Hospital acquired *Clostridium difficile* infections at a large NHS Hospital Trust: Outcomes and insights from a clinical audit

Charlotte Brookfield, Summya Fatima, Emma Bradley, Ivor Cartmill. *Pennine Acute Hospitals NHS Trust*

Background: *Clostridium difficile* infection is associated with high morbidity and mortality. National guidance is available to inform management and this has been translated to local guidelines within Pennine Acute Hospitals NHS Trust.
Aim(s)/Objective(s): The aim of this project was to evaluate local compliance with both national and local standards and to improve service as highlighted.
Method(s): An audit was conducted of all hospital acquired toxin positive *C. difficile* cases (≥72 hours post admission) between 1st January 2015 and 31st December 2015 which totalled 54 patients. Audit standards evaluated severity assessment, MDT involvement, appropriate treatment, monitoring, escalation and stopping of inappropriate antibiotics/proton pump inhibitor therapy. Data was taken from patient notes, infection control notes, the electronic prescribing system and microbiology documentation.
Results: The audit demonstrated that an MDT approach is in place with good communication of results and infection control liaison. There was also evidence to support that patients were being regularly reassessed and concomitant use of broad spectrum antibiotics reviewed. The vast majority of patients (69%) were commenced on oral vancomycin. Mortality outcomes from the audit were comparable to national standards. Areas for improvement include documentation of initial assessment and severity stratification both in clinical and microbiology notes. 26% of patient could not be assessed for severity which could potentially have led to under or over treatment.
Discussion and/or Conclusion(s): Actions from this audit have focused on increased education to clinicians and involvement around initial assessment, therapy choices and documentation. New guidelines have been initiated and supportive assessment tools developed ahead of a planned reaudit in 2016–17.

ID: 4782
A vital role by microbiologists in enhancing the diagnosis of infective endocarditis following positive blood culture and their management

Wijitha Weerakoon[1], Milind Khare[2], Deborah Gnanarajah[3], Rebecca Turner[3]. *[1]Derby Teaching Hospitals NHS Trust, [2]Derby Teaching Hospital NHS Trust, [3]Derby Teaching Hospital*

Background: Consultant Microbiologists noted a high incidence of infective endocarditis recently. Positive blood culture results were the key which made Microbiologists to initiate further investigations in most of the cases.
Aim(s)/Objective(s): To evaluate the compliance for the trust guideline on blood culture collection of suspected infective Endocarditis and evaluate adherence to BSAC guideline for empiric and selective treatment.
Method(s): Forty patients with Infective endocarditis were reviewed over a period of 1 year.
Results: Blood culture timing could not be commented on 23(57%) patients due to the delayed suspicion of Infective endocarditis in this group, as echocardiography was advised by Microbiologists following positive blood cultures.
Out of 40 patients, 12(30%) were found to have Streptococcal species causing endocarditis. Enterococcal species were found in 8 (20%) patients. Six patients had *Staphylococcus aureus*, 1 patient had MRSA, 1 had Staph epidermidis and one patient had *Candida albicans*.

4 patients were found to have unusual pathogens (*Erysephalothix rusipathiae*, *Haemphilus parainfluenzae*, *Eschericia coli*, and *Citrobacter* spp).
7 patients were found to have culture negative Infective endocarditis. Prior antibiotic therapy and inappropriate timing of blood cultures was the most probable reason for a 5 cases of culture negative endocarditis.
Discussion and/or Conclusion(s): Good clinical assessment and consideration of risk factors and taking 3 sets of blood cultures at appropriate time is the key for the diagnosis of Infective endocarditis and its appropriate management.

ID: 4789
Improving the investigation and diagnosis of urinary tract infection in the Emergency Department

Sarah Young, Hugo Donaldson, Felicity Lalloo, Cynthia O'Sullivan, Anu Mitra. *Imperial College Healthcare NHS Trust*

Background: A previous audit showed 15% of patients who presented to Charing Cross adult A&E were diagnosed with a urinary tract infection (UTI). Criteria for diagnosis varied and 47% of patients had a urine culture sent without clear clinical indication. Public Health England provides primary care guidance on UTI diagnosis. This study looked at using this guidance, with the addition of fever and confusion as symptoms which may also present when patients attend hospital, to ensure samples are sent appropriately.
Aim(s)/Objective(s): To improve investigation and diagnosis of UTI in A&E.
Method(s): The number of samples sent for culture 3 months pre and post introduction of the guidance was recorded for the laboratory system. Symptoms and antimicrobial therapy were recorded for all patients who had a sample sent for two weeks pre and post introduction from electronic medical records.
Results: The number of samples sent decreased from 714 to 378 following introduction of guidance. The proportion of patients who had a urine sent with one or no symptoms of UTI fell from 64% to 45%. The proportion of samples with no growth or no significant growth fell from 39% to 24%. Pre-intervention, 34 patients with no symptoms had growth in their urine (asymptomatic bacteriuria). Of these, 10% were commenced on antibiotics. This decreased to 22 patients asymptomatic bacteriuria and 1 received antibiotics.
Discussion and/or Conclusion(s): Introduction of guidance has led to fewer samples sent for culture and decreased the proportion with no growth. It has also decreased the number of patients receiving inappropriate antibiotics for asymptomatic bacteriuria.

ID: 4837
A review of *Actinobaculum schaalii* isolated from clinical specimens in the Newcastle upon Tyne Hospitals NHS Foundation Trust

Katherine Watson, Kathy Walton, Caroline Williams. *Newcastle upon Tyne Hospitals NHS Foundation Trust*

Background: Found in the normal human urogenital tract, *Actinobaculum schaalii* is a Gram positive bacillus related to *Actinomyces.* It has specific growth requirements and is difficult to identify, leading to potential under-reporting of infections. Rapid identification methods, including Matrix Assisted Laser Desorption Ionisation, Time-Of-Flight (MALDI-TOF) mass spectrometry, have increased recognition of its pathogenic role, mainly causing urinary infection in elderly patients with underlying urological conditions.
Aim(s)/Objective(s): To review *A. schaalii* isolates identified in the Trust (January 2011 – May 2016); patient demographics, clinical significance, antimicrobial susceptibilities and patient outcomes.
Method(s): Database search identified all isolates of *A. schaalii*. Bacterial identification was by MALDI-TOF and sensitivity testing by EUCAST methodology for Gram positive anaerobes.
Results: *A. schaalii* isolates were identified from 14 patients, mean age 70 years (range 46–92). The commonest source of infection was urinary; 5 patients had bacteraemia secondary to urosepsis and 5 had positive kidney urine or bladder biopsy cultures. Four presented with scrotal abscess, breast abscess, necrotising otitis externa and pacemaker pocket infection. Some isolates were assessed as clinically insignificant.
Patients who were given antibiotics received empirical piperacillin/tazobactam or co-amoxiclav, to which all isolates were susceptible. 12 patients were discharged; 2 patients with bacteraemia received piperacillin/tazobactam but died shortly afterwards.
Discussion and/or Conclusion(s): Our findings support the role of *A. schaalii* in urinary infection and bacteraemia, particularly in elderly patients with urological abnormalities. Its clinical significance is less clear in other infections. Formal identification is advised to prevent its misclassification as a contaminant in blood and urine cultures and to improve the understanding of its pathogenic potential.

ID: 4838
Echocardiography practice in *Staphylococcus aureus* bacteraemia (SAB): retrospective review at a university teaching hospital

Emma McGuire, Aqtab Mazhar Alias, Rachel Herbert, Eoghan de Barra. *Imperial NHS Healthcare Trust*

Background: SAB is frequently complicated by metastatic deposits and carries a high mortality rate. BSAC guidelines recommend echocardiography within seven days of treatment commencement to assess for cardiac involvement.
Aim(s)/Objective(s): The purpose of this study is to assess the level of adherence to these guidelines at our Trust.
Method(s): All SAB cases between April 2014 and March 2016 were identified from the laboratory system. We conducted a retrospective analysis of clinical and echocardiography data. Data was collected on time, indication and outcome of echocardiography as well as clinical information.
Results: Ninety four patients were identified; 60 (64%) with methicillin-sensitive *S. aureus* (MSSA) and 34 with methicillin-resistant *S. aureus* (MRSA) bacteraemia. Fifty four (57%) had an echocardiogram; either transthoracic echocardiogram (TTE) or trans-oesophageal echocardiogram (TOE); 52 vs 2 respectively. The median time to TTE was 6 days (range 2–17 days).
Forty three (83%) of TTEs were reported with as no evidence for infective endocarditis (IE); 7 TTEs found equivocal features. A TTE report was not found in 2 patients. Forty (43%) cases of *S. aureus* bacteraemia did not have evidence of echocardiography. Eighty five (90%) of patients with SAB had complicated infections. Appropriate indication for echocardiography request was not documented in 11 (16%) of cases.
Discussion and/or Conclusion(s): The low incidence of SAB IE in this series is concerning, published rates are 25%. The reasons for the low echocardiography rate needs to assessed. Time to echo, limited use of TOE and lack of documented indication may have reduced sensitivity.

ID: 4876
***Granulicatella* species: An under-recognised and emerging pathogen in orthopaedic infection?**

Pauline Jumaa[1], Nia Reeves[2], Sarah Mimmack[2], Michael Parry[2]. [1]*University Hospitals Birmingham,* [2]*The Royal Orthopaedic Hospital Birmingham*

Background: *Granulicatella* species are uncommon pathogens and are most frequently reported in cases of endocarditis. There are few reports of *Granulicatella* species causing orthopaedic infection.
Aim(s)/Objective(s): We describe the diagnosis, clinical characteristics and treatment of six consecutive cases of orthopaedic infection caused by *Granulicatella* species from a specialist orthopaedic hospital in the UK.

Method(s): Demographic, clinical and microbiological data on all patients from whom *Granulicatella* species had been isolated were extracted from the Bone Infection Unit database from September 2011 to April 2016.
Results: Six patients from whom *Granulicatella* species were isolated were identified. 5/6 isolates were *Granulicatella adiacens*, 1/6 was *Granulicatella elegans*. 3/6 infections were associated with orthopaedic implants (1 total hip replacement, 1 total knee replacement, 1 femoral endoprosthesis). The other 3 cases comprised infections following hemi-pelvectomy; below knee amputation and excision of a liposarcoma. 5/6 patients had malignancy and 4/6 cases reported dental treatment prior to their infection. All patients who had an implant had a two-stage revision. *Granulicatella* was cultured from deep tissue samples taken at surgery in all 6 cases. The median time to isolate *Granulicatella species* was 4 days (range: 1–8 days). In one case 16s rRNA PCR identified *G. adiacens* in addition to culture. Three patients had polymicrobial infection. In 4/6 cases treatment was successful with eradication of infection. One patient died of causes unrelated to infection.
Discussion and/or Conclusion(s): *Granulicatella* species are rare and challenging pathogens in orthopaedic infection. Our experience suggests that they may be associated with malignancy and prior dental treatment.

ID: 4884
Lightning strikes thrice

Jessica Johnson[1], Jane Democratis[1], Tae Lee[2]. [1]*Wexham Park Hospital,* [2]*John Radcliffe Hospital*

Background: Capnocytopagia Canimorsus infection is rare. A national survey done in the Netherlands identified 0.67 cases per million a year. It has a 28–31% case fatality rate.
We present three cases of severe sepsis, 1 fatal, 2 associated with animal bite, presenting in the last 12 months. Blood cultures grew Gram negative rods but unable to culture or identify by standard laboratory techniques. All were identified as Capnocytophagia Canimorsus by reference laboratory. Capnocytophagia is a rare important cause of severe sepsis that can be difficult to identify in the laboratory.

ID: 4891
Early bacterial infections in liver transplant patients in Gastroenterology Surgical Center, Mansoura University, Egypt

Rawia Badr[1], Rasha Hassan[2], Ghada Mashaly[2], Enas Hammed[2], Amr Yassen[3], Mohammed Wahab[3]. [1]*Faculty of Medicine, Mansoura University,* [2]*Faculty of Medicine,* [3]*Liver Transplantation Unit, Gastroenterology Surgical Center*

Background: Liver transplant is life saving for end stage liver disease patients. Infection following liver transplantation is a serious complication. Few data are reported regarding drug resistance in liver transplantation in Egypt.
Aim(s)/Objective(s): This study was carried out to detect the frequency of post transplantation infections, common sites of infection, types of bacterial isolates, the antibiotic sensitivity pattern and drug resistant bacteria in Gastroenterology Surgical Center, Faculty of Medicine, Mansoura University within a period of eight month from 1st April to the 30th November 2014.
Method(s): This study enrolled 76 patients who experienced living donor liver transplantation (LDLT) during the study period.
Results: The bacterial infection rate was 14/76 patients (18.4%) within the first thirty days post-operative, 6 patients had only one infection, while 8 patients experienced multiple infections (19 infection). Respiratory tract was the commonest site of infection detected in this study (13\25) (52%). Among 14 infected patients enrolled in this study, twenty seven pathogens were detected with the predominance of Gram negative organisms (17\27–63%). Drug resistance among isolates was very high including 12 (44.4%) and 9 (33.3%) isolates multi and extensively drug resistant respectively.
Discussion and/or Conclusion(s): Drug resistance is very common among liver transplant patients post operatively in Gastroenterology Surgical Center Mansoura University. Therefore, a comprehensive understanding of common pathogens in this care facility with their resistance pattern will help in good implementation of infection control policies with an impact on the quality of life of liver transplant patients.

ID: 4937
Royal Victoria Infirmary ventilator associated pneumonia care bundle audit

Katherine Watson, Manjusha Narayanan, Huw McConnell, Phil Laws. *Newcastle upon Tyne Hospitals NHS Foundation Trust*

Background: Ventilator associated pneumonia (VAP) causes increased duration of ventilation, ITU and hospital stay and increased costs. The Department of Health high impact intervention care bundle provides an evidence based approach to reducing incidence of VAP. This audit was prompted by a period of increased incidence of VAP on ITU.
Aim(s)/Objective(s): Review compliance with the care bundle's key action points for elevation of the head of the bed, sedation level assessment, oral hygiene, subglottic aspiration, tracheal tube cuff pressure and ventilator tubing management.
Method(s): A retrospective audit of all patients intubated for 2 or more days on ITU during a 30 day period.
Results: 21 patients (15 men and 6 women, average age 50 years) were ventilated for a total of 118 days. Overall the compliance with the VAP care bundle actions points was very high. 4 of the 6 audit standards had greater than 90% compliance. Sedation level assessment had the lowest compliance (80.5%). 3 of the 21 patients ventilated for ≥2 days (14.3%) were treated for ventilator associated pneumonia.
Discussion and/or Conclusion(s): Results were presented at the ITU clinical governance meeting. One point for improvement was to emphasise the need for complete documentation. We plan to re-audit compliance to check that standards remain high. The audit provided an opportunity to look at culture results of respiratory specimens from the ventilated patients. Most organisms isolated were susceptible to cefuroxime and co-amoxiclav. This supports the use of narrow spectrum antibiotics, especially as no *Pseudomonas aeruginosa* was isolated.

ID: 4941
Sepsis and bleeding post TRUS biopsy of the prostate. Can we identify those at increased risk?

Tomas Austin[1], Tracey Rowe[1], Claire Higgs[1], Mary Parkes[1], Senthooran Kanthasamy[1], Daniel Wilby[2], Helen Chesterfield[2]. [1]*Portsmouth NHS Trust,* [2]*Portsmouth*

Background: Prostate cancer diagnosis is a rapidly evolving diagnostic pathway. TRUS (Transrectal ultrasound) biopsy of the prostate remains one of the main diagnostic tools but can be associated with post-TRUS biopsy sepsis and bleeding.
Aim(s)/Objective(s): Can we predict which patients are at a higher risk of developing sepsis or significant bleeding after a TRUS Biopsy?
Method(s): Potential risk factors for sepsis and bleeding were prospectively recorded in 328 consecutive patients at a single institution using a new proforma sheet over a 9 month period. Data including previous travel, antibiotic use, previous UTIs, hospital admissions, presence of diabetes, immunosuppression, indwelling or intermittent self-catheterisation and anti-coagulant use were recorded. Standard antibiotic prophylaxis (Ciprofloxacin) was given to all patients.
Results: Of the 328 patients undergoing TRUS biopsy 5 (1.5%) patients developed SIRS defined sepsis, 6 (1.8%) required re-admission for rectal bleeding and 2 (0.6%) developed Urinary retention. The Readmission rate was 4% (13). 177 (54%) patients had no risk factors for sepsis. Previous antibiotic use was noted in 75 (23%) patients, prior travel in 61 (19%) and a previous UTI in 32 (10%). Of the patients readmitted with sepsis only 1 had any previous risk factors for sepsis.

70 (21%) patients were taking some form of anticoagulation medication but only 1 of the 70 was readmitted with rectal bleeding.
Discussion and/or Conclusion(s): Risk stratification of sepsis risk for patients undergoing TRUS biopsy remains a challenge. This study failed to identify any factors that increase post-TRUS biopsy sepsis or bleeding.

ID: 4944
Emergence of *Legionella maceachernii* infection in the United Kingdom

Jennifer Poyner[1], Louise Wellington[1], Diane Lindsay[2], Robert Weir[1], Kate Templeton[1], Donald Inverarity[1], Ian Laurenson[1]. [1]*NHS Lothian,* [2]*SHLMPRL*

Background: *Legionella maceachernii* is a rarely identified cause of Legionnaires' disease. There have been only six previously reported cases worldwide. To our knowledge, these are the only two UK cases and maybe the largest case series of *L. maceachernii* ever reported.
Results: Patient one presented in September 2014 with severe pneumonia and a previously undiagnosed, underlying lymphoproliferative disorder. The patient died of this infection eight days later.
Patient two presented in November 2015; a renal transplant patient with cough and diarrhoea. A CT scan showed right basal pneumonia. The patient died eight weeks later with respiratory failure caused by infections including Legionella.
Neither case had travelled during the typical Legionellosis incubation period.
In both cases *Legionella* spp. was detected by in-house qPCR as part of initial respiratory screen. Thereafter confirmed as *L. maceachernii* at the Scottish National Reference laboratory. Levofloxacin was used as the core treatment.
In the UK, Legionellosis is a notifiable disease. Lothian health protection team investigated both cases but no clear source was identified from multiple environmental samples. No household members developed infection.
Discussion and/or Conclusion(s): *L. maceachernii* may be an emerging cause of legionellosis. Diagnosis is dependant on the use of PCR and culture as routine urinary antigen testing and serology do not detect this species.
No clear link was established between the two cases despite both living within Lothian region and no clear environmental exposure was identified.
These two cases (and previous case reports) suggest *L. maceachernii* is associated with a high mortality, particularly in the immunosuppressed.

ID: 4959
What is the normal range for CSF white cell counts in children?

James Cargill, Richard Cooke. *Alder Hey Children's Hospital*

Background: Meningitis can occur in children with 'normal' CSF microscopy. Nevertheless, decisions to treat for bacterial meningitis will often be based on an 'elevated' CSF white cell count (WCC) response. Typically 'normal' CSF WCCs consist of lymphocytes and not neutrophils. CSF WCCs are also higher in normal term infants, compared to older children, though fall rapidly after the first few weeks of life.
Aim(s)/Objective(s): To establish reference ranges for CSF cell counts for routine reporting from a microbiology department in a specialist paediatric hospital.
Method(s): We review the interpretative guidance from NICE and PHE for what constitutes a normal CSF WCC in children. The NICE clinical guidance document CG102 ("Meningitis (bacterial) and meningococcal speticaemia in uder 16s: recognition, diagnosis and management"; 2010 updated 2015) was compared and contrasted to the PHE UK Standard for Microbiology Investigation B27 ("Investigation of Cerebrospinal Fluid"; issue 6, 2015).
Results: In neonates, NICE suggests treatment for bacterial meningitis if the CSF WCC is at least 20/mm^3 but does not comment on the expected number of neutrophils. In older children, >5 WCC/mm^3 or >1 neutrophil/mm^3 is considered abnormal. PHE guidance uses the following age related CSF WCC ranges/mm^3 neonates 0–30, 1–4 years 0–20, 5 years to puberty 0–10, adults 0–5, but makes no comment on the significance of the neutrophil count.
Discussion and/or Conclusion(s): There is no consensus between NICE and PHE guidance as to what constitutes a normal CSF WCC in children. At a local level, microbiology laboratories should agree interpretative criteria with paediatricians which should be reflected in all CSF laboratory reports.

ID: 5009
Carbapenemase-producing organisms: risk factors for infections and mortality at a London Teaching Hospital

Kerry Roulston[1], Yvonne Carter[1], Vicky Pang[1], Gemma Vanstone[2], Indran Balakrishnan[1], Damien Mack[1], Robin Smith[1]. [1]*Royal Free London NHS Foundation Trust,* [2]*HSL Analytics*

Background: At the Royal Free Hospital, screening for carbapenemase-producing organisms (CPO) is performed for all Intensive Care Unit patients. Risk-based screening is performed for private, renal, liver, haematology, infectious diseases, stroke and oncology patients.
Aim(s)/Objective(s): To review all patients with CPO and ascertain risk factors for infection and mortality.
Method(s): A retrospective review of all patients with CPO at the Royal Free Hospital from July 2013 to December 2015 was undertaken. A standardised questionnaire was used to collect data from the laboratory information management system and electronic care records.
Results: A total of 52 patients with CPO were identified (60% male, mean age 65). In-patient hospital stay in the past year was documented for 33 patients; abroad (n = 16), UK (n = 13), both (n = 4). 27 patients (52%) had positive clinical samples and 19 (37%) were treated for infection including; urinary tract (n = 4), pneumonia (n = 3), intra-abdominal (n = 3), intra-abdominal and pneumonia (n = 3), blood stream (n = 2), and osteomyelitis (n = 2). After multivariate analysis, having CPO isolated from clinical samples was associated with infection (OR = 11.86, 95%CI: 1.47–95.46, p = 0.020). The overall 30-day mortality rate was 16% from first positive sample, and in those treated for infection, 42% from the start of treatment. All eight deaths occurred in patients with a history of hospitalisation within the previous 12 months but this association did not reach statistical significance (p = 0.79).
Discussion and/or Conclusion(s): Patients with CPO are at risk of infection with high mortality. The ability to predict patients at increased risk of CPO infection could help to optimise empiric antimicrobial therapy and improve outcomes.

ID: 5062
An unusual case of *Erysipelothrix rhusiopathiae* bacteraemia in a patient with shingles and an overview of cases in GGC

Kirsty Keenan[1], Ashutosh Deshpande[1], Barbara Weinhardt[2]. [1]*NHS GG&C,* [2]*NHS GGC*

Background: We describe the case of a woman admitted with sepsis and an exacerbation of shingles. Bloods were unremarkable with the exception of a relative neutrophilia and CRP of 17. Blood cultures on admission grew Gram positive bacilli which turned out to be identified as *Erysipelothrix rhusiopathiae*. We describe the clinical history and management of this case as well as presenting an overview of laboratory reported cases in our health board.

ID: 5064
Faecal carriage of resistant organisms in the community and in-patient setting

Huan Hsin Cheng[1], Manjusha Narayanan[2], Caroline Williams[2], John Perry[2]. [1]*Newcastle University,* [2]*Freeman Hospital*

Background: The increased prevalence in antibiotic-resistant organisms secondary to overuse or inappropriate use of antibiotics have

become a major problem worldwide due to its significant impact in both the community and the hospital. Some bacteria acquire antimicrobial resistance against a range of antibiotics, which has created a serious concern to the public health. Therefore, it is vital for health professionals to recognize the presences of antibiotic-resistant organisms and to take appropriate actions where required.
Aim(s)/Objective(s): The purpose of this study is to estimate the prevalence of antibiotic-resistant organisms – ESBL (Extended Spectrum Beta-Lactamase producers), *C. difficile*, VRE (Vancomycin-Resistant Enterococci) and MRSA (Methicillin-Resistant *Staphylococcus aureus*) isolated in stool samples of both in-patients and the community, and calculate %carriage of each resistant organism within the two groups.
Method(s): 200 diarrheal stool samples from both inpatients and the community were collected and cultured.. The bacterial growth in the cultured samples were identified and recorded after 24 and 48 hours of incubation.
Results: 25% of samples were positive for Gram negative bacilli resistant organisms; 2% were positive for VRE; 4% were positive for *C. difficile*; 0.5% were positive for MRSA.
Discussion and/or Conclusion(s): The prevalence of ESBL found in this study showed an increasing trend compared to the results of previous studies and the amount of VRE found was lower. The % carriage of *C. difficile* was found higher compared to the values in the past. Only 0.5% was found to be MRSA positive, which is consistent with the decreasing trend suggested in other reports.

ID: 5066
An audit of microbiological sampling and antimicrobial management of patients with suspected infection in the Immediate Assessment Unit (IAU)

Amrita Randhawa[1], Beth White[2], Pauline Wright[2]. [1]*Queen Elizabeth University Hospital,* [2]*QEUH, Glasgow*

Background: Suspected infection is one of the commonest presentations in medical receiving. The use of antibiotics is increasing across NHS Greater Glasgow & Clyde. Obtaining appropriate samples for microbiological investigation before antibiotics are commenced may allow a switch to a narrower spectrum alternative, and reveal when empirical coverage is inadequate.
Aim(s)/Objective(s): We aimed to establish whether appropriate microbiological sampling and antimicrobial management of patients was achieved in acute receiving following the diagnosis of infection.
Method(s): This retrospective single centre study was performed in medical receiving over a 6 week period. Case notes were reviewed daily following a consultant review.
Results: Our study included 62 patients, the majority diagnosed with respiratory tract infections, followed by genito-urinary tract and skin and soft tissue infections. 38 patients (61%) were prescribed antibiotics according to local guidelines and the median time to administration of antibiotics in patients with sepsis syndrome was 3 hours 48 minutes. Of 32 patients with sepsis syndrome, 19 (59%) had at least 1 set of blood cultures taken. With regard to microbiological sampling in patients diagnosed with severe community acquired pneumonia, 67% had sputum samples sent and 11% had atypical screens performed. 15/19 (79%) organisms isolated from sampling were classed as significant. 4/15(27%) pathogens identified were resistant to empirical therapy.
Discussion and/or Conclusion(s): Our study highlights that further work is required to improve antimicrobial sampling in an acute medical receiving setting. If this could be achieved, this could influence future empirical antimicrobial guidelines.

ID: 5093
Effect of *Staphylococcus aureus* PSMα3 toxin on human platelets

Sultan Alnomasy. *University of Reading*

Background: CA-MRSA is a serious human pathogen because its ability to resist the host immune defences. CA-MRSA has the ability to cause acute infections such as meningitis and endocarditis due to production of toxins such as Phenol-Soluble Modulins (PSMs) toxins which play important roles in pathogenesis of *S. aureus*.
Aim(s)/Objective(s): This research aims to study the effect of *S. aureus* PSMα3 toxin on human platelet activity, what effect *S. aureus* PSMα3 have on platelet functions and to identify the mechanism of interaction between *S. aureus* PSMα3 and human platelets.
Method(s): Aggregometer was used to measure the effect of *S. aureus* PSMα3 on platelet aggregation. Flow cytometry was used to measure the effect of *S. aureus* PSMα3 on affinity of integrin αIIbβ3 to fibrinogen and exposure of P-selectin on surface of platelets. Phospho-VASP (Ser239) and phospho-VASP (Ser157) antibodies were used to determine the mechanism of this effect.
Results: *S. aureus* PSMα3 showed ability to inhibit platelet aggregation. The level of fibrinogen binding to integrin αIIbβ3 was significantly reduced in response to thrombin or CRP-XL due to presence of *S. aureus* PSMα3 and exposure of P-selectin on the surface of platelets was also reduced. This indicates that platelet fail to activate and recruit other platelets. *S. aureus* PSMα3 induced VASP phosphorylation in human platelets at residue Ser157.
Discussion and/or Conclusion(s): The experimental data from this study show that *S. aureus* PSMα3 toxin to be an inhibitor of platelet activation. This inhibition due to increasing the levels of cAMP that activate the PKA that prevents any further platelet activation.

ID: 5101
The St George's mycoplasma experience

Charlotte Patterson[1], Jonathan Youngs[2], Joanna Peters[3]. [1]*Royal Free Hospital,* [2]*London School of Tropical Medicine,* [3]*Royal Sussex County Hospital*

Background: *Mycoplasma pneumoniae* is a common cause of upper and lower respiratory tract infections (LRTIs) in Autumn and Winter. Outbreaks are a recognised phenomenon.
Aim(s)/Objective(s): We analysed data from patients diagnosed with *Mycoplasma* at St. George's Hospital, focusing on patient demographics, symptoms and treatment.
Method(s): We performed a retrospective analysis of all adult patients diagnosed with *Mycoplasma* on respiratory PCR September 2015 – April 2016. Data was collected from patient's notes, discharge summaries, electronic pathology, imaging and microbiology results.
Results: 30 adults tested positive for *Mycoplasma*. 60% (18/30) were male, mean age was 45 years (21–82). 43% had an underlying chest co-morbidity or were immunocompromised. Commonest presenting symptoms were cough (93%), fevers (93%), sputum production (79%) and shortness of breath (66%). The mean peak WBC count was 10×10^9/L, CRP 161 mg/L and ALT 142 IU/L. 85% (22/26) patients had abnormal chest X-rays. 87% (26/30) received an initial antibiotic effective against mycoplasma. After PCR result, use of beta-lactams fell from 16 to 6 whilst tetracycline monotherapy rose from 6 to 15 patients. Mean length of hospital stay was 5 days. 47% (14/30) were tested for antibody titre. 3/14 had negative serology but these were all tested within 8 days of symptom onset.
Discussion and/or Conclusion(s): Our cohort were predominantly young, male patients presenting with LRTI symptoms. It included patients with erythema multiforme major, myocarditis and acute delirium, which are all recognised phenomena associated with mycoplasma. Most patients received initial antibiotics effective against mycoplasma and many had treatment rationalised following PCR result suggesting that testing changed practice.

ID: 5109
2 year review of '*Streptococcus bovis*' group bacteraemias in NHS Greater Glasgow and Clyde

Mairi Macleod, Aleksandra Marek. *NHS Greater Glasgow and Clyde*

Introduction: The *Streptococcus bovis* group has an association with endocarditis and gastro-intestinal tract malignancy. This association is strongest with *S. gallolyticus* subspecies gallolyticus previously known as *S. bovis* biotype I. We reviewed the clinical presentation and

antimicrobial susceptibility patterns of *Streptococcus bovis* group blood culture isolates in NHS Greater Glasgow and Clyde.
Methods: Using a list generated using our LIMS system TPath we reviewed the electronic patient records of all patients who had isolated *Streptococcus gallolyticus*, *Streptococcus lutetiensis*, *Streptococcus infantarius* or *Streptococcus pasteurianus* from blood cultures.
Results: We present the breakdown of specialities under which these patients were managed, whether the blood culture was monomicrobial or part of a mixed culture, whether the patient had any prosthetic material, the penicillin minimum inhibitory concentration (MIC), whether a deep source was identified and mortality to date.
Conclusions: Results have guided the training of medical staff locally in managing these infections and allowed us to give locally accurate information to the clinical teams when advising on isolates of these organisms.

ID: 5155

More than meets the eye: Investigating the microbiology of ophthalmic infections in a West London Tertiary Hospital

Kanchana Niruttan, Timothy Rawson, Luke Moore. *Imperial College London*

Background: Antimicrobial resistance (AMR) is a leading patient health and safety issue, yet there is a paucity of data describing bacterial epidemiology among UK ophthalmic populations.
Aim(s)/Objective(s): To explore AMR trends among bacterial isolates from a tertiary eye hospital in west London.
Method(s): Interrogation of the laboratory information management system enabled retrospective identification of all bacterial isolates from ophthalmic samples in fiscal years 2012 to 2015.
Results: 466 isolates were identified from 401 patients (53% male, median age 42, range 1–92). 31.5% of samples were corneal scrapings (147/401), 32.4% were eye swabs (151/466). The remainder included contact lens fluid, wound cultures and skin swabs.
The most common organisms cultured were *S. aureus* (130/466; 27.9%), *P. aeruginosa* (105/466; 22.5%), *H. influenzae* (33/466; 7.1%) and *S. pneumoniae* (29/401; 7.2%). *P. aeruginosa* predominated among corneal scrapings (70/147; 47.6%), while eye swabs disproportionately grew *S. aureus* (50/151; 33.1%).
Of the 466 isolates, 262 were tested against chloramphenicol; 16.7% (44/262) were resistant, including some *P. aeruginosa*, *S. aureus* and *S. marcescens*. 190 isolates were tested against fusidic acid (the active component of fucithalmic), with 23.6% (45/190) resistant, including 33.3% (15/45) of *S. aureus*. Among all 110 *S. aureus* tested against methicillin, 30 (27.3%) were resistant.
Discussion and/or Conclusion(s): Four main pathogens predominate among ophthalmological samples from a tertiary referral London eye hospital. Among these pathogens, AMR for commonly used agents is high. This epidemiology must be integrated into empiric antimicrobial prescribing decisions for this patient cohort. Furthermore, the high rates of AMR suggest sampling for culture and susceptibility from all suspected bacterial eye infections be undertaken, enabling subsequent targeting of antimicrobial therapy.

ID: 5166

An evaluation of the utility of the Sigma Transwab method of recovery of *Neisseria gonorrhoeae* in sexual health clinics in Barts Health, London

Olivia Lucey, Jonathon Lambourne, Heather Dolphin, Martin Hourihan, Selena Singh, Jayshree Dave. *Barts Health NHS Trust*

Background: Sexual health clinics in Barts Health currently perform direct near-patient inoculation of selective plates for *Neisseria gonorrhoeae* (NG) for all suspected cases of gonorrhoea using disposable inoculation loops. The Sigma Transwab is a liquid medium transport swab which is M40-A2 compliant and comprises a cellular polyurethane foam for efficient absorption and release of the specimen. It is designed to improve the recovery of NG, allowing plate inoculation to occur centrally under controlled laboratory conditions.
Aim(s)/Objective(s): To evaluate and compare the recovery of NG from the Sigma Transwab versus the conventional inoculation loop from symptomatic patients in sexual health clinics in Barts Health Trust.
Method(s): 80 patients with suspected gonorrhoea had samples taken with both the Sigma Transwab and the routine disposable loop. The loop was used to inoculate a selective plate in the peripheral clinic and the Transwab was transported to the main laboratory for inoculation. Both plates were incubated in parallel and plates examined at 24 and 48 hours for culture growth.
Results: 18 out of a total of 80 patient samples were culture-positive for NG. The disposable loop method picked up all 18 positive samples whilst the Transwab only picked up 9 positive cultures. All 9 positive NG cultures missed by the Transwab grew after only 24 hours.
Discussion and/or Conclusion(s): The Transwab was found to be inferior to the traditional method with regards its ability to recover viable gonoccocus. Through this evaluation we were able to assess, improve and evaluate current provision of gonococcal culture as highlighted by United Kingdom Accreditation Service.

ID: 5180

***Mycobacterium mucogenicum*: A case report of a persistent rash**

Anna Jarchow-MacDonald, Helen M. Cordey, Alyson M. Bryden, William J. Olver. *NHS Tayside*

Background: *Mycobacterium mucogenicum* belongs to the rapid-growing non-tuberculous mycobacteria. It is commonly found in contaminated water. As pathogen it seems to mainly cause line-associated infections. Only a few cases of skin infections caused by *M. mucogenicum* have been published.
Aim(s)/Objective(s): Here we would like to present a case of a persistent rash with *M. mucogenicum* repeatedly grown from tissue samples.
Method(s): The patient's consent was obtained.
Results: A patient in her mid-sixties was seen by dermatology because of venous eczema and bilateral lower limb oedema. She is known to have rheumatoid arthritis. On physical examination a papular voilaceous rash on the left lower leg was noted. She reports slow progression of the rash over a two year period. The patient had been immunosuppressed due to methotrexate treatment when the rash first developed.
Histopathologically, tissue taken from the rash appeared as non-caseating granulomatous inflammation. Further samples from two biopsies of the rash were sent to the reference laboratory. *M. mucogenicum* grew after 8 days incubation from each sample. The organism tested susceptible to amikacin, clarithromycin, doxycycline, imipenem and linezolid.
Discussion and/or Conclusion(s): This finding was interpreted as clinically relevant. *M. mucogenicum* was found in two biopsies with a concurring clinical and histopathological picture. A prolonged course of doxycycline is planned and follow up of the patient will be under the care of the dermatology team.
Non-tuberculous mycobacteria such as *M. mucogenicum* can cause a wide range of infections. Due to their acid-fast nature, appropriate diagnostic methods should be chosen if an infection with these organisms is a possibility.

Topic: Decontamination

ID: 4505
Advanced technology in combating multidrug-resistant HAIs causing agents

Tatiana Grenkova[1], Eugenia Selkova[1], Margarita Gusarova[1], Marina Sukhina[2]. *[1]G.N.Gabrichevskiy Moscow Research Institute of Epidemiology and Microbiology, Russian Federation, [2]A.N.Ruzhih State Scientific Centre for Coloproctology, Moscow, RF*

Background: A solution of HAI germs' increasing antibiotic and disinfectant resistance problem requires development and implementation of new effective approaches to pathogens destruction.
Aim(s)/Objective(s): To study an effectiveness of pulsed xenon ultraviolet (UV) radiation continuous spectrum generated by 'Alfa-01' irradiating device against clinical strains of MDR bacteria's (*MRSA*, *VRE*, *P. aeruginosa*, *Acinetobacter baumannii*, *K. pneumonia*), *C. difficile* spores and *Mycobacterium terrae* test strain.
Method(s): Plastic and metal surfaces contaminated with the corresponding bacteria and *C. difficile* spores were exposed to radiation. The initial contamination was 10^6–10^7. The surfaces were placed vertically and horizontally against the irradiator at 1.5–4-meters distance. The exposure time was 5 and 10 minutes for bacteria, 4, 8, 16 and 30 minutes for *Mycobacteria*, and 4, 8, and 16 minutes for *C. difficile* spores. Sheep red blood cells were used as biological burden.
Results: After 5-minute treatment of horizontally and vertically aligned plastic and metal surfaces contaminated with bacterial strains (except *C. difficile* and mycobacteria) an effective decrease of microbial count has reached from 4 lg to 7 lg. For mycobacteria and *C. difficile* spores on the surfaces placed vertically at 2-meter distance from the irradiator, the 100% elimination of microorganisms was achieved in 8 minutes, for 4-meter distance – in 16 minutes.
Discussion and/or Conclusion(s): The high efficiency of the continuous spectrum pulsed UV against all tested HAIs pathogens allows for recommending the irradiating device with pulsed xenon lamps for wide use at hospitals.

ID: 4553
Chlorhexidine-impregnated wipes to prevent multi-resistant bacteria colonization in an intensive care unit

Jesus Ruiz[1], Esther Villarreal[2], Monica Gordon[2], Juan Frasquet[2], Álvaro Castellanos[2], Susana Cuesta[2], Marcela Pieruccioni[2], Paula Ramirez[2]. *[1]Hospital Universitario La Fe, [2]Intensive Care Unit. Hospital Universitario La Fe*

Aim(s)/Objective(s): To assess the efficacy of chlorhexidine-impregnated wipes [Clinell-Wash® (Vesismin/Ibersurgical)] to prevent multi-resistant bacteria (MRB) colonization and infection in an intensive care unit (ICU).
Method(s): A prospective observational study in a 24-beds critical care unit was designed. Chlorhexidine wipes were introduced for daily washing of patients undergoing mechanical ventilation as for those patients colonized by MRB.
To assess the efficacy of chlorhexidine wipes, evolution of number of patients and ICU-stays with MRB colonization were analysed during 11 months. Number of nosocomial infections compared with the equivalent period last year was analysed.
Data analysis was conducted through Stata software v.13.0, using Ji-square test to compare proportions. Evolution of patient colonization over the months was evaluated using a linear regression model.
Results: During the intervention period, 1835 patients were admitted to the ICU [mean age: 61.1 (SD: 15) years; APACHE II (Median (IQR): 30 (18–25)].
Following the introduction of chlorhexidine wipes, a significant reduction in the incidence of patients with MRB colonization over the months was observed ($\beta = -0.04$; $r2 = 0.438$; $p = 0.027$). No significance reduction in number of ICU-stays with MRB colonization was found ($r2 = 0.03$; $p = 0.279$). A significant reduction in the overall incidence of nosocomial infection in the intervention period compared to the equivalent period last year was observed (2.23% vs 3.91%; $p = 0.004$). No contact dermatitis was observed in treated patients.
Discussion and/or Conclusion(s): Chlorhexidine-impregnated wipes reduces the incidence of colonization and infection by MRB, appearing as a practical tool to prevent nosocomial infections in critical care units.

ID: 4584
Value of clean monitoring in endoscope reprocessing

Henning Reuter[1], Sabine Heiligtag[1], Walter Popp[2], Nina Parohl[2]. *[1]3M Germany, [2]Hykomed GmbH*

Background: Recent reports of endoscope-associated outbreaks with MDROs have shown that reprocessing of flexible endoscopes remains a challenge. Improved quality control by close monitoring of the cleaning of endoscopes can contribute to the identification of endoscope at risk for patient to patient transmission.
Aim(s)/Objective(s): Demonstrate contribution of clean monitoring with Adenosine-triphosphate (ATP) bioluminescence test in the reprocessing of flexible endoscopes to the overall process quality.
Method(s): The bedside flush, manual cleaning and automated endoscope reprocessing (AER) process steps of routine reprocessing of 60 clinically used gastroscopes have been monitored on six non-consecutive days with an ATP test in a German teaching hospital.
Results: The study shows an unstable cleaning outcome of the reprocessing. Although the cleaning performance of the manual cleaning and the AER was relatively stable, the study suggests that the endoscopic procedure or the effectiveness of the bedside flush drives the overall outcome of the endoscope cleaning. Influence of the condition of specific endoscopes and the invasiveness of the procedure are shown.
Discussion and/or Conclusion(s): Clean monitoring of the reprocessing of flexible endoscopes with a rapid, sensitive and quantitative ATP test can help identifying endoscopes at risk to contribute to pathogen transmission and can provide immediate feedback to the operator. A systematic surveillance can provide improvement to the overall quality control of reprocessing endoscopes and helps hospitals in documenting their process quality.

ID: 4686
Water, water, everywhere, and all the wards have sinks: a demountable tap mixer assembly that can be processed in a washer disinfector

Christina Bradley, Martyn Wilkinson, Adam Fraise. *Hospital Infection Research Laboratory, Queen Elizabeth Hospital Birmingham*

Background: Infections with *Pseudomonas aeruginosa* have been linked to hospital water supplies; the source in a Belfast outbreak was thought to be handwash basin taps (ref). The guidance given in HTM 04-01 Addendum states that healthcare premises should have flushing regimes in place, and advise against discarding patient-associated fluids, e.g. bathing water, down the sink. However, although this may reduce or delay the formation of biofilm, it will not prevent it. A tap capable of being easily removed from the plumbing system, and being dismantled for thermal disinfection, has been developed by Armitage Shanks. In this study the Markwik21 tap assembly was artificially contaminated with a biofilm-producing strain of *P. aeruginosa* and processed in a validated benchtop thermal washer disinfector (WD).
Method(s): A Markwik21 tap was dismantled, each component contaminated by immersion/flushing with a suspension of the test organism, and left in a humid environment for 7 days. The components were then processed in a WD. Sampling occurred before and after disinfection to establish pre and post disinfection counts. Testing was performed in triplicate.

Results: The Markwik21 tap was effectively decontaminated in a compliant thermal washer disinfector. An acceptable reduction in *P. aeruginosa* was achieved, i.e. >5 $\log_{10}$.
Discussion and/or Conclusion(s): Testing demonstrated that this tap assembly can be effectively decontaminated in a WD. The advantage of such processing is that cleaning is part of the WD cycle, assisting in the removal of biofilm. Further studies are planned to support the use of this tap in clinical areas.

ID: 4761
Sorting fact from fiction with ATP testing – a new algorithm for improved sampling in cleanliness measurement using ATP testing

Greg S. Whiteley[1,2], Trevor Glasbey[3]. [1]*Western Sydney University,* [2]*Western Sydney University & Whiteley Corporation,* [3]*Whiteley Corporation & Macquarie University*

Background: Rapid testing for Adenosine Triphosphate (ATP) is becoming a commonly used method for quantitative assessment of surface or device cleanliness. ATP testing is easy to use, is a broad measure of cellular contamination, and provides a real time alternative to visual inspection.
However, ATP testing is subject to variability problems that affect the interpretation and usefulness of the results. This variability includes inherent variability arising from device performance issues that causes imprecision and difficulties with the limits of quantitation.
Aim(s)/Objective(s): To improve the validity of cleanliness measurements using ATP testing.
Method(s): A series of experiments has defined the dynamic range of several available ATP testing systems. The performance characteristics indicated both imprecision (due to variability), limits of detection and limits of quantitation for the devices tested. Statistical methods were applied in the development of a new sampling algorithm to overcome the risks of variability in practical ATP testing.
The sampling algorithm uses a three tiered, brand specific cleanliness thresholds and a cleanliness verification step to ensure that surface cleanliness is verified using a validated cleaning method based on existing aseptic techniques.
Results: The results of the algorithm have indicated that the method is easy to use and provides the user a quantified, more accurate measurement of the real cleanliness status of surfaces and devices.
Discussion and/or Conclusion(s): The results indicate that this new ATP sampling algorithm mitigates the inherent variability and can be used in applications including cleanliness monitoring of environmental surfaces and medical devices.
This has important implications for improving cleanliness monitoring using ATP testing.

ID: 4770
Decontamination of general medical ward facilities with UV-C rays during construction in Royal Lancaster Infirmary

Vanda Plecko, Monika Pasztor, Peter Burkhart. *University Hospitals of Morecambe Bay NHS Trust*

Background: Outbreaks of invasive aspergillosis have been connected with on-going building works in hospitals. Moreover, during construction there is possibility to have increase in the numbers of the other opportunistic microorganisms besides Aspergillus. Reduction of overall bioburden in the patient environment and on patient equipment is linked with reducing the risks for hospital acquired infections. Ultra-V system (Hygiene Solutions) utilises UV-C rays to rapidly inactivate DNA with no ventilation restrictions or vapour-impermeable requirements.
Aim(s)/Objective(s): Aim of this project was to evaluate indicative 'snapshot' of environmental and air contamination before and after UV-C decontamination during the ongoing construction on a general medical word in Royal Lancaster Infirmary.
Method(s): In total 13 rooms were tested. Testing included total viable count (TVC) sampling before and after UV decontamination. Air sampling with Merck air sampler was performed for all tested rooms before decontamination, immediately after (8–20 hours) and week after. Total fungal and bacterial counts in the air were determined.
Results: TVC showed reduction from 73.3 to 1.7 which was obtained after the decontamination. The highest TVC levels were recorded for toilet roll holders, bin lids and sinks. Air samples showed highly variable numbers of different moulds with dominating Penicillium and other less virulent moulds with evidence of reduction following decontamination.
Discussion and/or Conclusion(s): UV-C decontamination achieved a significant level of reduction of microorganisms detected on the surfaces. Lower environmental contamination minimises the risks for infection during construction and improves patient's safety.

ID: 4819
Influence of copper and its alloys against resistant strains of coagulase-negative staphylococci isolated from touch surfaces of Polish hospital units

Anna Różańska, Agnieszka Chmielarczyk, Dorota Romaniszyn, Małgorzata Bulanda. *Jagiellonian University Medical College*

Background: Coagulase-negative staphylococci (CNS) are the predominant contaminant flora of the Polish hospital environment.
Aim(s)/Objective(s): The objective of the study was to evaluate the antimicrobial properties of copper and selected copper alloys, against CNS highly resistant to antibiotics, isolated from touch surfaces of Polish hospital units.
Method(s): Modification of *Japanese standard* – a method for testing antimicrobial properties of surfaces made of non-porous materials was used in the study. Assessment of antimicrobial properties was performed on copper alloys: CuZn37, CuSn6, CuNi12Zn24 and Cu-ETP as positive control and stainless steel as negative control. Bacterial strains used in the study were: *Staphylococcus haemolyticus* and *Staphylococcus epidermidis* – strains resistant to beta-lactam antibiotics, aminoglycosides, fluoroquinolones, clindamycin, erythromycin and trimethoprim/sulfamethoxazole vs. strains of these species forming a biofilm and, for comparison – *Stapylococcus aureus*.
Results: The strongest antimicrobial properties against the tested strains were found for pure copper – total elimination of bacteria from the level of 10^7 CFU/mL was observed after approximately 180 min. A faster total reduction of the density of bacterial suspension was also observed in case of SA comparing to CNS strains. Effectiveness comparable to that of pure copper was demonstrated for tin bronze (CuSn6).
Discussion and/or Conclusion(s): The results demonstrated that copper alloy materials exhibit strong antimicrobial properties against the study strains. It means that the use of equipment made of materials with antimicrobial properties can help to limit the spread of antibiotic resistance genes in the hospital environment.
The work was carried out in the framework of the NCBiR project PBS3/A9/32/2015.

ID: 4830
Universal decolonization of MRSA carriers is a successful strategy

Pascal De Waegemaeker, Raina Ablorh, Els De Brabandere, Jerina Boelens, Isabel Leroux-Roels. *Ghent University Hospital*

Background: Reports on decolonization of MRSA carriers have shown a low success rate in patients colonized in multiple positive sites and/or with risk factors (intravenous lines, indwelling catheters, wounds).
Aim(s)/Objective(s): We wanted to evaluate whether it is useful to perform a decolonization attempt in these patients, to promote universal rather than targeted decolonization in our center.
Method(s): From October 2012 to May 2016, all MRSA carriers were decolonized using a 5 day treatment protocol including chlorhexidine body and mouth wash, and mupirocine nasal ointment. Data were collected on the extent of colonization (nose, throat, perineum or other sites) and on other risk factors that could influence the outcome. Control screening samples were taken after at least 5 days of completion of the protocol.

Results: 122 MRSA patients were treated according to the 5 day protocol. In patients colonized in only one location (nose, throat or perineum) (n = 35), the decolonization protocol proved to be effective in 74.3% of cases. In patients colonized in multiple locations (n = 44) and/or with risk factors (n = 56), the treatment was successful in respectively 54.5% and 57.1% of the patients. Most patients (81.4%) became negative after just one attempt. Overall, 67% of the carriers remained negative up to one year of follow up.
Discussion and/or Conclusion(s): The success rate of MRSA decolonization is just below 70%, even with patients estimated to have a low chance of success included. Therefore, a universal rather than a targeted MRSA decolonization strategy seems to be justifiable.

ID: 4833
Are ATP and protein suitable tests for benchmarking cleaning of surgical instruments?

Dayane Costa[1,2], Lillian Kelly Lopes[3], Roel Castilho[4], Honghua Hu[5], Anaclara Tipple[3], Karen Vickery[5]. *[1]Surgical Infection Research Group, Faculty of Medicine and Health Sciences, Macquarie University, Sydney, Australia; [2]Faculty of Nursing, Federal University of Goias, [3]Faculty of Nursing, Federal University of Goias, Goiania, Brazil; [4]Sterilizing Service Unit, Macquarie University Hospital, [5]Surgical Infection Research Group, Faculty of Medicine and Health Sciences, Macquarie University, Sydney, Australia*

Background: Use of adenosine triphosphate (ATP) and protein tests have increased in Central Supply Sterilizing Department, however, its use is not completely standardized and requires a validation of benchmark according to the instrument design.
Aim(s)/Objective(s): To determine if Clean-Trace ATP and protein (3M) are suitable tests for benchmarking cleaning of surgical instruments.
Method(s): Six orthopaedic flexible drill bits (FDB) were contaminated with trypic soya broth containing 5% sheep blood and *Staphylococcus aureus* (10^8 cells/mL), allowed to dry for 4 hours and subjected to pre-rinsing, manual or automated cleaning. ATP present on the instrument surface and lumen, surface protein (50 µg – qualitative test), and bacterial contamination (Colony Forming Units) were determined after each step. The experiment was repeated five times.
Results: The protein test was insensitive failing to detect 40% of the FDB subjected just to pre-rinsing required cleaning, presenting them as clean or just requiring re-rinsing, despite ATP readings above 20,000 RLU. ATP levels and microbial load significantly decreased following either manual or automatic cleaning ($P < 0.001$). The median values for surface ATP were 10,780, 73 and 18 RLU for pre-rinsed, manually cleaned and automatically cleaned instruments, respectively. Similar results were obtained for luminal ATP. The microbial load on pre-rinsed instruments was $Log_{10}7.8492$ which decreased 3 logs with manual cleaning, and automatic cleaning removed all microbial contamination (>7.8 log_{10} reduction).
Discussion and/or Conclusion(s): The protein test used is unsuitable for point-of-use testing to determine if instruments are clean. ATP demonstrated suitability for point-of-use test, however further analysis of RLU variability is needed to validate a benchmark.

ID: 4852
How are Italy's bone marrow transplant units decontaminated in case of multi-drug resistant organisms? National survey by the Nurses' Group of GITMO

Iris Agreiter[1], Laura Orlando[2], Gianpaolo Gargiulo[3]. *[1]Division of Haematology and BMT Centre, San Maurizio, Bolzano, [2]Division of Clinical Haemato-Oncology, European Institute of Oncology, Milano, [3]Division of Clinical Haemato-Oncology, AOU Federico II, Napoli*

Background: Infections by multi-drug resistant organisms (MDRO) represent a huge problem in Bone Marrow Transplant (BMT) units and decontamination has turned to an actual topic.
Aim(s)/Objective(s): The Board of Nursing Referents Section of the Scientific Society "Italian Group of Bone Marrow Transplant" (GITMO) has the aim to detect and improve hidden procedures of daily hospital routine.
Method(s): After a literature review, a questionnaire composed by 72 questions was sent to all 100 Italian BMT centres. From 21st February until 31st March 2016, the principal BMT nurse of each centre filled out the questionnaire on a Google Drive platform. The main domains were six: infection control, screening, isolation, decontamination, collaboration and communication.
Results: Seventy-two centres divided into 50 adults, 14 paediatrics and 8 mixed departments, answered to the questionnaire. Forty-eight units are composed by a BMT centre and a haematology division, 24 are only BMT centres. Patient's rooms colonised by MDRO are cleaned twice a day in 87% of cases and left as last room to clean in 92% of units. Cleaning personnel gets in 76% of centres a specific education on MDRO decontamination and is in 91% of the units throughout composed by the same cleaners. Microbiological controls after final decontamination take place in 57% of BMT departments. Particle count, plates and swabs are the most common procedures to control the effectiveness of decontamination.
Discussion and/or Conclusion(s): The national survey gives a snapshot of the current situation in Italy. Many procedures could be improved and standardised in order to enfeeble MDRO in BMT units.

ID: 4912
Evaluation of disposable pre-impregnated wipes versus a standard two-step protocol for cleaning and disinfection of high-touch surfaces in intensive care

Beatrice Casini[1], Anna Righi[2], Nunzio De Feo[3], Serena Giorgi[2], Lavinia Zezza[2], Enrico Tagliaferri[4], Paolo Malacarne[3], Gaetano Privitera[2]. *[1]Department Translational Research, University of Pisa, N.T.M.S., [2]Department of Translational Research, University of Pisa, N. T.M.S., [3]Anesthesia and Intensive Care Unit PS, University Hospital, [4]Infectious Disease Unit, University Hospital, Pisa, Italy*

Aim(s)/Objective(s): To evaluate the effectiveness of pre-impregnated wipes in reducing environmental bacterial burden when compared to the current standard protocol (SP).
Method(s): High-touch surfaces in a 12-bed Intensive Care Unit were cleaned and disinfected either by the daily standard two-step protocol, application of an alcohol-based detergent Keradet (Kiehl), followed by a chlorine-based disinfectant Antisapril 2% (Angelini), or by using disposable wipes impregnated with quaternary ammonium compounds/Biguanide (Clinell Universal Wipes, GAMA).
Effectiveness in reducing microbial burden of high touch near-patient surfaces was assessed by a contact plate method on five sites immediately pre- procedure and post- at 0.5, 2.5, 4.5 and 6.5 hours. The study was repeated five times over three months, sampling 11 beds for each protocol (560 sampling sites).
Results: Pre-impregnated wipes demonstrated a decrease in mean Total Bacterial Count (TBC) from 43 to 16 CFU/24 cm^2 (63.9%) after 0.5 hours vs. a reduction from 27 to 16 CFU/24 cm^2 (40.3%) for the SP. In subsequent 2.5, 4.5 and 6.5-hour tests, mean TBCs decreased respectively by 64.1%, 65.6% and 74.1% with disposable wipes, while for SP methods, TBCs showed increases of 8.3%, 20.7% and 24.3%.
According to the Italian hygiene standard (ISPESL, 2009), when using pre-impregnated wipes 14 of 180 sites of sites showed TBC >50 CFU/24 cm^2 (Hygiene Failures) whereas for SP 32 of 176 sites were classed as failed (Chi squared, $p < 0.05$).
Discussion and/or Conclusion(s): Disposable wipes used on near-patient inanimate surfaces provide a more effective alternative to the usual two-step procedures, considering the potential residual activity.

ID: 4952
Dry biofilms: implications in clinical environmental disinfection

Jawal Said[1], Tamara Perez Outeiral[2], Jean-Yves Maillard[2], Martin Kiernan[3]. *[1]Cardiff University/GAMA Healthcare Ltd., [2]Cardiff University, [3]University of West London*

Background: Clinical surfaces may become contaminated with microorganisms. Cleaning and disinfection are crucial interventions

in minimising the spread of healthcare associated infections. Viable organisms have been shown to persist in dry biofilms even after terminal cleaning and disinfection. This work demonstrates the use of dry biofilm testing to investigate the efficacy of various disinfectant approaches.
Method(s): *Staphylococcus aureus* (NCIMB 9518) biofilms were grown in Tryptone Soya Broth on 10 mm stainless steel discs (2B finish) at 20–23°C for 12 days with rotation between wet and dry phases at 37°C every 48 h. Dry biofilms were exposed to disinfectant solutions with varying exposure times or wiped with disinfectant wipes using the ASTM2967-15 test. For comparison wet biofilm of *S. aureus* grown for 48 h and dried *S. aureus* inoculum (EN 13727) were used. Disinfectants included chlorine, glutaraldehyde and peracetic acid. Assessment of efficacy measured: biomass reduction by crystal violet staining, biofilm recovery indicated by a pH indicator colour change and transfer of bacteria from surface to surface.
Results: Treatment of dry biofilms with wipes showed 60–90% reduction in biomass while biocidal solutions alone showed little reduction in biomass. Both modes of treatment did not achieve the ideal 3–4 $\log_{10}$ reduction in CFU; some biofilm recovery was seen with the colorimetric medium after 24–48 h. Wet biofilms grown for 48 h showed no recovery in the colorimetric medium after 24–48 h. Dry biofilms, in contrast to 'wet' biofilms and planktonic cells, were found to persist after biocidal exposure highlighting the need for an improved anti-biofilm approach.

ID: 4981
Effectiveness of a multimodal intervention to improve the standard decontamination practices among the healthcare workers of Bangladesh

Lutfe Ara[1], S.M. Niaz Mowla[1], Shaikh Mahmud Kamal Vashkar[1], Delwar Hossain[2], Utpal Kumar Mandal[1]. [1]*icddr, b,* [2]*Dhaka Medical College & Hospital*

Background: The necessity of proper disinfection and sterilization cannot be overemphasized for successful prevention and control of Healthcare Associated Infections (HAIs). Improper sterilization poses serious threat of infections over the patients.
Aim(s)/Objective(s): To assess the impact of a multimodal intervention program to improve the decontamination practices of medical instruments among the healthcare workers (HCWs) at secondary level healthcare facilities in Bangladesh.
Method(s): A yearlong quasi experimental study was conducted at two secondary level healthcare facilities in Bangladesh, where a total of 772 HCWs participated that included physicians, nurses, laboratory technicians, ward boys and cleaning staff. The multimodal intervention program consisted of education on standard decontamination process, skill enhancement through on job training and improvement of decontamination facilities. Compliance to standard decontamination practices was measured through direct observation before and after the intervention.
Results: Continuous improvement of compliance on standard methods of disinfection and sterilization was seen after the intervention. Remarkable compliance was achieved- 78.95% at the Institute of Child and Mother Health (ICMH) and 86.95% at General Hospital, Sirajgonj (GHS) ($p < 0.0001$). Indicator tape for sterilization was introduced at both hospitals and the compliance significantly increased from 0% to 57.90% at ICMH and 0% to 65.22% at GHS ($p < 0.0001$). Cleanliness of sterilization room improved from 63.64% to 89.47% at ICMH and 43.59% to 95.65% at GHS.
Discussion and/or Conclusion(s): The study results show that the implemented multimodal intervention improved the standard decontamination practices among the HCWs, which in turn will play a critical role in preventing and controlling healthcare associated infections.

ID: 4986
Can a single-bed space within a multi-bedded bay be safely decontaminated with UVC without posing a risk to other patients and staff?

Jenny Child[1], Samantha Horridge[2], Andrew Weedall[2], Douglas Clarkson[2]. [1]*Harrogate & District Foundation NHS Trust,* [2]*University Hospitals of Coventry & Warwickshire*

Background: Decontamination of single bed-spaces within multi-bedded patient bays with HPV or UVC can be logistically difficult to achieve if emptying the whole bay of patients puts too much operational pressure on the hospital as a whole.
UVC is easily blocked by solid objects including fabric and glass.
Aim(s)/Objective(s): The aim of this study was to establish whether it would be safe to use a UVC source to decontaminate a single-bed space within a multi-bedded bay screened only by standard hospital privacy curtains.
Method(s): The study was carried out a clinical simulation rooms in the education centre of University Hospital, Coventry, fitted out as a three-bedded bay found elsewhere in the acute hospital. Each bed space is fitted with standard issue flame-retardant 100% polyester curtains (Sunlight, UK).
A UVo™ system (Hygiene Solutions, Kings Lynn, UK) was operated within a bedspace behind closed privacy curtains, and UV levels outside the curtains measured using a Bentham dmc150 double monochromator system (Bentham Instruments Ltd, Reading, UK) spectrum range 250–410 nm.
Measurements at head, abdomen and ankle heights were made with the use of a polystyrene, body shaped maniken placed outside the closed curtains.
Results: The lowest value of effective treatment dose was equivalent to around 11 times that of the maximum permissible UV exposure and the maximum treatment dose was around 260 times this exposure limit.
Discussion and/or Conclusion(s): It would not therefore be advisable to operate a UVC system with only hospital curtains screening off the bedspace from other patients or staff.

ID: 4997
Air and steam still do not mix – failure of non-vacuum benchtop steam sterilizers

Andrew Smith[1], Sandra Winter[1], David Lappin[1], George McDonagh[1], Brian Kirk[2]. [1]*University of Glasgow,* [2]*3M Healthcare*

Background: Although steam sterilization failures have been reported due to failure to remove air from the load, a classic example being the Devonport incident from the 1970's. There is still widespread denial in some healthcare groups that the presence of air can contribute to sterilization failures.
Aim(s)/Objective(s): The aim of this study was to investigate steam penetration into dental handpieces using benchtop non-vacuum sterilizers commonly used in dental practice.
Method(s): Three different types of handpieces were investigated for steam penetration into handpiece lumens using chemical indicators (CI), biological indicators (BI) and thermocouples/data loggers (TC). Non-vacuum (type N) Benchtop steam sterilizers were investigated in both the laboratory and general dental practice setting. In the laboratory we tested 4 different makes with 3 machine models for each make. In the General Dental Practice setting we tested seven non-vacuum benchtop sterilizers.
Results: Results in the laboratory demonstrated BI failure for 15/1152 tests, CI failure for 9/1152 tests, typical delays in reaching sterilization temperature ranged from 0 to 165 seconds detected using TC. In general dental practice we detected BI failure rate of 34/378 tests, CI failure rate of 25/378 tests. And TC failure rates of 28/42 (defined by a temperature delay of 2°C, SHTM 2010).
Discussion and/or Conclusion(s): In conclusion, we have demonstrated that type N sterilization of dental handpieces is unreliable due to trapped air in handpiece lumens. As a minimum we recommend

that dental handpieces used in invasive procedures should be steam sterilized in a vacuum benchtop steam sterilizer.

ID: 5077
UMONIUM38 Neutralis securing of incubators in neonatalogy

Nicolas Coltel[1], Frank van Laer[2]. [1]*Huckert's International,* [2]*UZA*

Background: Incubators could be source of contamination that could affect neonates. Their disinfection procedure should be a key element in the fight against pathogens, and should be a crucial point to control.
Aim(s)/Objective(s): Assess the performance of a DM dedicated-disinfectant during the maintenance of incubators. Identify potential sources of infection. Evaluate sampling material for reliability and accuracy.
Method(s): 15 incubators were sampled with Rodac plates and environmental swabs before and after disinfetion. Rodac plates were applied on mastress and swabs on doors. Tranpsort liquid form swabs was spread on specific chromogenic media. Plates were identified and blind-counted by different operators.
Results: After disinfection, doors were free of contamination, mattresses (2/15) presented a residual contamination (1 CFU) with *S. saprophyticus* or *Pseudomonas.*
S. aureus was more oftenly present on mattresses (9/15) than doors (6/15) and was not observed anymore after disinfection.
When disinfection and sampling were performed by 2 different operators, an incubator appeared really positive. Contamination after disinfection? Inadequate disinfection?
RODAC plates are more reliable than 100 µL from a swab to detect a potential contamination. Swab sampling followed by spreading on chromogenic media allows the examination of the complexity of bacterial flora.
Discussion and/or Conclusion(s): Umonium38® Neutralis presented bactericidal activity at 0.5% after 10 min. RODAC plates were a powerful indicator of bacterial contamination.
Mattresses were more contaminated than doors, with bacteria from enterobacteriae and/or Pseudomonas clusters. Mattress is a critical item to be disinfected and monitored.
Disinfection controls could reveal possible lack of disinfecton or treatment failure. 'Orientation' medium is sufficient to detect the variety of bacteria.

ID: 5139
Department of Public Health Sciences and Pediatrics Torino University

Carla Maria Zotti[1], Savina Ditommaso[2], Monica Giacomuzzi[2], Elisa Ricciardi[2]. [1]*Department of Public Health Sciences and Pediatrics, Torino University,* [2]*Department of Public Health Sciences and Pediatrics, Torino University*

Background: DUWLs become contaminated from the main water supply, which, although potable, still carries bacteria. Removal or inactivation of bacteria requires the use of chemical germicides, which could be used intermittently as a 'shock' treatment and/or continuously in small quantities.
Aim(s)/Objective(s): Longitudinal study was undertaken to find out the efficacy of the continuous use of ICX® tablets, a chemical cleaner, combined with monthly shock disinfection using hydrogen peroxide (3%).
Method(s): The DUWLs effluents were sampled to determine the bacteria total viable counts (TVCs) from two dental chairs treated as above and from one chair that never received treatments.
The efficacy of ICX® was also assessed in vitro versus the collection strains (*Staphilococcus aureus*, *Pseudomonas aeruginosa*) according to EN 1040 method.
Results: The post-intervention monitoring achieved levels of TVCs conforming to the limits of the Italian standard for drinking water. However, during the six months of surveillance after 30 days of shock, chairs showed an increase in TVCs. No significant differences were found between the TVCs detected in the dental chairs receiving treatments versus the control. In vitro ICX® caused 4.0 and 7.6 decimal log reduction of *S. aureus* respectively at 60 min and after 24 h. Instead, the product is less effective (1.3 log) in reducing the number of *P. aeruginosa* both after 60 min and 24 h.
Discussion and/or Conclusion(s): In conclusion, a continuous disinfection with ICX® as proposed by the manufacturer, does not control the bacterial growth during daily use; furthermore it has shown a poor performance against gram-negative bacteria.

ID: 5160
Comparison of two UV systems for terminal disinfection of patient rooms contaminated with MRSA, ESBL-producing *Klebsiella pneumoniae* and *Clostridium difficile*

Shanom Ali, Samuel Yui, Monika Muzslay, Peter Wilson. *University College London Hospitals NHS Trust*

Background: Persistence of bacteria/spores in the clinical environment is a potential risk for acquisition of infection. UV-irradiation (enhanced-disinfection) devices were evaluated for decontamination efficacy.
Method(s): Following terminal-disinfection of a single-isolation room, test organims (~10^5 cfu MRSA, *K. pneumoniae* [KP], 10^4 cfu *C. difficile* spores [CD]) prepared in low/heavy soil were inoculated onto 1 cm^2 carriers placed at various locations (1-Floor, 2-Under bed, 3-Footrail, 4-Headboard, 5-bedside table).
Devices:
A –Triple-emitter (254 nm) arranged around the bed in triangular formation (Surfacide® Helios)
B –Single-emitter (265 nm) relocated according to sensors in room (Ultra-V™, Hygiene Solutions)
Surface swabs were taken from 14 environmental sites before and after terminal-disinfection and after enhanced-disinfection. Inoculated carriers were assayed to determine efficacy (log-reductions).
Results: Time for enhanced-disinfection was similar between devices (A = 35 ± 14 min, B = 36 ± 6 min). All (14/14) environmental sites were contaminated before terminal-disinfection and 13/14 sites (93%) after (n = 27). Enhanced-disinfection eliminated contamination in 8/14 (57%) and 11/14 (79%) using device A or B respectively.
Both devices reduced MRSA and KP (>5 log reductions) regardless of soiling or location and effective (>4 log reduction) against CD with low soiling on: floor-surfaces, difficult-to-access areas (location 1–2) and high-frequency-touch sites (location 3–4) but less effective (0.3 log reduction) with heavy soiling. Device A effectively reduced >4 log CD from the bedside table despite heavy soiling.
Conclusion: Enhanced-disinfection (UV-irradiation) is effective against MRSA, KP and CD spores and can reduce contamination from surfaces missed during terminal cleaning. In-use efficacy-testing should be considered to assure correct positioning of devices to access shadowed areas, floor surfaces and improve hospital decontamination protocols.

ID: 5179
In vitro efficacy of disinfectants utilised for skin decolonization and environmental decontamination during a hospital outbreak with *Candida auris*

Silke Schelenz[1], Alireza Abdolrasouli[2], Darius Armstrong-James[2]. [1]*Royal Brompton Hospital,* [2]*Imperial College School of Public Health*

Background: A recent *C. auris* outbreak has led to the implementation of extensive Infection-Prevention-and-Control-measures. *C. auris* skin and environmental decontamination has been a challenge as there is no published information on the efficacy against *C. auris*.
Aim(s)/Objective(s): To establish the *in-vitro* efficacy of *disinfectants* utilised for skin and environmental decontamination during a *C. auris* outbreak.
Method(s): *In-vitro* susceptibility of *C. auris* and ATCC controls were tested against chlorhexidine, iodinated-povidone and sodium-dichloroisocyanurate using a microdilution-method.

Efficacy of hydrogen peroxide in the killing *C. auris* was evaluated by vaporized H_2O_2. Vaporization was performed as per manufacturer's instructions [www.bioquell.com]. *Candida* were desiccated in 96-well plates (1×10^8 Cells/mL), reconstituted with RPMI after H_2O_2 exposure, incubated and viability assessed.
Results: *C. auris* isolates demonstrated growth inhibition to chlorhexidine (0.125–1.5%; 3 minutes exposure). *C. auris* and *C. parapsilosis* expressed higher MICs compared to *C. albicans*, *C. tropicalis* and *C. krusei*. *C. auris* showed growth inhibition at concentrations of 0.07–1.25% iodinated povidone. *C. parapsilosis* had higher MICs compared to other *Candida* but was still effective at 1.25% iodinated-povidone.
All *Candida* were killed at 1000 ppm chlorine accept *C. parapsilosis* which failed to be killed at a 3 minutes exposure.
H_2O_2 vapour was 96.6–100% effective in killing *C. auris* and 100% for other *Candida.*
Discussion and/or Conclusion(s): In summary *C. auris* was effectively inhibited by chlorhexidine *in-vitro* at concentrations below recommended use of 2 and 4% for skin decolonization. Iodinated-povidone was also effective much below the 10% concentration used as antiseptic agent. For the environmental decontamination during our *C. auris* outbreak we used chlorine releasing agents (1000 ppm for routine cleaning; 10,000 ppm for terminal cleaning) and H_2O_2 which both appear effective *in-vitro.*

Topic: Device related infection

ID: 4434
Case series on the management of culture negative vascular graft infections at a regional surgical unit using outpatient parenteral antibiotic therapy (OPAT)

Gareth Hughes, Mirella Ling. *Worcestershire Royal Hospital*

Background: Vascular graft infections can present a number of challenges to infection specialists. Empiric antibiotic choice in culture negative cases often relies on covering both enteric gram negatives in addition to *Staphylococci* and *Streptococci*. There is paucity of guidance on exact antibiotic choice. Outpatient parenteral antibiotic therapy (OPAT) has not been used much in this patient group.
Aim(s)/Objective(s): We present 3 patients with culture negative vascular graft infection who presented to a regional vascular surgery unit in Worcestershire & Herefordshire, UK.
Method(s): We searched for patients admitted to our unit from 01/01/2014 to 11/10/2015 using medical records for our trust and speaking with the Infectious diseases physicians and Vascular surgeons who would have managed patients in this time frame.
Our search term was ICD-10 *Code T82.7 – Infection and inflammatory reaction due to other cardiac and vascular devices, implants and graft.*
Results: 43 patients were identified all via ICD code. 30 of these were excluded as they had vascular catheter or cardiac device infections. Of the 13 remaining, 3 had clinical and radiological evidence of culture negative graft infection.
Discussion and/or Conclusion(s): In the 3 patients described, all were managed as culture negative vascular graft infections with good treatment outcomes. All received an intravenous course of a glycopeptide and a carbapenem followed by oral continuation phase with gram negative and gram positive cover. All received teicoplanin and ertapenem via OPAT.
Our results suggest whilst vascular graft infections are challenging, teicoplanin with ertapenem may merit more investigation as an antibiotic choice for vascular graft infection and is suitable for OPAT.

ID: 4492
External ventricular drainage and CSF leakage as major risk factors for nosocomial meningitis in neuro-ICU

Natalya Kurdumova[1], Gleb Danilov[1], Olga Ershova[1], Michael Shifrin[1], Ivan Savin[1], Irina Alexandrova[1]. *[1]Burdenko Neurosurgery Institute, Moscow, Russia*

Background: Nosocomial meningitis (NM) is a hazardous complication in neurosurgery leading to increased mortality, treatment prolongation and its higher costs. The emergence of multidrug-resistant pathogens causing NM is disastrous.
Aim(s)/Objective(s): Our aim was to assess the incidence, identify the main risk factors and highlight the etiology of NM in intensive care unit (ICU) patients following neurosurgical procedures.
Method(s): The results of ongoing prospective surveillance of NM in ICU were analysed for 2010–2015. Data on 2148 patients staying in ICU for more than 48 hours were daily collected into electronic database. NM was defined using standard case definitions by the US Centers for Disease Control and Prevention.
Results: External ventricular drainage (EVD) was used in 540 patients, 143 patients experienced CSF leaks postoperatively. NM was diagnosed in 180 patients (8.4% ± 0.8 (95% CI 6.7–9.9)): in 98 (18.1%) with EVD and in 49 cases (34%) of CSF leaks. The relative risk of meningitis was 6.6 for EVD group and 5.1 for patients with liquorrhea ($p < 0.01$). NM developed in 2.0% of patients without any risk factors and in 54.6% when both factors were presented ($p < 0.01$). Meningitis etiology was identified in 65.0% of cases. NM was associated with Gram-positive (CoNS) CSF isolates in ~50% of EVD cases while in 80% of patients with CFS leaks it was caused by Gram-negative bacteria (*Acinetobacter baumannii*, *Klebsiella pneumoniae*).
Discussion and/or Conclusion(s): EVD and CSF leakage are major risk factors for NM in neuro-ICU. EVD is associated mainly with Gram-positive agents while liquorrhea is a risk factor for Gram-negative infection.

ID: 4571
Device associated bacteraemia surveillance

Benjamin Cooke, Jonathan Horwood, Trisha Miller, Eliza Jenkins, Kathleen McCartney, Diane Williamson, Caroline McDermott, Isabelle Gordon, Saranaz Jamdar. *NHS Forth Valley*

Background: Device associated infections are a significant cause of iatrogenic harm, and are a Clinical Governance focus in NHS Forth Valley. Benefits have been shown from the national care bundle approach to central line insertion and maintenance, but other types of implantable device may also cause problems. Variability of infection rates across the Board represents an opportunity to identify good practice, and target intervention.
Aim(s)/Objective(s):
To identify bacteraemias associated with implantable medical devices.
To identify high risk areas for device infection.
To allow feedback to clinical teams about practice in relation to devices.
Method(s): Over a period of 42 months, all bacteraemias were reviewed by a Microbiologist. Those that were clinically linked to an infected device were identified, and the patient's notes were examined. Additionally, all *Staphylococcus aureus* bacteraemias were reviewed. All cases were then discussed at a weekly meeting to decide on the source of infection, and any evidence of failure to complete an insertion or maintenance bundle (where one existed) resulted in a critical incident report. Information was collected on the type of device, where the infection was acquired, and the organism involved.
Results: Of 45,009 blood cultures, 192 Device Associated Bacteraemias (DABs) were identified. 87 were hospital acquired and 96 were healthcare-associated. Urinary catheters were the most commonly associated device, accounting for 85 DABs.
Discussion and/or Conclusion(s): As a result of this study, standardised Board-wide insertion and maintenance bundles for urinary catheters, peripheral venous cannulae and Hickman lines have been

developed. DAB review has been continued as part of our routine IPCT surveillance programme.

ID: 4579

Incidence of peripheral intravenous catheter-related complications in a U.S. hospital discharge database

Sangtaeck Lim[1], Erica Adams[1], Michael S. Broder[2], Eunice Chang[2], Sheila R. Reddy[2], Marian Tarbox[2], Tanya Bentley[2], Liza Ovington[1]. [1]*Ethicon, Inc.,* [2]*Partnership for Health Analytic Research, LLC*

Background: The burden of peripheral IV (PIV) related bloodstream infections (BSI) is underevaluated. Identifying PIV-related complications in real world data is challenging due to the broad use, inconsistent coding, and voluntary reporting for these devices.
Aim(s)/Objective(s): To estimate the incidence of PIV-related complications.
Method(s): In this retrospective analysis of Premier Perspective Database® US hospital discharge records, we studied hospital admissions between 7/1/2013 and 6/30/2015 with 7 primary diagnoses unlikely to cause a complication of interest: pneumonia, chronic obstructive pulmonary disease (COPD), myocardial infarction, congestive heart failure, chronic kidney disease (CKD), diabetes, or major trauma. Based on expert input, all admissions were assumed to include a PIV. We excluded admissions with evidence of potential non-PIV causes of complications (e.g., dialysis, surgery, central line use). We reported rates of selected PIV-related complications: BSI, cellulitis, phlebitis, infections not elsewhere classified (NEC), and extravasation.
Results: We identified 588,375 qualifying admissions (N = 15,637–187,904). Mean (SD) age was 66.1 years (20.6), 52.4% were females, and admissions were mainly non-elective (95.2%). Overall 1.8% of patients (n = 10,354) had a complication, and rates varied by primary diagnosis: 0.98% (COPD) to 2.67% (pneumonia). BSI was most common (82.2% of all complications), overall ranging from 0.67% (CKD) to 2.46% (pneumonia). Rates of cellulitis, phlebitis, infections NEC, and extravasation were lower than BSI and varied by primary diagnosis.
Discussion and/or Conclusion(s): Incidence rates of PIV-related complications were uncovered in hospital data and were consistent with research citing PIV complications regardless of dwell time. Further study of hospital discharge records may provide insight into the clinical and economic impact of these complications.

ID: 4688

***Pseudomonas aeruginosa*: contamination of tap outlet fittings and consequential contamination of tap water**

Chloe Hutchins[1], Jimmy Walker[2], Jeremy Webb[3], Ginny Moore[2], Katy-Anne Thompson[2]. [1]*University of Southampton and Public Health England,* [2]*Public Health England,* [3]*University of Southampton*

Background: In 2011/12, the deaths of 4 neonates were linked to *Pseudomonas aeruginosa* and the contamination of hospital tap water. Investigations demonstrated that the tap outlet fittings (OFs) were heavily colonised by *P. aeruginosa*. OFs may become contaminated during cleaning.
Aim(s)/Objective(s): To investigate the contamination of OFs via contaminated cleaning cloths and the consequential contamination of water delivered from both frequently and infrequently used taps.
Method(s): Microfibre cloths contaminated with *P. aeruginosa* (10^8 CFU/mL) were used to wipe three different types of OF (A, B and C). OFs were inserted into an experimental tap rig for up to 24-hours. Survival over time was assessed by culture. Taps were used at high-and low-frequencies by subjecting taps to single-, and multiple flushes. Water was sampled via membrane filtration.
Results: The median number of *P. aeruginosa* transferred from cloths to OFs was 1.4×10^5 CFU. *P. aeruginosa* persisted on all OFs for 24-hours. However, in comparison to OFA, significantly fewer organisms were recovered from OFB and C after 8- and 12 h respectively. *P. aeruginosa* was recovered from water delivered from OFA at levels above the augmented care alert level (i.e. ≥10 CFU/100 mL). Contamination persisted despite continued flushing. In contrast, water delivered from OFB did not contain *P. aeruginosa* beyond the first flush.
Discussion and/or Conclusion(s): Contamination of OFs via cleaning cloths can occur. OF design, whilst not removing the potential for retrograde contamination may, in combination with a flushing regimen, prevent these waterborne pathogens from contaminating the water delivered from the outlet.

ID: 4714

In vitro studies into biofilm prevention using antibiotic-loaded beads: implications for prosthetic infection management

Robert Howlin[1], John Cooper[2], Sean Aiken[2], Paul Stoodley[3]. [1]*University of Southampton and University Hospital Southampton NHS Foundation Trust,* [2]*Biocomposites Ltd,* [3]*The Ohio State University*

Background: Bacterial biofilms play a key role in prosthetic infection (PI) pathogenesis. Establishment of the biofilm phenotype confers the bacteria with significant tolerance to systemic antibiotics and the host immune system meaning the twin strategy of thorough joint debridement and prosthesis removal often remain the only possible course of therapeutic intervention. Protection of the prosthesis and dead space management may be achieved through the use antibiotic loaded cements and beads which aim to release high localised concentrations of antibiotics to the surgical site.
Aim(s)/Objective(s): The antibacterial and antibiofilm efficacy of these materials is poorly understood. We have performed an array of *in vitro* studies against a selection of important gram negative and gram positive pathogens involved in PIs to better understand their potential clinical benefit.
Method(s): Acrylic cement and various non-acrylic materials prepared as beads loaded with antibiotics were evaluated for their capacity to both inhibit biofilm formation and kill preformed biofilms using agar diffusion assays, viable cell counts, confocal and scanning electron microscopy. Studies to model the release of antibiotics from mineral based cements permitted an understanding of antibiotic elution kinetics and the bacterial response.
Results: Agar diffusion assays demonstrated antibacterial concentrations of eluting antibiotics lasting for up to 111 days, dependent on the cement type, antibiotic and bacterial strain. Antibiotic-loaded beads attenuated early bacterial colonisation and reduced biofilm formation for multiple days post inoculation. Established biofilms were harder to clear.
Discussion and/or Conclusion(s): Synthetic antibiotic-loaded CS beads have potential to reduce or eliminate biofilm formation on implant material to aid in the management of PIs.

ID: 4715

Study to evaluate the biofilm prevention capability of three bone void fillers combined with antibiotics

Robert Howlin[1], John Cooper[2], Sean Aiken[2], Paul Stoodley[3]. [1]*University of Southampton and University Hospital Southampton NHS Foundation Trust,* [2]*Biocomposites Ltd,* [3]*The Ohio State University*

Background: An increasing number of biomaterials combined with antibiotics are being used in the surgical management of osteomyelitis.
Aim(s)/Objective(s): This study evaluated biofilm prevention capability of three commercially available materials combined with antibiotics against *S. epidermidis* and *MRSA*, and their susceptibility to surface colonization under repeated bacterial challenges.
Method(s): Three materials were evaluated: high purity synthetic calcium sulfate combined with vancomycin and tobramycin[A] (SCS-VT), calcium sulfate/hydroxyapatite containing gentamicin[B] (CSHA-G) and calcium sulfate/calcium carbonate containing gentamicin[C] (CSCC-G). Beads of each were placed into 6 well plates (10 beads/well) and 4 mL of each bacterial strain (10^6 cells/mL) added to the wells. At days 1 (24 h post-inoculation), 2, 3, 7 and 14, viable cell counts, confocal laser scanning microscopy and scanning electron microscopy of the bead

surface was performed to assess the extent of surface colonisation and biofilm formation.
Results: Following two bacterial challenges (48 hrs incubation) with both strains, CSHA-G and CSCC-G were showing extensive bacterial colonization while SCS-VT remained clear (Poster Figure 1). With MRSA SCS-VT maintained a 5 log and 4 log reduction after days 3 and 7 respectively. For *S. epidermidis* CSC-VT maintained a 6 and 1 log reduction on days 7 and 14 respectively.
Discussion and/or Conclusion(s): The presence of the broad spectrum combination of vancomycin and tobramycin in high purity calcium sulfate bone void filler is superior to gentamicin alone in both CSHA-G and CSCC-G with respect to biofilm prevention and bacterial colonisation in this challenging *in-vitro* model.

ID: 4722
Wipe out catheter-related bloodstream infections in neonates: the bundle & beyond

Kavita Sethi, Liz McKechnie. *Leeds Teaching Hospitals NHS Trust*

Background: Catheter-related bloodstream infections (CRBSI) remain the leading cause of health care associated infections (HCAI) in neonates. CRBSI reduction is a significant patient safety challenge in neonatal units and lack of paediatric focused research makes it difficult to adapt the adult evidence-based strategies in critically ill neonates.
Aim(s)/Objective(s): Leeds Centre for Newborn Care is one of the largest neonatal services in the UK caring for about 1800 babies/year, approx. 5% being extremely premature. In 2008–09, there were 8 MRSA bacteremia on the unit, the highest numbers reported from any neonatal service in UK. We used a multifaceted approach to address vascular access and on-going care.
Method(s): A neonatal CRBSI surveillance service was introduced by the IPC team in Nov 2011. The data was reviewed by a multi-disciplinary team (MDT) and a vascular care bundle was developed and implemented in August 2014. The Line Team led by advanced neonatal nurse practitioners was the key element. The intervention was reinforced with nursing staff initiating changes to handover, education and communication.
Results: Implementation of care bundle has led to a noticeable reduction in CRBSI (>10/1000 catheter days to 1.69/1000 catheter days). No MRSA bacteremia has been reported to date. MDT review & feedback of CRBSI rates to clinical staff was an excellent motivator for change. Nursing empowerment made the difference and Leeds service has achieved one of the best results as reported in neonatal Specialized Service Quality Dashboard.
Discussion and/or Conclusion(s): A collaborative, multi-disciplinary, multi-pronged approach to reducing HCAI can be successful in continuous quality improvement in high risk and complex patient population.

ID: 4904
Use of a biological tracer to investigate microbial aerosols generated by heater-cooler units

Ginny Moore, Simon Parks, Allan Bennett. *Public Health England*

Background: *Mycobacterium chimaera* infections have been attributed to a specific make/model of heater-cooler unit (HCU) used in cardiopulmonary bypass. To help inform local decision making, NHS Trusts require evidence that alternative heater-cooler systems can reduce the risk of mycobacterial infection. However, the time required to culture *M. chimaera* and the potential for bacterial growth and/or biofilm formation means aerobiological investigations focusing on naturally or artificially contaminated HCUs are problematic.
Aim(s)/Objective(s): To assess the use of a non-pathogenic, aerostable, biological tracer (MS-2 bacteriophage) to investigate microbial aerosols generated and released from an HCU.
Method(s): A new make/model of HCU was filled with filtered tap water and high numbers of MS-2 (10^{10} pfu/L) added to the tanks. All-glass impingers were used to sample the air when the HCU was circulating and not circulating water. Samplers were operated for 5 min before the impinging fluid was transferred to a sterile container and cultured for MS-2.
Results: Similar numbers ($p = 0.1$) of MS-2 were recovered from the air when the HCU was circulating (1.9×10^4 pfu/m^3) and not circulating (3.8×10^3 pfu/m^3) water. The filler inlet was identified as the principal area of aerosol release. Aerosol release was not affected by the position of the inlet cover but could be minimised through crude modification to the filler unit.
Discussion and/or Conclusion(s): Specialist aerobiology using a biological tracer can determine the level of aerosol release from an HCU and its location. Results are obtained rapidly and could be used by manufacturers and NHS Trusts to inform design and purchasing decisions alike.

ID: 4910
Impact of a multi-faceted intervention strategy on device associated infections at an Indian Trauma Center

Alphina Karoung, Purva Mathur, Neha Rastogi, Jacinta Gunjiyal. *Jai Prakash Narayan Apex Trauma Centre, AIIMS*

Background: The majority of infections in ICUs are device-associated infections (DAIs). Appropriate surveillance and its effective implementation is need of an hour and a challenging task in developing countries.
Aim(s)/Objective(s): To ascertain rates of DAIs in critically ill trauma patients and to monitor the compliance rates of hand hygiene and preventive bundles using an indigenously developed automated surveillance system.
Method(s): The study was conducted from January, 2013 to March, 2016. Indigenous software for algorithmic detection of DAIs in accordance with CDC's NHSN definitions was developed. The DAI rates, compliance to hand hygiene and preventive bundles were regularly reported as feedbacks. The impact of this automated surveillance was assessed on the rates of DAIs, compliance to preventive bundles and hand hygiene.
Results: A total of 6,517 patients were included amounting to 35,748 patient days. The rates of VAP, CLABSI and CA-UTI were respectively 8.4, 3.6 and 3.1/1,000 device days. There was significant correlation between device days and the propensity to develop infections. Infections were the cause of death in 168(38%) of fatal cases. A significantly higher rate of VAP, CLA-BSI and CA-UTIs was noted in fatal cases. *Acinetobacter baumanni* and *Klebsiella pneumoniae* were the most common pathogens causing VAP, CLABSI and CA-UTI. A high rate of multi-resistance was observed. Gross reduction in the DAI rates and increased compliance to hand hygiene and preventive bundles were observed. The software was developed at a cost of $1,580.
Discussion and/or Conclusion(s): The automated surveillance is a cost effective and an essential prerequisite leading to significant reduction in DAIs and mortality.

ID: 4928
A team approach to successful reduction of haemodialysis catheter-related *Staphylococcus aureus* bloodstream infections

Mairead Skally[1], Maria Greene[2], Sheila Donlon[3], Veronica Francis[4], Colm Magee[4], Peter Conlonl[4], Conall O'Seaghdha[4], Declan DeFreitas[4], Edmond Smyth[4], Fidelma Fitzpatrick[5], Hilary Humphreys[5], Mark Denton[4], Margaret Fitzpatrick[6], Lillian Rajan[4], Binu Dineesh[4], Karen Burns[7]. *[1]Department of Microbiology, Beaumont Hospital, [2]Renal Clinical Support, Beaumont Hospital, [3]Infection Control, Beaumont Hospital, [4]Beaumont Hospital, [5]Beaumont Hospital and Royal College Surgeons Ireland, [6]Department of Microbiology, Beaumont Hospital, [7]Beaumont Hospital and Health Protection Surveillance Centre*

Background: *Staphylococcus aureus* is a well recognised cause of blood stream infections (BSIs) in haemodialysis patients. We previously reported that 83% of *S. aureus* BSI in this cohort were haemodialysis catheter-associated. Since 2013, a multi-disciplinary quality improvement programme for prevention of haemodialysis catheter-associated

S. aureus BSI has guided our haemodialysis infection prevention strategy.

Aim(s)/Objective(s): To describe the results of the first three years of this programme.

Method(s): BSI rates are calculated per 100 patient months (PM). Root cause analysis (RCA) is performed for each haemodialysis catheter-associated *S. aureus* BSI. Results are discussed at biannual multi-disciplinary team meetings, focusing on patient risk factors, BSI complications, team response, follow-up actions and agreed improvement plans.

Results: The rate of haemodialysis catheter-associated BSI decreased by 46% over the study period from 0.753 per 100 PM (13 patients, 77% of haemodialysis *S. aureus* BSI) in 2013 to 0.406 per 100 PM (8 patients, 47% of haemodialysis *S. aureus* BSI) in 2015. Documenting action plans and awareness of previous relevant *S. aureus* microbiology, e.g. previous exit site infections, were the most significant risk factors targeted for improvement. Several practice initiatives were also introduced across all dialysis units such as introducing pre-insertion protocols, displaying audit results locally, and, engaging staff and patients to continually raise awareness of best practice.

Discussion and/or Conclusion(s): Active surveillance, timely RCA, with feedback and interventions, along with a multi-disciplinary team approach has significantly reduced both the rate and proportion of haemodialysis catheter-associated *S. aureus* BSI (by 46% and 38% respectively).

ID: 4938

The effect a line care bundle on central line catheter Candida colonisation rates in the critical care area

Luke Bedford[1], Margaret Gilham[2], Stephen Webb[2]. [1]*Papworth NHS Foundation Hospitals Trust,* [2]*Papworth Hospital NHS Foundation Trust*

Background: Invasive Candidiasis can be a devasting infection for patients, particularly those in the critical care area (CCA). Whilst numerous risk factors are present in these patients, line colonisation with Candida is significant but preventable

Catheter line care bundles have been shown to reduce line associated infection. Papworth hospital introduced a trustwide line care programme in 2010, which involved a line-care bundle, antimicrobial impregnated catheters and an educational programme, to reduce episodes of infection and catheter colonisation.

Aim(s)/Objective(s): We investigated the impact of the programme on colonisation rates of central venous catheters (CVC) sent from the Papworth CCA from 2010 to 2015.

Method(s): We ascertained all CVC line cultures sent from the Papworth CCA which grew Candidia species from the laboratory information system. The number of patient line tip days had been prospectively recorded from the start of the programme introduction, and was used to calculate the rate of line tip colonisation per 1000 patient CVC days.

Results: There was a falling trend in line tip colonisation by Candida species over the study period, with a fall from a median of 2 episodes per month in 2010 to 1 episode per month in 2015. This translated into a fall from 3.41 episodes per 1000 patient CVC days to 1.03 in 2015.

Discussion and/or Conclusion(s): We found a sustained reduction in candida line tip colonisation rates from patients in the critical care area as part of a CVC care programme. We would expect this to have prevented episodes of invasive candidaemia and exposure to unnecessary antifungal agents.

ID: 5029

Analysis of disinfected endoscopes channels surface

Lissandra Chaves de Sousa Santos, Khalid Aljohani, Honghua Hu, Karen Vickery. *Faculty of Medicine and Health Sciences, Macquarie University*

Background: In 2004 we showed that 100% of patient-ready endoscopes were contaminated with biofilm either in their air-water channels or working channels. The presence of biofilms was more evident in damaged areas of the channel. Since then improved methods of decontaminating endoscopes have been developed.

Aim(s)/Objective(s): In this study we have evaluated disinfected endoscopes for presence of bacterial contamination and surface damage.

Method(s): 40 air-water channels and 23 working channels including 12 gastroscopes and 11 colonoscopes were examined. Surface's roughness was analysed and compared with never used channels. Live bacteria were isolated and identified by 16s rDNA sequencing. Quantitative real-time PCR of 16s rRNA gene was used to quantify the total number of bacteria present. Live/dead viability staining in conjunction with confocal laser scanning microscopy and scanning electron microscopy were used to visually confirm bacterial viability and biofilm presence respectively.

Results: 40% of air-water channels and 50% of working channels were bacterial culture positive. PCR demonstrated an average of 2.8×10^3 and up to 3.1×10^5 bacteria/cm contaminating air-water channels whilst an average of 1.6×10^3 and up to 4.6×10^4 bacteria/cm contaminating working channels. The bacteria in these samples were visually confirmed to be present as a biofilm by SEM. Bacteria within the biofilm were shown to be viable by live/dead staining and CLSM. Used endoscopes channels presented higher roughness values when compared with new channels.

Discussion and/or Conclusion(s): Despite the improvement on disinfection process showed by decreased contamination on endoscopes channels, viable biofilm containing pathogenic species still can be found in processed endoscopes channels.

ID: 5102

Investigation of attached microorganisms in the lumens and balloons of indwelling urethral urinary catheters

Katherine Belfield[1], Sajitha Kalith[1], Jannifer Adcock[2], Richard Parkinson[2], Roger Bayston[1]. [1]*University of Nottingham,* [2]*Nottingham University Hospitals NHS Trust*

Background: Urinary catheters are associated with a high risk of urinary tract infection (CAUTI) and are a major clinical and financial burden. Examination of lumens and balloons (representative of bladder environment) of catheters may offer insight as to why some patients develop symptoms and others do not.

Aim(s)/Objective(s): This study aims to quantify and identify microorganisms attached to the lumens and balloons of indwelling urinary catheters and relate this to patient-specific information.

Method(s): Indwelling urethral urinary catheters in situ for ≥14 days were collected from patients at Nottingham University Hospitals NHS Trust. The balloon was separated and placed in sterile phosphate buffered saline (PBS). The remaining catheter lumen (ports were discarded) was drained, filled with PBS and ends clamped. The catheter components were sonicated. Microorganisms in the sonicate were enumerated, identified, and susceptibility testing was performed.

Results: Sixty-one catheters were collected. The most commonly isolated organisms were *Escherichia coli* and *Enterococcus faecalis*. 19.7% of patients received antibiotics while catheterised and 25% of those had a multi-drug resistant (MDR) organism attached to the lumen (all lumens were colonised irrespective of antibiotic use). Conversely, 2.04% of catheters from patients not known to be receiving antibiotics had a MDR organism present. Symptom presentation does not correlate to numbers of colonising organisms (7/61 patients were symptomatic). Five lumens were blocked and *Proteus mirabilis* was present in 2/5.

Discussion and/or Conclusion(s): Lumens and balloons of urinary catheters were colonised irrespective of presence of antibiotics. Results suggest that antibiotic use does not reduce microorganism colonisation. The data also emphasises the lack of correlation between microorganism growth and symptomatic CAUTI.

ID: 5148

Non-surgical CVC inserted in Pediatric Intensive Care Unit is at high risk for infection

Achille Yepmo[1], David Faraoni[2], Chantal Lerminiaux[3], Philippe Van Der Linden[1]. *[1]CHU Brugmann- Queen Fabiola University Hospital Children, [2]CHU Brugmann - Queen Fabiola University Children Hospital, [3]Queen Fabiola University Children Hospital*

Background: Central line infection is a serious complication.
Aim(s)/Objective(s): To determine the rate of central venous catheter (CVC) infection and the predictive factors of CVC infection in Queen Fabiola University Children Hospital (QFUCH, Brussels, Belgium).
Method(s): Prospective monocentric observational study that included all inserted CVC from November 2013 to May 2016. Outcome variable was CVC infection. Determinants of CVC infection were analyzed through multivariate logistic regression model that included the following variables: age of children, surgical vs non-surgical insertion, place and site of insertion, indication and duration of CVC.
Results: 577 CVC were inserted. Only 475 CVC were analyzed, including 91 surgical and 384 non-surgical CVC. The crude rate of CVC infection was 0.03 and 8.9 per 1000 CVC days respectively for surgical and non-surgical CVC. There were no difference among the insertion sites ($p = 0.075$). The only factor associated with outcome was non-surgical CVC insertion in PICU (OR 2.02, 95% CI (1.06–3.85), $p = 0.032$). In contrast, no difference between CVC inserted in NICU and operating room was observed (OR 0.64, 95% CI (0.34–1.21), $p = 0.17$).
Discussion and/or Conclusion(s): CVC insertion in PICU was a risk factor of infection. Our results are in accordance with the available literature. CVC inserted in PICU cumulates many risk factors for infection such as severe medical conditions, multilumen CVC, many CVC, long duration of CVC, prolonged mechanical ventilation, parenteral nutrition, blood transfusion. To reduce the overall rate of CVC infection in QFCUH, a multimodal strategy including education, training of the staff and implementation of checklist should be set up.

ID: 5164

Modelling catheter-related *Staphylococcus aureus* infections in vitro

Rasmus Birkholm Grønnemose, Hans Jørn Kolmos, Thomas Emil Andersen. *University of Southern Denmark*

Background: Recent studies revealing the elaborate interactions between *Staphylococcus aureus* and the human coagulation system during vascular infections have prompted the need for more *in vivo*-like *in vitro* models.
Aim(s)/Objective(s): In this study we aimed to develop a new *in vitro* model for vascular catheter-related infections with *S. aureus* using human plasma in a flow system.
Method(s): The model allowed for continuous monitoring of the bacteria-coagulation build-up during adhesion and biofilm formation in a flow chamber by using fluorescent microscopy with GFP-producing *S. aureus* and human plasma supplemented with fluorescent fibrinogen.
Results: Using the model, we show that *S. aureus* creates an elaborate biofilm on medical grade silicone containing both human fibrin(ogen) and bacterial poly-N-acetylglucosamine (PNAG).
Discussion and/or Conclusion(s): A new catheter biofilm method was established and shown to model the bacteria-coagulation interplay *in vitro*. This model will allow for future studies of novel catheter loading agents targeting bacteria-induced thrombosis.

ID: 5181

Access to bladder scanners and specialist urology nurses in NHS Trusts: room for improvement

Ammar Yusuf, Susan Hopkins. *Royal Free London NHS Foundation Trust*

Background: In England, there are >500,000 hospital onset urinary tract infections (UTI) each year; 50% associated with a urinary catheter (UC). At least 1% progress to bloodstream infections (BSI). The overall effectiveness of bladder scanners in reduction of UTI is 75%. A quality improvement programme for UC, including clinical nurse specialists (CNS), reduced UTI by 75%.
Aim(s)/Objective(s): To assess uptake of bladder scanners and access to urology CNS in the NHS.
Method(s): A freedom of information was sent to all NHS acute and community/care (CC) trusts requesting the number of bladder scanners registered in their equipment library, recent purchases of bladder scanners in 2015/2016, number of urology CNS and hospital training and policy records for bladder scanners.
Results: A response was returned from 111 Trusts (21 CC; 89 Acute). There was wide variation in the number of registered bladder scanners in organisations (mean 17; range 0–74); this was not significantly different between organisation type. In 2015/16, 63 trusts purchased new scanners. Bladder scanner training records were more frequently available in Acute compared to CC trusts (72% V 47%) but similar proportions had a policy for scanner use (36% Acute V 38% CC). CC Trusts reported significantly less urology CNS than Acute trusts (mean 0.4 V 4.2 whole time equivalent per organisation).
Discussion and/or Conclusion(s): Bladder scanners and urology CNS have proven clinical and cost-effectiveness in reducing UTI but are not embedded in all NHS organisations. These will be important measures for organisations to implement to achieve reductions in UTI and Gram-negative BSI.

Topic: Diagnostics

ID: 4423

Klebsiella pneumonia New Delhi Metallo-beta-lactamase-1 outbreak in a Surgical Ward at Mater Dei Hospital

Noel Abela, Claire Marantidis Cordina, Elizabeth Scicluna, Andrea Falzon Parascandalo, Michael Borg, Geraldine Borg, Samuel Tanti. *Mater Dei Hospital*

Background: New Delhi metal-β-lactamase (NDM)-producing Gram-negative bacteria have spread globally and pose a threat to all healthcare institutions. We reported was the first of NDM outbreak detected in Malta.
Method(s): A highly resistant NDM-1 *Klebsiella pneumoniae* (KP) was reported from the rectal swab of a patient in a surgical ward at Mater Dei Hospital in January, 2016; this was followed by a further case within the same week. Cross-transmission was suspected; it was decided to screen all patients rectally for CRE. A third case was identified after the initial screening and ward was closed to further admissions. Full contact precautions were implemented with a dedicated nurse to the 3 confirmed cases. Furthermore all patients that remained in the ward were screened from wounds, rectal and those with a urinary catheter inserted for CRE twice weekly and a 4th case was identified.
Results: A retrospectively exercise was performed and another 2 patients were traced and identified in the same ward. VNTR typing confirmed that these isolates were all of the same clone. No further cases were reported.
Discussion and/or Conclusion(s): We suspect that that NDM-1 KP was introduced to our hospital in 2011 when Libyan patients were admitted for treatment during the Libyan crisis. This was not detected before the outbreak because the PCR was not available at the time.

ID: 4490

Comparison of the QuantiFERON-TB Gold (QFT) and Gold Plus (QFT Plus) ELISAs and manual and automated QFT Plus for the detection of latent TB infection

Ngee Keong Tan[1], Foziya Malik[1], Aine O'Callaghan[2], Carmel Prendergast[1], Angela Houston[3], Cassie Pope[3], Timothy Planche[3]. *[1]South West London Pathology, St George's University Hospitals NHS Foundation Trust, [2]Biomnis Ireland, Three Rock Road, Sandyford Business Estate, Dublin 18, Ireland, [3]Infection Care Group, St George's University Hospitals NHS Foundation Trust*

Background: Latent tuberculosis infection (LTBI) is an asymptomatic condition which occurs in some individuals after an infection with *Mycobacterium tuberculosis*. The main purpose of diagnosing LTBI is to consider medical treatment for preventing active TB. QuantiFERON-TB Gold ELISA (Qiagen, Germany), an interferon-gamma release assay (IGRA), has been used in our laboratory for LTBI screening since 2014. In 2015, Qiagen released a new generation IGRA called "QFT Plus". These assays maybe performed manually or automated on a DS2 analyser (Dynex).
Aim(s)/Objective(s): This study aims to investigate the agreement between the QFT and QFT Plus assays. Agreement between manual and automated methods between two laboratories was also examined.
Method(s): 84 prospectively collected clinical and 14 internal QC samples were tested manually in parallel between December 2015 and February 2016 using QFT and QFT Plus according to the manufacturer's instructions. Of the 84 clinical samples, 15 positive and 21 negative samples by manual QFT Plus were tested on a DS2 by Biomnis.
Results: 31/98 samples were positive, 63/98 were negative and 2/98 were indeterminate by both ELISAs. This gives the overall agreement of 98% (*kappa* 0.957; 95% CI 0.897–1.000). 2 results were not in agreement, one was low positive and the other was low mitogen.
14/15 samples were positive and 21/21 were negative by both manual and automated methods. This gives the overall agreement of 97% (*kappa* 0.942; 95%CI 0.831–1.000). 1 positive was not reproduced due to the presence of clots.
Discussion and/or Conclusion(s): Excellent agreement was demonstrated between the QFT and QFT-Plus ELISAs, and between manual and automated methods.

ID: 4497

Serodiagnostic markers as predictors for tuberculosis diagnostic and treatment outcome

Dolapo Awoniyi[1], Ralf Baumann[2], Novel Chegou[3], Belinda Kriel[3], Ruschca Jacobs[3], Jayne Sutherland[4], Harriet Mayanja-Kizza[5], Tom Ottenhoff[6], Desta Kassa[7], Martin Kidd[8], Gerhard Walzl[9]. *[1]Stellenbosch University, [2]Institute for Occupational and Social Medicine, Aachen University of Technology, 52074 Aachen, Germany; [3]Stellenbosch Univrsity, Cape Town, South Africa; [4]Vaccines and Immunity Theme, Medical Research Council, Gambia; [5]Department of Medicine, Makerere University, Kampala, Uganda; [6]Department of Infectious Diseases, Leiden University Medical Centre, Leiden, The Netherlands; [7]Ethiopian Health and Nutrition Research Institute, Addis Ababa, Ethiopia; [8]Centre for Statistical Analysis, Stellenbosch University, [9]Stellenbosch University, Cape Town, South Africa*

Background: Successful control of tuberculosis is not only dependent on timely and accurate diagnosis but also on efficacious treatment monitoring, which currently relies largely on month 2 and 5 sputum culture status.
Aim(s)/Objective(s): To evaluate the potential of serodiagnostic markers for TB diagnosis and as candidates for monitoring the response to TB treatment.
Method(s): We evaluated the sensitivity and specificity of plasma immunoglobulin IgA, IgG and/or IgM against 8 mycobacterium protein antigens (ESAT-6, Tpx, LAM, PstS1, AlaDH, MPT64, 16 kDa and 19 kDa) and 2 antigen combinations (TUB, TB-LTBI) of 21 LTBI controls, 21 healthy controls and 21 active TB patients at baseline. 19 TB cases were followed up at the end of anti-TB treatment at month 6.
Results: The top single serodiagnostic markers are anti-16 kDa IgA, anti-MPT64 IgA, anti-LAM IgG and anti-TB-LTBI IgG. IgA response to MPT64 best discriminated active TB from non TB (QFT +ve and QFT –ve) with both sensitivity and specificity of 95%. Anti-16 kDa IgA had the best sensitivity of 95% and specificity of 90% for differentiating active TB from latently infected individuals. There was a further improved performance when marker combinations were used, with accuracy exceeding 95%. Anti-LAM and anti-TB-LTBI had low baseline IgG while there were high baseline responses in anti-TUB IgG, anti-16 kDa IgA and anti-16 kDa IgM after successful completion of anti-TB treatment.
Discussion and/or Conclusion(s): This result shows the potential of a multi-serodiagnostic marker in differentiating active TB from non TB. Furthermore, we have shown that some serological markers could be useful for monitoring TB treatment response.

ID: 4559

Evaluation of the Unyvero P55 Pneumonia Cartridge for the identification of respiratory pathogens and resistance genes in broncho-alveolar lavage fluids

Naomi Gadsby[1], Martin McHugh[1], Stephen Hamilton[1], Laura MacKenzie[1], David Griffith[2], Kate Templeton[1]. *[1]NHS Lothian, [2]NHS Lothian/Univeristy of Edinburgh*

Background: Faster respiratory pathogen detection and antibiotic resistance identification is important in critical care due to the severity of illness, significant prior antibiotic exposure and infection control implications. The Unyvero P55 Pneumonia Cartridge (Curetis AG) rapid molecular assay detects 38 bacterial pathogens and antibiotic resistance genes.
Aim(s)/Objective(s): To evaluate the performance of the Unyvero P55 Pneumonia Cartridge test on broncho-alveolar lavage (BAL) fluids from patients in Critical Care, compared to routine microbiological culture and in-house molecular assays.
Method(s): 75 BAL fluids from patients admitted to the Royal Infirmary of Edinburgh Intensive Care Unit between Jan 2013 and Sept 2015 were tested using routine microbiological culture methods. Residual specimens were stored at –80°C for retrospective anonymised molecular testing by the Unyvero test and a range of in-house real-time PCRs.
Results: At least one bacterial species was isolated by routine culture in 49 (65%) cases. Unyvero and in-house assay results were both concordant with culture in 56% instances. Additional organisms were detected by Unyvero test and in-house assay in 21% and 25% instances respectively. Cultured organisms were not detected by the Unyvero test and in-house assay in 27% and 22% instances respectively. Antibiotic resistance genes were detected in 26 instances by the Unyvero assay, these matched the antibiogram in 53% cases where the relevant sensitivity was known.
Discussion and/or Conclusion(s): Molecular testing identified a number of respiratory pathogens in this patient cohort that were not grown in culture. Improvements in panel coverage and detection sensitivity are required to increase the utility of these assays in the critical care setting.

ID: 4713

Matrix assisted laser desorption-ionisation time-of-flight mass spectrometry (MALDI-TOF MS) for the identification of *Neisseria gonorrhoeae*

Ruaridh Buchanan[1], Heather Dolphin[1], David Ball[1], Jayshree Dave[2]. *[1]Barts Health NHS Trust, [2]Barts Health NHS Trust/Public Health England*

Background: *Neisseria gonorrhoeae* is the second most common sexually transmitted pathogen in the UK. Increasing levels of antimicrobial resistance make accurate identification of this organism vital clinically and epidemiologically. Current PHE guidance stipulates the need for dual identification to increase accuracy, partly due to the psycho-social and medico-legal consequences of incorrect identification, but also because there has been no large series examining the

accuracy of newer technologies such as MALDI-TOF MS. In this retrospective study we compare MALDI-TOF MS with biochemical identification.
Aim(s)/Objective(s): To assess the accuracy of MALDI-TOF MS for the identification of *Neisseria gonorrhoeae* in comparison with biochemical identification (Biomerieux API NH).
Method(s): Laboratory records of all Genitourinary Medicine culture samples between January 2012 and October 2014 were reviewed retrospectively. All isolates with both an API NH and MALDI-TOF MS identification recorded were included; a subset analysis examined the reasons for requiring repeat MALDI-TOF MS analysis.
Results: 1190 isolates were eligible for inclusion, with 1082 biochemically identified as *Neisseria gonorrhoeae*. MALDI-TOF MS identified 984 (91%) of these correctly after one analysis, rising to 1081 (99.9%) after two analyses. Failure to generate an acceptable identification score was the reason for repeat analysis in 76% of cases; the remaining 24% of isolates were either initially identified as other *Neisseriae* or as genetically dissimilar contaminating organisms incorrectly sampled from culture media.
Discussion and/or Conclusion(s): MALDI-TOF MS is an accurate and reliable method of identifying *Neisseria gonorrhoeae*. Laboratories with access to this technology could consider its use as a single method of identification in routine cases.

ID: 4743
Evaluation of the feasibility of using C-reactive protein (CRP) to optimise prescribing for lower respiratory tract infections in primary care settings

Jacqueline Sneddon[1], William Malcolm[2], Gail Haddock[3], Simon Hurding[4], Alastair Leanord[5], Dilip Nathwani[6]. *[1]Healthcare Improvement Scotland, [2]NHS National Services Scotland, [3]NHS Highland, [4]NHS Lothian, [5]The Scottish Government, [6]NHS Tayside*

Background: The Scottish Antimicrobial Prescribing Group has developed several initiatives to promote reduction of unnecessary antibiotic use for respiratory tract infections in primary care.
Aim(s)/Objective(s): This study was developed to evaluate the feasibility of using CRP testing, as recommended by NICE, to support clinical decision making in lower respiratory tract infections (LRTI) in GP practices in Scotland.
Method(s): A study steering group was established to provide advice on methodology and governance issues. Ten GP Practices were recruited across four health board areas to take part in the study. Following training, practices used the CRP testing on patients presenting with suspected LRTI for at least 4 weeks during the period November 2015 – February 2016. Data collected during consultations and GP feedback were analysed to determine the practical aspects of how the test was used and its perceived impact on GP decision making and prescribing of antibiotics.
Results: Data suggests that CRP testing can be accommodated with the current appointments system, by either the GP running the test during the consultation or a practice nurse performing the test in a nearby treatment room. The test appeared to reduce the number of immediate prescriptions, increase use of delayed prescriptions and provided reassurance for both prescribers and patients when no antibiotic was used. Study results will be used to inform future strategy for point of care testing for community infections.
Discussion and/or Conclusion(s): CRP testing is practical in the Scottish primary care context and offers an additional tool to support reduction of unnecessary use of antibiotics for respiratory infections.

ID: 4757
Evaluation of Xpert Influenza assay; easy to use but moderate sensitivity and no subtype data

Timothy Barkham[1], Janice Leong[1], Masafumi Inoue[2]. *[1]Tan Tock Seng Hospital, [2]Experimental Therapeutics Centre, Agency for Science, Technology and Research*

Background: Testing for Influenza with nucleic acid tests (NATs) is a daily activity. The desire to know subtypes, originally driven by the threat of H5N1, led to the introduction of a single tube NAT that delivers results for Influenza A, B and subtypes H1N1 and H3N2. The weakness of the system is that samples are run in batches. In contrast, an apparent strength of the Xpert flu assay is that it is run on a random access instrument, allowing individual samples to be processed without waiting for a batch.
Aim(s)/Objective(s): To compare the Xpert assay with the assay in routine use.
Method(s): 146 clinically requested samples were run on the in use abTEST Flu 4 QPCR I kit and the Xpert Flu/RSV XC kit in June 2015. Analysis assumed the in use assay to be correct as accumulated quality assurance data showed excellent performance.
Results: The Xpert system detected 31/35 H3N2, 34/35 H1N1, 30/35 Influenza B and 1/1 Influenza A without subtype: a total of 96/106 (90%). Five of the missed cases were due to a 'failed' run. The Xpert system did not detect influenza in any of the 40 samples reported as 'not detected' by the in use assay.
Discussion and/or Conclusion(s): Failed runs, linked with microfluidics, are a significant weakness of the Xpert system. Detection sensitivity is 10% inferior to our current system and the Xpert does not deliver subtypes, nor can it be updated with amended primers/probes at short notice. This can be crucial when dealing with outbreaks of new subtypes requiring different management.

ID: 4858
Direct Lancefield grouping for the rapid identification of streptococci in blood cultures

Melissa Baxter[1], Aiden Plant[1], Marina Morgan[1]. *[1]Royal Devon and Exeter NHS Foundation Trust*

Background: Standard laboratory identification of the Lancefield group of Streptococci is by latex agglutination for the carbohydrate antigen primarily from a colony following incubation and growth of the organism. We sought to determine the reliability of undertaking Streptococcal grouping directly from positive blood cultures, proposing that the rapid identification may expedite appropriate antimicrobial therapy, infection control precautions and public health notification.
Methods: Positive blood cultures (BacTalert 3D) with Streptococci identified on Gram's stain were prospectively subjected to direct Lancefield A, B, C and G grouping (Prolab diagnostics) from December 2015 to June 2016. Comparison was made with final identification on completion of culture, either by repeat Lancefield grouping or MALDI-TOF analysis.
Results: Of 53 blood cultures positive for β-haemolytic streptococci, 32 were subject to direct Lancefield grouping. 27 agglutinated with a single group, whilst five remained agglutination negative. All of the 27 yielded the same organism on final culture ($p = 0.02$). The five negative agglutinations cultured Group A streptococcus on four occasions and Group G streptococcus on one.
Discussion: We report 84.4% sensitivity in identification of Streptococcal bacteraemia with direct Lancefield grouping. Importantly there were no false positives. We propose direct grouping is a useful adjunct in the interpretation of positive blood cultures pending confirmatory testing. The utility of this with regard to clinical impact is yet to be evaluated.

ID: 4866
Finding the needle in the haystack: Screening for CPOs at a large London Teaching Hospital using Rosco Confirm Kits

Gemma Vanstone[1], Damien Mack[2], Indran Balakrishnan[3]. *[1]HSL Analytics, [2]The Royal Free London NHS Foundation Trust, [3]The Royal Free NHS Foundation Trust*

Background: Several methods for the detection of carbapenemase producing organisms (CPOs) are now available, with different

advantages and disadvantages. The Royal Free London NHS Foundation Trust screens all patients considered 'high-risk' for colonisation with CPO.

Aim(s)/Objective(s): To review current CPO screening methodology and results from samples received during Jan-Apr 2016, with particular focus on carbapenemase types identified and turn-around times.

Method(s): Screening samples are cultured on chromogenic media; the penicillin/cephalosporin antibiogram, together with MICs to relevant carbapenems, are then used to identify potential CPOs (pCPOs). These are tested by KPC/MBL Confirm Kit (Enterobacteriaceae) or KPC/MBL Confirm in *P. aeruginosa/Acinetobacter* Kit [Rosco Diagnostica]. Possible OXA-48 positive Enterobacteriaceae are highlighted by resistance to Temocillin and require Reference Laboratory confirmation.

Results: During Jan–Apr 2016 inclusive, 3775 screening samples (1735 patients) were tested for CPO. 3664/3775 (97.06%) samples were shown to be negative for CPO using chromogenic media and/or antibiogram analysis. pCPOs were isolated from 111/3775 (2.94%) samples from 77/1735 (4.43%) patients, of which 54 [from 52 patients] represented non-duplicate isolates that were tested for carbapenemase production. 22/54 were confirmed CPOs (41% of pCPO samples, 42% of pCPO patients, 0.6% of screening samples, 1.3% of patients screened): 8 OXA-48, 5 VIM, 4 NDM, 4 OXA-23 and 1 KPC.

Discussion and/or Conclusion(s): OXA-48 represented 36.4% of the CPOs detected, highlighting a need to adapt our protocol to improve detection of this genotype, particularly with regard to turn-around time which currently relies on Reference Laboratory confirmation. Consequently, we are evaluating RapidEC CarbaNP [Biomerieux] and Xpert Carba-R PCR [Cepheid] to improve detection of CPOs.

ID: 4870

Review of *Mycobacterium tuberculosis* sensitivity testing protocol for resistant strains at the Scottish Mycobacteria Reference Laboratory

Alex Kennett[1], Pauline Claxton[2], Ian Laurenson[2]. [1]*NHS Lothian,* [2]*Scottish Mycobacteria Reference Laboratory*

Background: The World Health Organisation (WHO) estimated that multi-drug resistance (MDR) was found in 3.3% of new cases of *Mycobacterium tuberculosis* (TB) in 2014 and 20% of previously treated cases.

Aim(s)/Objective(s): To assess the utility of extended Drug Susceptibility Testing (DST) carried out on resistant TB isolates at the Scottish Mycobacterial Reference Laboratory (SMRL).

Method(s): The use of the BACTEC MGIT 960 system, second line TB eXiST testing, TREK sensititre MYCOTB MIC plates, Hain GenoType MTBDRplus and MTBDRsl genotypic testing on 44 resistant clinical isolates was examined between the end of January 2014 and 11th June 2015.

Results: 18 isolates showed mono-drug resistance; isoniazid (10), pyrazinamide (7) and streptomycin (1). 26 isolates were resistant to more than one drug. 6 were multi-drug resistant and 2 were extremely drug resistant. Complete phenotypic and genotypic testing was carried on the majority of samples with 100% isolates tested using MGIT 960 system, TB eXist software and MYCOTB MIC plates, 100% were tested with MTBDRplus and 93.2% (n = 41) with MTBDRsl testing. In total, only 3 (6.8%) of isolates showed inconsistent results between the different modalities of testing and 1 demonstrated ethambutol resistance after extended incubation.

Discussion and/or Conclusion(s): On the basis of this review, resistance testing was streamlined to carry out MTBDRplus and second line TB eXist testing on mono-resistant isolates, reserving MYCOTB plates and MTBDRsl testing for multiple drug resistant isolates.

ID: 4922

Improving detection of CPOs in the diagnostic microbiology laboratory

Hema Sharma[1], Gemma Vanstone[2], Indran Balakrishnan[1]. [1]*Royal Free London NHS Foundation Trust,* [2]*HSL Analytics*

Background: To aid identification of carbapenemase producing organisms (CPOs), The Royal Free London NHS Foundation Trust uses susceptibility profiles to penicillins and cephalosporins, alongside MICs to relevant carbapenems. Possible CPOs are then tested by KPC/MβL Confirm (Enterobacteriaceae) or KPC/MβL Confirm (*P. aeruginosa*/*Acinetobacter*) Kits [Rosco Diagnostica] – results are available 24 h later. Due to the inability of Rosco assays to detect OXA-48, resistance to temocillin is used as a surrogate marker for this genotype; possible OXA-48s require Reference Laboratory (AMRHAI, PHE) confirmation, which incurs a delay of 3–5 d.

Patients with possible CPOs are isolated in side-rooms and removed if/when isolates are confirmed negative. Reducing turnaround-time (TAT) to CPO detection will optimise both infection control and antibiotic stewardship.

Aim(s)/Objective(s): To improve CPO detection TAT with use of RapidEC CarbaNP [Biomerieux] and Xpert Carba-R [Cepheid] assays.

Method(s): 42 unique isolates from screening specimens received between Jan-Apr 2016 meeting susceptibility criteria for carbapenemase testing were additionally tested by RapidEC CarbaNP and Xpert Carba-R. All isolates were sent to AMRHAI for confirmation.

Results: AMRHAI identified 19/42 CPOs [8 OXA-48, 5 NDM, 4 VIM, 1 KPC, 1 OXA-23]. Our in-house method of Rosco plus temocillin susceptibility (100% sensitivity, 43.5% specificity) lacked specificity due to its inability to detect OXA-48s. The RapidEC CarbaNP (100.0% sensitivity, 91.3% specificity) and Xpert CarbaR (94.7% sensitivity, 100% specificity) performed well and detected all OXA-48 positive CPOs with results available within 1.5–3 h.

Discussion and/or Conclusion(s): Both RapidEC CarbaNP and Xpert CarbaR assays improved TAT to CPO detection (particularly OXA-48s). Xpert Carba-R had the additional advantage of determining carbapenemase type.

ID: 4929

Diagnostic accuracy evaluation of the RenDx Fungiplex assay for detection of candidaemia

Cara McKeating[1], Raquel Posso[2], Lewis White[2], Ronan McMullan[1,3]. [1]*Microbiology, Belfast Health and Social Care Trust,* [2]*Regional Mycology Unit, Public Health Wales Microbiology Cardiff, University Hospital of Wales,* [3]*Centre for Experimental Medicine, Queens University Belfast*

Background: The Renishaw RenDx Fungiplex is a new PCR-based test that detects *Candida*/*Aspergillus* DNA in blood/serum/plasma specimens.

Aim(s)/Objective(s): The aim was to provide preliminary evaluation of the diagnostic accuracy of this test, for detection of candidaemia in the NHS service context.

Method(s): Twelve consecutive adults with candidaemia were identified prospectively. For 11 of these patients serum taken contemporaneously with the blood culture was available and was stored at −70°C for batch analysis. Where possible, serum obtained the preceding and/or following day was also collected. Serum from thirty-nine adults with a paired negative blood culture was also collected in a similar manner for negative controls. Staff performing PCR testing were blinded to the culture result. Sensitivity and specificity were calculated, expressed with 95% confidence intervals.

Results: In the primary analysis, a comparison of paired blood culture and contemporaneous serum was undertaken. Of 11 candidaemic patients, the paired serum was PCR-positive in 4, generating sensitivity of 36.4% (8.0–64.8%). Of the 39 control sera, 5 were PCR-positive, generating specificity of 87.2% (76.7–97.7%). The sensitivity increased to 63.3% (34.8–91.8%) in a secondary analysis when the serum samples from the day before/after the positive blood culture were included (7 of 11 detected).

Discussion and/or Conclusion(s): Overall sensitivity of the RenDx Fungiplex test was lower than previously reported and may relate to low copy-number candidaemias or retrospective PCR testing. Furthermore, the sample size is small, leading to uncertainty in these accuracy metrics. Further diagnostic accuracy assessment is required to guide optimal adoption of this test into routine NHS practice.

ID: 4932

Impact of changes in the diagnostics of Pneumocystis jirovecii (PJP) helping outbreak identification and management

Milind Khare, Deborah Gnanarajah, Wijitha Weerakoon, Rebecca Turner. *Royal Derby Hospital*

Background: Immunofluorescence was a gold standard for the diagnosis of PJP infections. PCR became available for various samples like broncho-alveolar lavage (BAL), sputum, throat swab and EDTA blood. It is still difficult to differentiate between colonisation and disease.
Aim(s)/Objective(s): To evaluate impact of changes in diagnostics for PJP in a teaching hospital.
Method(s): PJ PCR was introduced as available investigation for diagnosis in 2009. 2009 to 2012, Immunofluorescence was still offered for BAL. From 2012 onwards only PCR was offered as investigation for PJP.
Results: In 2012, 29 patients were positive for PJ PCR of which 11 were definite, 7 probable, 5 possible and 6 colonised cases. Some of this positivity might be due to change in diagnostics. In 2013 total of only 7 patients had positive PCR, no definite infection, 1 probable, 3 possible and 3 colonised. In 2014 total positives went up to 27 with 14 definite, 4 possible and 9 colonised. Outbreak was declared as 5 patients had PJP positive from the same unit at the same time. Air, inlet and outlet filters, environmental sampling & genotyping were initiated. In 2015 22 were positive with 11 definite, 3 probable, 1 possible and 7 colonised. In 2016 only 4 definite cases identified so far.
Discussion and/or Conclusion(s): PJP can be a coloniser and sometimes difficult to differentiate from an infection. Clinical features and HRCT guides diagnosis. Cycle times may be helpful. Blood PCR although not validated, is a useful practical tool.
Availability of PCR and genotyping was helpful in the recognition and management of outbreak.

ID: 4951

Comparison of 4 multiplex real-time PCR assays for the detection of viral pathogens in respiratory specimens

Helen Kirk-Granger, Christopher Holmes, Julian Tang. *University Hospitals of Leicester NHS Trust*

Background: Multiplex real-time PCR has become the test of choice for the detection of multiple respiratory viruses in clinical specimens. Several commercial assays are available, and a head-to-head comparison of multiple assays/platforms assists the final selection for diagnostic service provision.
Aim(s)/Objective(s): Comparison of 4 real-time PCR assays: the Argene multi-well system (Biomerieux), Respiratory pathogens 21 assay (Fast-track Diagnostics – FTD21), and two versions of an in-house multiplex real-time PCR assay ('standard' and 'extended').
Method(s):

1. Comparison of the relative analytical sensitivity and inter/intra assay variations of each assay by testing a panel of known positive samples for: influenza A/B, RSV, parainfluenza 1–4, adenovirus, human metapneumovirus, coronavirus & rhinovirus
2. Determination of clinical sensitivity, specificity, positive and negative predictive values for each viral target by testing a blinded panel of respiratory samples (n = 81). Consensus results were defined as those with the highest inter-assay concordance for each target.

Results: For the known positives, the FTD21 kit was the most sensitive, giving the lowest Cts for 79% of samples tested (22/28), though it gave the lowest relative performance (based on concordance) of 80%. The 'extended' in-house assay had the highest concordance, 98%, compared to 90% for the 'standard' in-house and Argene assays.
Discussion and/or Conclusion(s): Although the FTD21 kit appeared to be the most sensitive assay, this selection needs to be considered within the context of each individual laboratory's workflow and staffing numbers. The use of concordance (indicating the lack of a specific gold standard) can give misleading impressions. Eventually, a semi-automated platform (AusDiagnostics) was deemed more suitable for our laboratory.

ID: 5008

Evaluation of the Xpert MRSA NxG assay and the BD MAX MRSA XT assay for the detection of mecA+, mecC+ and mecA drop-out *S. aureus* isolates circulating in Europe

Frederic Laurent[1], Jason Tasse[2], William Mouton[2], Patricia Martins-Simoes[2], Jean-Philippe Emond[3], Jean-Philippe Rasigade[2], Olivia Raulin[3]. *[1]French National Reference centre for Staphylococci International Centre for Infectiology Research (CIRI), INSERM U1111 – CNRS UMR5308, Université Lyon 1, ENS de Lyon Hospices Civils de Lyon Institut des Sciences Pharmaceutiques et biologiques, Université de Lyon France, [2]French National Reference centre for Staphylococci, International Centre for Infectiology Research (CIRI) – INSERM U1111 – CNRS UMR5308 – Université Lyon 1 – ENS de Lyon, Hospices Civils de Lyon, [3]Laboratoire de bactériologie, Hôpital de Compiegne, France*

Background: Reports of atypical SCCmec cassettes, novel mec genes, diverse genetic backgrounds in MRSA strains as well as emergence of mecA drop-out isolates are increasing.
Aim(s)/Objective(s): To evaluate the accuracy of the last versions of Xpert MRSA NxG assay (XpertA) (Cepheid) and BD MAX MRSA XT assay (BDA) (Becton Dickinson) using a selection of *S. aureus* isolates circulating in Europe.
Method(s): 114 isolates were included: (i) Group 1: 53 MRSA isolates (mecA-positive, n = 43; mecC-positive, n = 10, 33 different spa-types) representing the main clones circulating in Europe; (ii) Group 2: 37 randomly-choosen MRSA isolates harbouring various atypical SCCmec cassette; (iii) Group 3: 16 randomly-choosen mecA-drop-out MSSA. All isolates were tested using XpertA and BDA kits according to manufacturers.
Results: In Group 1, all isolates were correctly identified as MRSA except one for XpertA (spa-t045) and three for BDA (spa-t001, spa-t091, spa-t064). All mecC isolates were detected by both reagents.
In Group 2, 8 isolates (spa-t008, -t030, -t127, -t190, -t1614) using BDA and 3 isolates (spa-t777, -t1664, -t2505) using XpertA were misclassified.
In Group 3, all the 26 mecA drop-out isolates (Group 3) were identified as MSSA whatever the assay used.
Discussion and/or Conclusion(s): Xpert MRSA NxG assay showed a higher accuracy to identify the MRSA isolates tested compared to BD MAX MRSA XT assay (BDA) with 4 versus 11 misclassifications respectively, mainly due to MRSA with new or variant SCCmec cassette. The range of primers targetting SCCmec cassette is likely more wide and optimised in XpertA kit.

ID: 5011

An assessment of the extent of unnecessary inpatient full-body (chest, abdomen and pelvis) CT scan examinations

Taufiq Khan[1], Rashika Fernando[2], Elizabeth Joekes[2], Michael Beadsworth[2]. *[1]University of Liverpool, [2]Royal Liverpool and Broadgreen University Hospitals NHS Trust*

Background: Radiation exposure is a risk factor for malignancy. The use of diagnostic computed tomography (CT) imaging is increasing

and it is important, given the associated radiation exposure, that CT examinations are only carried out when medically necessary.
Aim(s)/Objective(s): To determine the extent of unnecessary full-body (chest, abdomen and pelvis) CT scans that are carried out.
Method(s): All inpatients undergoing a full-body CT scan over a 12 month period from September 2014 to September 2015 across an infectious diseases/clinical pharmacology directorate were retrospectively identified from the radiology database. Clinical description, indications and outcomes of imaging were all assessed. Appropriateness was assessed against published and available local guidance. Scan requests due to metastases of unknown origin and the staging of lymphoma, gastric, colorectal, bladder, testicular, cervical and endometrial malignancies were adjudged to be appropriate requests. All other requests were recorded as inappropriate unless clear further information was included.
Results: A total of 92 admissions were identified. 57 patients (62%) were judged to have had a full-body CT scan that was not appropriate. 'Query malignancy' was the most common indication (33%). 43 of the 92 imaging examinations (46.7%) led to a diagnosis. 81% described unexpected findings, of which over 90% were incidental not requiring further follow-up.
Discussion and/or Conclusion(s): Inappropriate total-body CT scan examinations are a significant problem. This represents an unacceptable radiation risk to the patient, financial cost and causes delays for other patients. Further evidence based guidelines on when a full-body CT scan should be performed along with strategies to raise awareness of appropriate indications are required.

ID: 5014
An evaluation of the Check-Direct CPE assay for the detection of carbapenemase-producing Enterobacteriaceae from routine rectal screening swabs

Carlene Rowson, David Partridge. *Sheffield Teaching Hospitals*

Background: The reliable and rapid detection of carbapenemase-producing Enterobacteriaceae (CPE) is vital for the timely implementation of infection control measures to prevent their wider spread. Most current screening is performed using selective cultures which can take several days to provide a result.
Aim(s)/Objective(s): We intend to evaluate the performance of the Check-Direct CPE assay for the detection of CPE from routine rectal screening swabs.
Method(s): The performance of the test will be evaluated and compared alongside the selective culture screening method currently used at our institution. Both tests will be performed on routine rectal screening samples collected prospectively from adult patients as part of the local CPE screening protocol. We intend to collect 100 rectal swabs and report on the sensitivity, specificity and turnaround times.

ID: 5026
Evaluation of a hospital ward point of care testing service for meticillin resistant *Staphylococcus aureus*, *Clostridium difficile* and Norovirus

Benjamin Parcell[1], Diane Vass[2], Fiona MacKenzie[3]. [1]*NHS Grampian,* [2]*Senior Charge Nurse Stroke Ward & AMAU Dr Grays Hospital Elgin,* [3]*Scottish Microbiology & Virology Network (SMVN) Manager*

Background: The Scottish Microbiology and Virology Network (SMVN) carried out a national service evaluation of rapid molecular diagnostics to assess its impact on healthcare associated infections (HAIs) and antimicrobial resistance. Eight sites across Scotland reflecting different levels of healthcare were recruited. Dr Gray's Hospital in Elgin was the only site to use the GeneXpert as a point of care test (POCT).
Aim(s)/Objective(s): To evaluate the GeneXpert as a POCT for Meticillin Resistant *Staphylococcus aureus* (MRSA), *Clostridium difficile*, and Norovirus on a hospital ward, assessing its impact on clinical diagnosis and management of HAIs.
Method(s): GeneXpert was situated on a Stroke ward and ward staff were trained to carry out Xpert SA Nasal Complete, Xpert *C. difficile* and Xpert Norovirus testing from 16/10/14 until 18/01/16. Questionnaires and interviews were used to gather data from staff on use and acceptability of POCT on the ward. Baseline and test phase data including clinical turnaround times (CTATs) were compared.
Results: In total, 1105 tests were carried out. Compared to culture Xpert SA Nasal Complete had the highest sensitivity and specificity (100.00% and 98.92% respectively). Norovirus sensitivity was 83.33% and specificity 98.66% compared with in-house PCR, while *C. difficile* sensitivity was 73.91% and specificity 98.71% compared to glutamate dehydrogenase (GDH). Feedback from staff was largely positive, with testing felt to aid bed management for *C. difficile* and Norovirus, and improving MRSA management.
Discussion and/or Conclusion(s): Ward staff embraced using the POCTs, allowing the hospital to extend their local services and improve turnaround times, positively influencing management of HAIs.

ID: 5032
Phenotypic characterization oxacillin susceptible-methicillin resistant *Staphylococcus aureus* and coagulase negative *Staphylococcus* (OS-MRSA and OS-MRCoNS)

Rajni Gaind[1], Indu Biswal[1], Karnika Saigal[1], Khusbu Pandey[2]. [1]*VMMC and Safdarjung Hospital,* [2]*VMMC and Safdarrjung Hospital*

Background: CLSI recommends cefoxitin disc for the routine screening of MRSA as it is a potent inducer of the *mecA* regulatory system. There have been scattered reports of functionally oxacillin susceptible, *mecA*-positive *S. aureus* (OS-MRSA) clinical isolates. However there are no studies available from India regarding the prevalence of OS-MRSA.
Aim(s)/Objective(s): To observe the prevalence of OS-MRSA strains in septicaemic patients and to standardize a phenotypic identification method to detect OS-MRSA/OS-MR CONS (coagulase negative *Staphylococcus*) using cefoxitin disc induction method
Method(s): All methicillin sensitive *Staphylococcus* isolates were identified using cefoxitin disc, oxacillin MIC and PBP2a latex agglutination tests for *meecA* (primary testing). All tests were interpreted using CLI guidelines. These isolates were subjected to an induction test using cefoxitin disc and secondary tests using cefoxitin disc, oxacillin MIC and PBP2a were performed to detect the presence of OS-MRSA and OS-MR CoNS.
Results: 157 isolates were collected including 81 *Staphylococcus aureus* and 76 coagulase negative *Staphylococcus* strains (CoNS). 36/81 and 25/76 *Staphylococcus* strains were methicillin susceptible. Seven of total 36 MSSA tested were found to be OS-MRSA and four out of 25 MS-CoNS were found to be OS-MR CoNS.
Discussion and/or Conclusion(s): The emergence of OS-MRSA strains poses concern over the therapeutic alternatives for a presumed MSSA infection. These strains may go unrecognized in clinical specimens, unless the strains are induced prior to testing. Additional animal models and large scale studies are required to prove clinical significance of these isolates.

ID: 5050
A regional audit of compliance with national standards for loading/unloading of blood cultures across the East Midlands

Michael Weinbren[1], Vivienne Weston[2], Shrikant Ambalkar[3], Rebecca Walker[3], Dina El-Zimaity[4], Manjula Natarajan[4], Nelun Perera[5], Naomi Thompson[6], Emma Hendry[5], Felicia Lim[5]. [1]*Chesterfield Royal Hospital Foundation Trust,* [2]*Queen's Medical Centre Nottingham,* [3]*King's Mill Hospital,* [4]*Kettering General Hospital,* [5]*University Hospitals of Leicester,* [6]*Chesterfield Royal Hospital Foundation Trust*

Background: Blood cultures are a key investigation in the septic patient forming part of the Sepsis Six Bundle. National guidelines for blood culture processing issued in 2013 by the standard methods group of PHE (SMI B37) state 100% of blood cultures should be loaded on the analyser within 4 hours of collection and 100% of blood cultures to be removed within 2 hours of flagging positive. NICE guidelines require 'real time' reporting of 36 hour negative neonatal blood cultures.

Aim(s)/Objective(s): To audit blood culture load/unload delays across the region.
Method(s): Six hospitals in the region participated in the audit each providing data on 30 consecutive positive blood cultures containing *E. coli*. This provided data points to calculate load delay, time from collection to flagging positive and unload delay.
Results: One hospital met the standard of 100% loaded within 4 hours of collection, the remaining five hospitals ranging from 7% to 59%, some samples taking more than 24 hours. Time to positivity correlated with load delays. No hospital unloaded 100% of samples within 2 hours of flagging positive; one hospital achieved 97%, with a variation of 14–57% with the remaining five. Only one hospital sent out 'real time' 36 hour neonatal negative blood cultures.
Discussion and/or Conclusion(s): Audit is key to establishing the effectiveness of the blood culture pathway. Without audit significant delays may go unrecognised and impact on patient care. Benefits of optimising the blood culture pathway include early correction of deficiencies in empirical therapy, improved antibiotic stewardship and early cessation of antibiotics in neonates.

ID: 5079
Toxic shock syndrome toxin (TSST) positive MSSA in Glasgow

Clare Murphy[1], Ashutosh Deshpande[1], Elizabeth Dickson[2], Nitish Khanna[2]. *[1]NHS GG&C, [2]NHS GGC*

Background: TSST is an exotoxin that acts as a superantigen leading to signs of toxic shock syndrome in patients with serious Staphylococcal infections. Roughly 10% of *Staphylococcus aureus* bacteraemia isolates received at the Scottish MRSA reference lab are TSST positive but the clinicians are not informed of the results.
Aim(s)/Objective(s): To assess whether patients with MSSA bacteraemias who are TSST positive display clinical signs of toxic shock syndrome, and if it is appropriate to withhold the TSST PCR result from clinicians.
Method(s): Data from the Scottish MRSA reference laboratory was extracted between January 2013 and July 2014. Isolates of MSSA bacteraemia were received from 58 patients, of which we were able to access 39 casenotes. Clinical, demographic and outcome data were recorded.
Results: There were 23 male and 16 female patients with a wide age distribution. 28% of cases appeared to be hospital acquired, and a number of comorbidities were identified as risk factors with device-related or skin/soft tissue infection the commonest associations. Average CRP was 175 and length of duration ranged from 1–440 days. SIRS scores and clinical signs of TSS were poorly documented and overall mortality was 33%.
Discussion and/or Conclusion(s): Due to small numbers and poor documentation it is difficult to conclude whether TSST makes a clinical impact, however during the study we have identified several methods to take the project forward constructively.

ID: 5089
Evaluation of CHROMagar *C. difficile* for the direct isolation and detection of toxigenic *C. difficile* from diarrheal stools

Kanchan Dhamija[1], Frederick Pink[1], Anand Sivamakrishnan[2], Rohini Manuel[1], Lynette Phee[1], David W. Wareham[1]. *[1]Barts Health Trust, [2]Barking, Havering and Redbridge University Hospitals NHS Trust*

Background: *C difficile* associated disease, both antibiotic associated diarrhea (AAD) and *C. difficile* infection (CDI) impacts on morbidity, mortality and the use of antimicrobials in hospitalized patients.
Aim(s)/Objective(s): We evaluated a novel selective fluochromatographic culture media (CHROMagar *C. difficile*) for the rapid detection of *C. difficile* in diarrheal stools.
Method(s): Two hundred and nine samples were used in the analysis. Each sample was tested for GDH and toxin A and B before inoculation onto CHROMagar *C. difficile* plates (CHROMagar, Paris, France). Plates were incubated anaerobically at 37°C for 48 hours and then examined under ultra-violet (UV) light for fluorescent colonies.
Results: The *C. difficile* GDH antigen was detected in 58% (n = 121) of the stool samples with 90% of these (n = 110) also positive for CDT A or B. When cultured on CHROMagar *C. difficile*, fluorescent colonies were grown from 97/110 (88%) GDH positive samples. Absence of flourescent colonies in 13 samples was either because they failed to grow or they had non flourescent colonies. However 5 samples which were negative for GDH and Toxin had flourescent colonies.
Discussion and/or Conclusion(s): Our findings support the use of CHROMagar *C. difficile*. The test was found to be 89% sensitive and 94% specific. It is an easy to perform, sensitive and specific method to detect the presence of *C. difficile* in stool samples.

ID: 5106
Cost implications for the NHS of using the Alere™ i Influenza A&B near patient test with nasal swabs

Joy Allen[1], Susanna Davis[2], Rachel O'Leary[3], Ashley Price[4], John Simpson[3], Anne Tunbridge[5], Luke Vale[6], Michael Whiteside[7], Cariad Evans[2], Mohammad Raza[2], Michael Power[1]. *[1]NIHR Diagnostic Evidence Co-operative Newcastle, [2]Department of Virology, Sheffield Teaching Hospitals NHS Foundation Trust, [3]NIHR Diagnostic Evidence Co-operative, [4]Department of Infectious Diseases, Royal Victoria Infirmary, [5]Department of Infectious Diseases, Sheffield Teaching Hospitals NHS Foundation Trust, [6]Health Economics Group, Institute of Health & Society, Newcastle University, [7]Department of Acute Medicine, Doncaster Royal Infirmary*

Background: A recent evaluation of the Alere™ i Influenza A & B near patient test (NPT) indicated that, when the decision to isolate a patient with suspected influenza (flu) is based on clinical symptoms alone (current practice), not all patients with flu are isolated (increasing the likelihood of onwards transmission), and some patients without flu are unnecessarily isolated (at increased cost to the healthcare provider).
Aim(s)/Objective(s): To evaluate cost implications to the NHS, of using Alere™ i with nasal swabs to manage patients with suspected flu.
Method(s): A budget impact model estimated costs from hospital admission to discharge, or treatment completion. The model parameters were based on published data where possible and expert opinion otherwise. Uncertainties in the model parameters were investigated using deterministic one-way sensitivity analyses.
Results: The total cost of the Alere™ i Influenza A & B NPT for a cohort of n = 1000 adults is £132,203 compared with £375,650 for current practice, resulting in a total saving of £243,477. The NPT is cost saving in terms of isolation (£190,867 less costly than current practice), laboratory costs (£465,550) as well as antiviral prescription (£6,652). However it incurs costs in terms of onward transmission (£622 more expensive than current practice). Sensitivity analyses show that largest savings occur when the time to return the standard laboratory result is greatest.
Discussion and/or Conclusion(s): The model indicates that Alere™ i could have greatest impact on costs associated with diagnosis and management of patients with suspected flu, in hospitals reliant upon off-site laboratories, where sample transport time can delay result availability.

ID: 5126
Is there a point in culturing formed stools – What are the implications of extending the current Scottish *C. difficile* testing criteria to other enteric pathogens?

Padmaja Polubothu[1], John Coia[2], Tony Speekenbrink[2], Alison Whyte[2]. *[1]NHS Greater Glasgow & Clyde, [2]Glasgow Royal Infirmary*

Background: Our laboratory tests approximately 12,500 stool samples annually for various enteric pathogens. However, in accordance with Scottish guidance, only unformed stools are tested for *C. difficile*. We

wanted to determine the potential impact on diagnostic yield of extending this policy to testing for other organisms.
Aim(s)/Objective(s): The primary aim was to determine the diagnostic yield of non-diarrhoeal versus diarrheal stools. A secondary aim, was to assess the clinical/public health significance of positive results from non-diarrhoeal stools.
Method(s): A database search retrieved stool sample results from 1st August 2015 to 20th October 2015. Our laboratory records note whether samples are non-diarrhoeal or diarrhoeal. Hospital electronic discharges and laboratory clinical notes for all patients with positive stool culture results were analysed.
Results: 2747 samples were received: 146 were not processed. Forty-four percent were non-diarrhoeal. 119 samples were positive for *Campylobacter* sp. (36 non-diarrhoeal). 25 samples were positive for *Cryptosporidium* sp. (12 non-diarrhoeal). 11 were positive for Salmonella sp (2 were non-diarrhoeal). 4 were positive for *Shigella* sp. (2 were non-diarrhoeal). Only two samples (both diarrhoeal) were positive for *E. coli* 0157.
Discussion and/or Conclusion(s): In this study, almost a third of positive stool samples were non-diarrhoeal. Unfortunately, due to limitations of the available clinical data, we could not ascertain the full clinical/public health significance of these positives. However, the organisms isolated are generally regarded as significant human pathogens.
In conclusion, we would advise against extending the policy of only testing unformed stools to encompass enteric pathogens other than *C. difficile*.

ID: 5130
Tuberculous meningitis – diagnostics audit

Michael Riste, James Scriven. *Heart of England NHS Foundation Trust*

Background: CNS infections result in significant morbidity and mortality and their management can be complex and difficult. Anecdotal evidence suggests that some areas of this are suboptimal at our trust but objective evidence is lacking. As part of this wider CNS audit we looked specifically at TB meningitis diagnosis and management to compare this with national guidelines.
Aim(s)/Objective(s): To determine whether patients with presumed tuberculous meningitis are investigated appropriately.
Specific audit targets followed the BIA guidelines for TB of the central nervous system 2009).
Method(s): Patients were identified using the Birmingham TB database (proposal was to look at all lymphocytic CSFs, but this data was not available at the time of audit). Electronic and paper records were then assessed and an audit proforma completed with details of demographics, clinical presentation, investigations and management.
Results: Headache and fever were the most common presenting symptoms.
There were significant delays in performing lumbar puncture in these patients.
CSF volume was poorly documented and not assessable from current laboratory reporting methods.
Only 1 patient had a positive CSF TB culture. 2 grew TB from sputum or BAL and the remainder were treated as probable TBM.
14/15 patients had some form of imaging to look for extrapulmonary TB.
Discussion and/or Conclusion(s): Appropriate CSF sampling is difficult to audit presently; this requires better documentation and amendments to laboratory reporting.
Despite CSF culture and PCR being frequently negative, few patients had further microbiological samples obtained. Clinicians should pursue such investigations more aggressively to aid diagnosis.

ID: 5133
Evaluation of the Enigma MiniLab (RSV, influenza A, B) during the 2015–2016 influenza season

Julian Wei-Tze Tang[1], Marie-Jo Medina[2], Catherine Noon[1], Kelly Statham-Gill[1], Teena Eddison[1], Mouna Bouridane[1], Harsha Varia[1], Christopher W. Holmes[1], Alexander M. Martin[1], Ann Hunter[1].
[1]University Hospitals of Leicester NHS Trust, [2]University of Leicester, Leicester, UK

Background: Rapid point-of-care tests (POCTs) are now available in many formats, particularly for respiratory viruses. However, users need to consider a balance between the turnaround time (TAT), sensitivity/specificity, ease of use and cost of the test.
Aim(s)/Objective(s): To evaluate the new Enigma MiniLab PCR-based POCT that tests for RSV, influenza A and B (without any subtyping), against our in-house respiratory PCR assay, in an adult bone marrow transplant/oncology unit, during the 2015–2016 influenza season.
Method(s): Symptomatic, consenting patients requiring treatment and isolation for influenza-like illness were tested by taking two swabs, one each for the Enigma POCT (TAT = 90 minutes) and in-house assay (TAT = 6 hours).
Results: In total, 86 samples were tested. For RSV, influenza A and B, respectively: 80, 81, 81 samples were NEG on both assays; 2, 3, 3 samples were POS on both assays; 1, 2, 0 samples were POS on the in-house assay and NEG on the POCT; whereas, 3, 0, 2 samples were found POS on the POCT and NEG on the in-house assay. The POS% on the POCT and in-house assay, respectively were: RSV: 5.8%, 3.5% (Kappa coeff = 0.477, McNemar's test p = 0.625); influenza A: 3.5%, 5.8% (Kappa coeff = 0.739, McNemar's test p = 0.500); influenza B: 5.8%, 3.5% (Kappa coeff = 0.739, McNemar's test p = 0.500), showing no statistical difference between the performance of the two assays.
Discussion and/or Conclusion(s): All the ward staff commented on how easy the POCT was to use. However, given the small number of positive samples for each virus, further evaluation of this Enigma MiniLab assay will continue through this coming influenza season.

ID: 5142
Something old, something new. The utility of old and new diagnostics in tricky clinical cases

Daniel Burns[1], Danai Papakonstantinou[2], Tom Troth[3], Jamie Scriven[2].
[1]Army Medical Directorate Birmingham Heartlands Hospital, [2]Birmingham Heartlands Hospital, [3]Birmingham Heartlands Hospital/ Army Medical Directorate

Background: An 18 year old asylum seeker travelled from Eritrea to the UK overland through Libya, the Mediterranean, and Europe. He presented with a month's history of fever, weight loss, malaise and abdominal pain.
Initial investigations including a chest X-ray, routine bloods, abdominal ultrasound, malaria films, HIV test, and blood and urine cultures were all unremarkable apart from raised inflammatory markers.
Sputum cultures grew *Haemophilius influenzae* but despite a course of amoxicillin the fevers continued. A wide differential was considered in view of the ongoing fevers, travel history and lack of organ focus. Extensive investigation was performed including a CT of the chest, abdomen and pelvis, brucella, leishmania and coxiella serology, a bone marrow biopsy, stool cultures and microscopy, and a vasculitis screen but no cause was found.
A PET scan was performed to localize the presumed infective or malignant lesion and allow targeted biopsy. Multiple metabolically active abdominal and thoracic lymph nodes not apparent on CT were seen. EBUS collected insufficient sample for definitive histology. Given his country of origin, clinical picture and a positive T-spot test a diagnosis of occult tuberculous lymphadenitis was made and anti-tuberculous therapy was started. The patient defevresced and put on weight. Subsequently a stool culture and the lymph node biopsy sample grew *Mycobacterium bovis.*

This case demonstrates both the utility of PET scan, a new test, to localise disease and provided a target for biopsy, but also an old test, stool culture for mycobacteria, to reach the diagnosis of cryptic *Mycobacterium bovis* lymphadenopathy.

ID: 5161
Direct identification of blood culture isolates – a key to improved antibiotic stewardship?

Emily Goldstein, Aleksandra Marek, Mairi Macleod. *NHS Greater Glasgow and Clyde*

Background: Identification of isolates directly from blood culture fluid using MALDI-TOF permits preliminary result reporting of pathogens in around 30 minutes. This rapid turnaround time allows targeted antibiotic therapy resulting in improved patient management and antibiotic stewardship.
Results: In this study we performed direct identification of isolates from 102 blood culture bottles which flagged positive, using a centrifugation method and compared these results to identifications obtained using traditional culture and identification methods. Correct identification was achieved in 65% of monomicrobial infections compared to traditional methods, with a greater proportion of Gram negative organisms being correctly identified (69%) than Gram positive organisms (63%). Ten blood culture bottles investigated in this study were polymicrobial, the direct identification method correctly identified one organism in 7 of these samples, in each case the likely pathogen was identified (e.g. *Staphylococcus aureus* or *Enterococcus* spp.) whereas probable contaminants were not. We also performed a retrospective analysis of antibiotic prescribing for patients included in this study to determine whether the correct identification of blood culture isolates using direct identification methods, improving the turnaround time by at least one day, would improve antibiotic prescribing practice and could in turn improve patient outcome.

ID: 5165
A retrospective analysis of the investigation of suspected meningitis in an Acute Medical Unit

Katharine Relph, Jenni Crane. *NHS Lothian*

Aim(s)/Objective(s): To assess current practice in the investigation of suspected meningitis in view of the newly published UK joint specialist guidelines, and to establish areas of practice that require improvement.
Method(s): A retrospective audit of all patients presenting with suspected meningitis who had lumbar puncture (LP) for suspected meningitis over an eighteen month period was performed. Case identification was undertaken by reviewing all CSF samples received by laboratories. Data was collected from case notes using a pro-forma adapted from the recent guidelines.
Results: 75 patients were included. 2 patients had their LP in <1 hour. Mean time to LP was 13 hours (range 1–107) from presentation. 57 patients had neuro-imaging prior to LP. In 22 of these patients there was no indication for this. Other reasons for delayed LP included uncontrolled seizures, deteriorating GCS, agitation, patient refusal, and technically challenging LPs. 54 patients had blood cultures sent and 18 patients had blood sent for bacterial PCR.
Discussion and/or Conclusion(s): A significant majority of patients waited >1 hour for a LP. The most common factor for delay was waiting for neuro-imaging.
To improve the investigation of these patients the following interventions have been implemented:

- Reduce unnecessary requests for intracranial imaging through education of medical staff
- Simulated LP teaching for medical trainees
- Improved accessibility to equipment (e.g. LP packs) to facilitate timely LP
- The use of electronic ordering bundles for blood cultures and bacterial PCR.

Further prospective analysis will be undertaken to assess the above proposals.

Topic: Education and training

ID: 4429
Prospective analysis of patient safety in operation room

Fatemeh Mousavi[1], Ali Vahdani[2]. *[1]Iranian Hospital, [2]Iranian Hospital*

Background: In order to find out strength and weaknesses in our health system, we point out to patient safety as a whole and its details such as many helping factors, likewise any failure in communication.
Aim(s)/Objective(s): We performed a research about patient care using Prospective Observational Technique. Considering any failure that is critical for patient's life and by resolving them before they happen, we can create a safer environment for ongoing surgery in operation rooms and drawing attention of staff to potential faults.
Method(s): First of all, one survey was created to evaluate staffs' knowledge about patient safety and considered methods to prevent any errors and then a one-page form was prepared to collect faults and near miss cases errors in the duration of research. The preferred research method was correlational method because of different aspects of research.
The duration was only one month as a start point and main participants were staff of the operation room in Iranian hospital Dubai. In next step analyzing was done based on LOTICs score and as a result we recommended some solutions to remove problems like wise.
Results: Based on collected data, we found out there are many important negotiable problems about patient safety in operation room. First of all, miscommunication is important issue, also we found out some gaps on training and education in OT.
Discussion and/or Conclusion(s): Improving communication among staff, arranging training course in hospital, managing work load…, can help to create safer place for doing surgeries.

ID: 4435
Knowledge, attitude and practices of health care workers on preventive measures of hospital acquired infections are poor in Yaounde

Stephane Talbit Ndjonya[1], Enow Ashuntantang Gloria[2], Hortense Gonsu Kamga[3], Sinata Koulla Shiro[3], Sylvain Raoul Simeni Njonnou[2], Aime Timnou Tiodoung[2], Anne Ongmemb Boli[2]. *[1]Erasmus University Teaching Hospital, [2]Department of Internal Medicine, Faculty of Medicine and Biomedical Sciences, [3]Department of Microbiology, Faculty of Medicine and Biomedical Sciences*

Background: In Cameroon, isolation of resistant bacterial strains at the Yaounde Central Hospital (YCH), closure of Intensive care unit (ICU) of YCH and Yaoundé University Teaching Hospital (YUTH) for disinfection as a result of nosocomial infection, make hospital acquired infections a major problem in our environment. There is no sensitization, and specific control program for this health issue in Cameroon.
Aim(s)/Objective(s): The aim of our study was to evaluate knowledge, attitudes and practices of health care workers of YGH, YUTH and YCH on preventive measures towards nosocomial infections.
Method(s): We carried out a descriptive cross-sectional study in the above mentioned health institutions from May to September 2015. It was a consecutive sampling. Data were collected via a self-administered and anonymous questionnaire.
Results: Our study population was made of 63 health care workers. Most of the health care workers had less than 5 years experience (n = 28). None of the professional had good knowledge. 80 to 87.5% had poor knowledge. Hand hygiene was the least known preventive

measure for nosocomial infection. The global level of practice is poor, estimated at 23.1% for nurses and 40.0% for medical student. Vaccination rate of the study population against hepatitis B virus was 44.4%. About 73.3% had no procedure for hand hygiene in the health care delivery unit. Only 14.3% applied the recommendation of hand washing before and after each patient.
Discussion and/or Conclusion(s): Knowledge, attitude and practice levels are poor in our study population. We found no correlation between socio demographic characteristics, knowledge, attitudes and practices towards prevention of nosocomial infection.

ID: 4471
An examination of hand washing education and attitudes amongst medical staff in Trauma & Orthopaedics

G. Alexander Augustithis[1], Rashid Abu-Rajab[2]. [1]*Department of Spinal Surgery, Royal Victoria Infirmary,* [2]*Department of Orthopaedics & Trauma, Royal Alexandra Hospital, Paisley, UK*

Background: Hand hygiene compliance amongst medical staff is poor. We performed a project to determine knowledge of the 'how' and 'why' of hand hygiene practice. Initial results showed a good understanding of the 'how' of hand hygiene practice but poor understanding of the core science behind current guidelines (the 'why'). An educational event was administered by our local infection control team to address short-comings.
Aim(s)/Objective(s): Following the educational event a further questionnaire was administered to re-assess staff knowledge of hand hygiene practice and their attitudes towards hand hygiene education.
Results: Our results show the basic principles of hand hygiene (the 'how') were well understood but understanding of the core science (the 'why') was lacking. Participants indicated a strong tendency towards evidence based practice wishing to have the opportunity to evaluate evidence before enacting a change in clinical practice. Participants indicated that they were unhappy with the current format of hand hygiene education which was thought to be overly dogmatic.
Discussion and/or Conclusion(s): Our study shows a poor understanding of the core science under-pinning current hand hygiene practice amongst medical staff. We contend that the learning style of medical staff mandates a greater focus on the evidence and science behind current hand hygiene guidelines. Current education theory suggests that better knowledge is likely to translate into higher compliance with hand hygiene guidelines. We suggest that hand hygiene education should be changed to reflect the particular needs of medical staff and that a parallel program should be run for medical staff.

ID: 4502
Hand hygiene practice among anesthiologists in Palestine

Ahmed Abu Tayeh[1], Ruba Sajdeya[2], Samir Hasan[2], Fady Zaben[2], Anis AL-Hajjeh[2], Colin Green[2]. [1]*International Medical Education Trust 2000- Palestine (IMET2000-Pal),* [2]*IMET2000-Pal*

Background: Hand hygiene is considered an important procedure for prevention of hospital acquired infection (HAI) in patients and healthcare providers. Its compliance in anesthesia providers has been poorly studied in Palestine. In the absence of standard protocols for hand hygiene in the Palestinian health care system, compliance may be poor.
Aim(s)/Objective(s): To evaluate compliance of anesthesiologists with hand hygiene practice inside the operating room (OR).
Method(s): A multi-centre, cross-sectional, descriptive study, using a self-administered questionnaire, was conducted in January–March 2015. Participants' compliance regarding IC practices and availability of training material and programs policies were examined using 48 items questionnaire. SPSS was used for data analysis.
Results: Fifty-seven anesthesia doctors from hospitals in West Bank responded to our survey. Most participants were males (93%), 66.7% were residents, and 29.8% were specialists. 61.4% had a postgraduate degree. Only one third of respondents begin their day with hand washing while only half always wash their hands between cases. 36.4% reported that they rarely wash their hands before inducing general anesthesia. 20.4% rarely wash their hands in neuroaxial blocks, 35.1% in peripheral blocks, 41.7% in venous cannulation. Surprisingly, 24% or participants reported the absence of alcohol inside the operating room.
Discussion and/or Conclusion(s): Anesthesia providers adherence to hand hygiene practice and guidelines is extremely low. This exposes patients and healthcare providers to serious nosocomial infections. Further research is required to know why they do not comply the infection control (IC) practices. Hand hygiene improvement programs should be prioritized and addressed to help anesthesiologists to employ safe hand hygiene.

ID: 4525
Giving a fresh touch to education and training in infection control

Moi Lin Ling[1], Hui Xian Toh[2], Angel Koh[2], Kwee Yuen Tan[2], Daphne Chan[3], Edison Ng[3]. [1]*Singapore General Hospital Pte Ltd,* [2]*Singapore General Hospital,* [3]*Singapore Health Services Pte Ltd*

Background: It is critical that every healthcare worker knows and understands basic Infection Control practices to protect themselves against healthcare associated infections. However, there are significant difficulties delivering effective teaching to staffs who are burdened with heavy workload.
Aim(s)/Objective(s): This paper aims to describe how we use a new "blended" approach employing a combination of professional videos, online material and quizzes designed to provide structure, standardization, and equality of learning to all job categories of health care workers.
Method(s): Needs assessment was first done according to categories of healthcare workers. Core topics identified include orientation for new hires and hand hygiene as a basic module for all healthcare workers. Specialised modules were also defined for high risk areas e.g. ICU, CSSD, OT and Endoscopy Unit. E-modules were then developed and rolled out in phases hospitalwide. Where there are skills to be assessed, videos and e-competency modules were created.
Results: The blended approach used has resulted in improved staff understanding and engagement. Hand hygiene compliance increased from 71.9% to 86.1% followin hospitalwide implementation of the new e-competency modules for hand hygiene. The enhanced orientation program has helped in ensuring 98% of new staff to be trained in infection control within 1 month of hire in FY15.
Discussion and/or Conclusion(s): We have demonstrated that blended learning is an effective and creative tool that can be used to enhance infection control training and competency assessment. This impacts on behaviour change leading to better compliance to infection control practices and hence, reduction on healthcare associated infections.

ID: 4587
Use of a diarrhoea assessment and management pathway to promote best practice

Elizabeth Flude. *Queen Elizabeth Hospital Gateshead Health NHS Foundation Trust*

Background: NHS Trusts in England are required to report *Clostridium difficile* toxin positive cases in patients over 2 years to the Department of Health mandatory surveillance programme. NHS trusts must demonstrate year on year reduction in the numbers of *Clostridium difficile* (CDI) infection.
Aim(s)/Objective(s): Our aim was to develop a bespoke Diarrhoea Assessment Management Pathway (DAMP record). This was to assist in the identification and management of the patient with potentially infective diarrhoea, promote consistent record keeping and engage clinical staff to implement a bundle of risk reducing interventions.

Our objective was for staff to understand risk assessment & recognise infection potential in their patient group.
Method(s): Comprehensive assessment is required to establish type and possible cause of diarrhoea, to isolate the patient at the earliest opportunity and to improve timely submission of samples for testing. The DAMP record should commence following the patient's first episode of Bristol Stool Chart type 5–7. The Bristol stool chart is incorporated in the DAMP record.
It is a comprehensive tool, informative guide and monitoring record requiring education and training, engagement and ownership by clinical teams. The pathway is subject to continuous audit and development by our team to measure compliance across the Trust encouraging continuity of care throughout the patient journey.
Results: The DAMP record is used as evidence to reduce the number of trust unavoidable CDI cases.
Discussion and/or Conclusion(s): The IPC Team supports ward teams cultivating clinical excellence, positive communication and reinforcement of best practice. We engage with staff, sharing and discussing lessons learned as part of our on-going commitment to patient safety.

ID: 4702
ICHG's activities and how the Japanese infection control measures changed since HIS 2002 in Edinburgh

Hiroki Yamanoue[1], Ristuko Iuchi[2], Mineko Kanazawa[3], Setuko Shikakura[4], Naohisa Fujita[5], Harunobu Yura[4], Eiko Oosawa[1], Misao Sugiura[1], Shimpei Hatae[4]. *[1]Shizuoka Tokushukai Hospital, [2]Infection Control, Rakuwakai Otowa Hospital, [3]The Red Cross Society Nagasaki Atomic Bomb Hospital Infection Control Nurse ICC, [4]ICHG Japan Infection Control Hospital Group, [5]Department of Clinical Laboratory and Infection Control, Kyoto Prefectural University of Medicine*

Background: The Infection Control Hospital Group (ICHG) is a group which is composed of people from various occupations related to medicine, who aim to improve the measure of infection prevention in Japan.
Aim(s)/Objective(s): This report shows our activities and how Japanese measures of infection control have changed since 2002 when our activities were reported for the first time in HIS Edinburgh.
Method(s): The measures have been compiled by our inspection tours, mainly from EU and been adapted to Japanese customs. The measures have been introduced by published guides/manuals, giving lectures and conference presentations as our three main activities.
Results: 10 guides/manuals have been published since 2002. Some of them were the first publications in their field in Japan. One of the on-going lectures for the city healthcare center has lead to the decrease in number of influenza outbreaks. The National Center Hospital for Children was the first building designed considering infection prevention. Some of the ICHG members participated in designing the hospital. The guide/manuals about hospital architecture which were published by ICHG have influenced the design of hospitals in Japan.
Discussion and/or Conclusion(s): We have taught infection prevention measures which we compiled from our inspection tours in the EU hospitals and the EU's medical professionals knowledge. We believe that intelligence from them is superior to that of any other sources. As a result, Japanese Infection Prevention measures have changed due to the introduction of the EU practices. We would like to continue studying abroad and translating the knowledge we acquire to Japan to further improve infection prevention there.

ID: 4704
Disadvantages in health care workers hand hygiene education

Sergejs Kuznecovs, Galina Kuznecova. *Preventive Medicine Institute*

Background: Health care-associated infection in hospitals is a major cause of morbidity and mortality, and effective hand hygiene is the best ways to prevent it.
Aim(s)/Objective(s): The aim of the present study is to show what should be changed in health care workers behaviour to increase hand hygiene.
Method(s): A questionnaire-based survey was carried out anonymously among 254 nurses and 242 physicians in Latvia to identify and quantify factors that affect the hand washing behaviour. Groups were asked to answer in free form with regard to failing or neglecting to wash their hands when they should have done so. The questionnaire included details of the situations in which physicians and nurses neglected to wash their hands were classified into the five categories described in Japan study in 2002.
Results: 128 nurses (50,3%) and 180 physicians (74,3%) neglected to wash their hands when they should have done so. Among them "was too busy" were 102 (79,6%) nurses and 115 (63,8%) physicians, "forgot" 9 (7%) nurses and 24 (13%) physicians, "do not recognize the necessity" 2 (1,5%) nurses and 1 (0,05%) physicians, "did not find facility for washing hands" 3 (1,6%) nurses and 8 (4,4%) physicians, "use gloves instead of washing hands" 11 (8,5%) nurses and 32 (17,7%) physicians.
Discussion and/or Conclusion(s): Significant differences were found among staff groups. To improve hand hygiene psychological factors must be considered: including motivation, recognition and behaviour in urgent conditions. Hospitals need to develop and implement innovative educational and motivational programmes tailored to physicians.

ID: 4709
…and the winner is…A national contest on Clean Care

Francesco Auxilia[1], Antonella Agodi[2], Cristina Arrigoni[3], Silvio Brusaferro[4], Marcello Mario D'Errico[5], Pasqualina Laganà[6], Maria Teresa Montagna[7], Ida Mura[8], Luisa Sodano[9], Maria Valeria Torregrossa[10], Cesira Pasquarella[11]. *[1]Department of Biomedical Sciences for Health, University of Milano, [2]University of Catania, [3]University of Pavia, [4]University of Udine, [5]University Politecnica delle Marche, [6]University of Messina, [7]University of Bari Aldo Moro, [8]University of Sassari, [9]University of Rome Tor Vergata, [10]University of Palermo, [11]University of Parma*

Background: Patient safety and HAI prevention and control should be a pillar of the professional level of competency starting from the first approach to health care organizations (undergraduate level). It should be based also on active involvement of the students. The 10th anniversary of the adoption of Clean Care is Safer Care project in Italy provided the opportunity to the Universities members of the GISIO- SItI Study Group on HAI to try new ways to encourage students' creativity.
Aim(s)/Objective(s): To actively involve students in Nursing, Medical Degree, Other HealthCare Professionals in a creative contest on hand hygiene in order to increase their awareness both of this topic and more in general of HAI.
Method(s): The Universities members of the GISIO network promoted at local level a contest after previously defining aim, methods and framework for evaluating the results. Students were invited to prepare by May 5th, 2016 products such as videos, posters, presentations, leaflets, screensavers. The best works will represent their University in a national contest to be held on November 18th.
Results: More than 600 students from 9 Italian Universities and 38 from Albania were involved. 105 projects were presented for evaluation. A local committee judged according to a common framework on the following items: scientific accuracy, creativity, products' technical quality, usefulness for campaigning. A national committee will be in charge to apply the same criteria to the national contest.
Discussion and/or Conclusion(s): Given the encouraging achievements, the steering group is considering whether to extend the participation in the next future.

ID: 4720

The relationship between HCW surface contacts, care type and hand hygiene: An observational study in a single-bed hospital ward

Marco-Felipe King[1], Catherine Noakes[1], Andrew Sleigh[1], Sue Bale[2], Liz Waters[2]. [1]*University of Leeds,* [2]*Aneurin Bevan UHN*

Background: Hand hygiene is considered to be one of the major tenets in infection control strategies. However, little is really know about how care type effects compliance.
Aim(s)/Objective(s): This study quantifies relationships between hand hygiene and the frequency with which healthcare workers (HCWs) touch surfaces in patient rooms for different care types. Surface contacts patterns are quantified to determine patterns.
Method(s): Surface contact order and hand hygiene likelihood were recorded in an NHS single-bed UK hospital ward for six care types.
Results: Surface contacts often formed representative non-random patterns, but hygiene before or after patient contact depends significantly on care-type ($p = 0.001$). Hygiene likelihood correlated with the number of surface contacts (CI 1.1–5.8, $p = 0.002$) but not time spent in the room.
Discussion and/or Conclusion(s): This highlights that a potential subconscious need for hand hygiene may have developed in HCWs, which may support and help focus future hygiene education programmes.

ID: 4767

One Health approach to antibiotic stewardship education Eden AMR session 2016

Neil Powell[1], Lee Evans[2]. [1]*Royal Cornwall Hospital Trust,* [2]*Cornwall Partnership Foundation Trust*

Background: Antimicrobial resistance (AMR) is a global threat requiring collaboration across the healthcare community.
Aim(s)/Objective(s): To develop a one day conference delivered by speakers representing animal, human and environmental aspects of antimicrobial resistance to professionals in Cornwall.
Method(s): The following programme was delivered;
The epidemiology of AMR
The AMR drivers in livestock and farming
The AMR drivers in humans
The AMR drivers in the environment,
AMR infection case studies
NHS England strategy,
The audience represented nine sectors with sessions delivered by representatives from five different professional backgrounds; Consultant Epidemiologist of Public Health England Veterinary Surgeon, two Medical Microbiologists, Environmental Microbiologist, Pharmacist.
Results: The day met the expectations of the diverse audience, with participants reporting that the following knowledge learnt from the conference will inform future practice (number or responses in brackets); the website resources sign posted e.g. PHE Fingertips (14), to become and promote Antibiotic Guardian (5), the risk of foreign hospitalisation on CPE carriage (4), infection control key to tackling AMR (4), the threat of CPE on health security (4), implementation of the CPE toolkit (2), importance of screening patients (2), review antibiotics by 72 hours (2).
Participants enjoyed; diversity of speakers (18), the broad and global overview of current AMR (13), environmental dimensions of AMR (9), farming and vets approach to tackling AMR/antibiotic stewardship (9), human travel and the spread of resistance (8), the complexity of AMR (5).
Discussion and/or Conclusion(s): The complexity of AMR was successfully delivered by a range of AMR specialists simultaneously to a wide range of professionals.

ID: 4790

Hospital design and IPC: A UK-India collaboration

Teresa Inkster[1], Christine Peters[2], Peter Hoffman[3]. [1]*Queen Elizabeth University Hospital, Glasgow,* [2]*Queen Elizabeth University Hospital Glasgow,* [3]*Public Health England*

Background: In March 2016 three Infection Control professionals from the UK travelled to Mumbai to participate in a workshop on design for Infection Control and Prevention, organised by the British Deputy High Commission.
Aim(s)/Objective(s): We describe our input to the workshop and visits to three local hospitals where we engaged with local infection control teams.
Method(s): We toured outpatient clinics, ICUs, operating theatres, and a sterile supplies department. We discussed the challenges they face e.g. MDR/XDR tuberculosis and multi/pan drug resistant Gram negative organisms, both still rare in the UK as well as control measures important in the prevention of antimicrobial resistance and transmission of micro-organisms; decontamination of the environment and equipment, hand hygiene, antimicrobial stewardship, surveillance, diagnostics and specialist ventilation.
Results: Participating in the workshop enabled us to share our experience of the built environment and hospital design. We each presented talks on ventilation, water damage and the built environment in intensive care. Lots of discussion and debate took place between delegates at the workshop with regards to hospital ventilation issues and options for water control in hospitals.
Discussion and/or Conclusion(s): Our visit was the start of an exciting collaboration between India and the UK in relation to design for infection prevention and control. Funding for future research is available from a number of sources and opportunities exist for international exchange programmes and fellowships.

ID: 4810

Finnish infection control nurses' educational needs

Tarja Kuutamo[1], Maija Hupli[2]. [1]*Hospital District of Helsinki and Uusimaa, HUS, Unit of Infection Control and Hospital Epidemiology,* [2]*Department of Nursing Science, University of Turku*

Background: Infection control nurses play a key role in effective infection control and prevention practices. However, according to previous studies, infection control nurses' educational needs are poorly defined. The purpose of this study was to describe the Finnish infection control nurses' educational needs. The research question was: What kind of educational needs do infection control nurses have?
Method(s): The informants in this study were Finnish infection control nurses ($n = 148$) and the response was 66.9%. The data were collected using electronic questionnaires in summer of 2011. The data were analyzed using the inductive content analysis. Two categories were formed as a result of analysis to describe infection control nurses' educational needs. The formed categories were professional education and education that supports executing assignments.
Results: Infection control nurses described that they need a wide educational background that is made especially for them. Nurse-education is a good foundation for the job although some nurses remarked, that education in the university gives a better starting point to understand or write scientific publications. Educating staff is an important part of infection control nurses job, but they rarely have any formal education to do that. Human resource management, information management, project management and pedagogic competence are important skills for them.
Discussion and/or Conclusion(s): Infection control nurses' education should contain substance knowledge and skills that would support the best performance. Infection control nurses' education should be at university, which would also give the opportunity to use clinical expert's tittle.

ID: 4818

Educational programme for healthcare cleaning professionals

Tarja Kuutamo[1], Irma Meriö-Hietaniemi[2], Päivi Liljendahl[3]. *[1]Hospital District of Helsinki and Uusimaa, HUS, Unit of Infection Control and Hospital Epidemiology, [2]Hospital district of Helsinki and Uusimaa, HUS. Unit of Infection Control and Hospital Epidemiology, [3]HUS, Hospital Facility Maintenance and Institutional Hygiene Service*

Background: Patient infection safety in hospital entails that all health care workers and associated personnel know how they can prevent infections on daily basis. Changing environment, new technology and employee turnover create a challenge to maintain the highest standards of cleanliness and infection control requirements.
Aim(s)/Objective(s): Hospital facility maintenance and institutional hygiene service unit remarked that there is a need for a new team, that has a wider knowledge and know-how on special cases in hospital cleaning. The idea of the team is that it would take charge on situations that require special expertise.
Method(s): Infection control and Hospital epidemiology and Hospital facility maintenance and institutional hygiene service units planned together an educational program for Infection team. Identified problem areas were handling of epidemic situations and difficulties in isolations procedures.
The training included both theory and practical education. 24 healthcare cleaning professionals were chosen for the team in 2013. All the chosen have had experience of several years' in institutional cleaning and some had worked as a supervisor.
Results: Infection team members described, that they need regular education of basic elements on reducing infections. They also pointed out need for education about personal protecive equipment, regarding especially how to use them. Strengthening the basic skills on infection prevention helped the healthcare cleaning professionals to take lead in situations that required specific care. Infection team members also educate their colleagues.
Discussion and/or Conclusion(s): The team members are motivated and knowledgeable healthcare cleaning professionals and they are an important part of infection prevention at Hospital District of Helsinki and Uusimaa.

ID: 4892

Microbiology demand management of female genital samples submitted for culture from primary care in NHS Grampian

Noha Elsakka, Isabel Cook, Tanzeel-Ur Rehman, Ian Gould. *NHS Grampian*

Background: A large number of female genital samples are submitted to microbiology lab of Aberdeen Royal Infirmary every year.
Aim(s)/Objective(s): A demand management exercise was undertaken to endorse national guidelines regarding management and Lab diagnosis of abnormal vaginal discharge.
Method(s): An educational GP newsletter was issued in October 2011 explaining that high vaginal swabs in asymptomatic women should not be sent for culture and highlighted the current guidelines. This was followed by an audit of female genital samples submitted to the microbiology lab for culture (01/01/2012 – 31/12/2012), which showed that among 10192 samples received, 61% were culture negative. Among positive samples 54% were positive for candida, and 31% for mixed anaerobes. A further GP newsletter was issued advising that clinical diagnosis of candida or bacterial vaginosis is not an indication for testing, and patients should be treated empirically. A further intervention was undertaken targeting eight GP practices with the largest number of samples. An electronic decision support tool was generated, including a list of clinical abstracts representing common clinical scenarios; each was linked to a recommendation of whether or not culture is indicated. A link to national guidelines was included.
Results: Analysis showed 1248 samples were submitted during Sept-Nov 2014, this was significantly reduced to 791 samples in Sep-Nov 2015 ($p < 0.005$, paired t-test) following introduction of the electronic tool.
Discussion and/or Conclusion(s): The outcome represents a successful targeted demand management exercise on culture of female genital samples in NHS Grampian.

ID: 4902

The learning curve in hand hygiene technique – a multi-institutional study

Tamás Haidegger[1], Ákos Lehotsky[2], Száva Bánsági[3], Péter Róna[3], Péter Szerémy[3], László Szilagyi[4]. *[1]Hand-In:Scan, [2]Semmelweis University, [3]Hand-In-Scan Kft., [4]Hand-In-Scan*

Background: The heritage of Semmelweis is the discovery of the importance of hand hygiene during the medical care. Our study was focused on the quality of hand rubbing, employing an innovative imaging-based device, deriving the learning curve in hand rubbing, measuring the time to achieve optimal performance.
Method(s): A total of 168 health-care workers (HCW) were involved from 3 Hungarian hospitals in an educational and training program, during which repetitive computer-enhanced fluorescein trials were conducted at 2–3 days intervals. There were 22 doctors, 124 nurses and 22 other employees; 157 female versus 11 male, 158 right- vs. 10 left-handed. Mean age was 40.5 years. HCWs were asked to perform hand rubbing with a UV-dyed solution (on a voluntary bases), and received instantaneous, objective visual feedback.
Results: The rate of successful/failed performance (regarding complete coverage) was evaluated. On the institution level, the failure rate was 32–62%, 25–46%, and 12–14% at first, third, and fifth attempt, respectively, with an average of 42%, 29% and 13%.
Discussion and/or Conclusion(s): Digital evaluation and direct feedback on the quality of hand rubbing can be used efficiently to acquire the skills for proper hand hygiene. The collected data shows that multiple training sessions are required to achieve the desired level of quality.

ID: 4909

Implementing a coordinated response to rising numbers of measles cases: lessons from a London hospital

Beatrice Cockbain[1], Tehmina Bharucha[2], Jennifer Hart[2], Ons El Hayet Ben Ismail[2], Tabitha Mahungu[2], Tanzina Haque[2], Dianne Irish[2]. *[1]Royal Free Hospital, [2]Royal Free Hospitals NHS Trust*

Background: In April 2016, a measles outbreak was declared in London, with 138 cases confirmed from January-June 2016 in the city: 12.3% at our hospital. Despite this growing caseload, there have been delays in the recognition and diagnosis of measles by clinicians due to lack of awareness and exposure.
Aim(s)/Objective(s): To improve measles awareness in front-line healthcare workers (HCWs).
Method(s): The implementation of a measles awareness campaign focussing on three main areas: assessing immunity in patients and HCWs; recognition of the clinical presentation and infection control measures.
Results: Awareness posters were displayed in key areas including the Emergency Department, Paediatrics and Medical Admissions Unit. Posters gave information about the clinical presentation of measles and necessary infection control measures. Information was also placed on the hospital intranet homepage and immunisation awareness messages were emailed to staff.
Teaching sessions for frontline HCWs, including a medical 'Grand Round' presentation, focused on all three areas of the measles awareness campaign. HCWs were urged to clarify their immune status with occupational health and be vaccinated, if required. In addition emphasis was put on early recognition and the prompt respiratory isolation of suspected cases.
Discussion and/or Conclusion(s): Successful infection control strategies require HCWs to find them both relevant and understandable. This measles awareness strategy was both: HCWs found teaching

informative and action was taken by staff to clarify their immunisation status. This is an example of a simple, effective and easily implementable infection control strategy, which could be modified for other current or emerging infections, in both primary and secondary healthcare settings.

ID: 5000

Acquaintance and attitude regarding nosocomial infections among nursing staffs working in a tertiary care hospital in western Nepal

Sana Khan. *Manipal College of Medical Sciences, Pokhara, Nepal*

Background: Nosocomial infections are a significant cause of morbidity and mortality in every health care system, especially in developing countries.
Aim(s)/Objective(s): The objective of the study was to find out the acquaintance and attitude regarding nosocomial infections among nursing staffs working in a tertiary care hospital in western Nepal.
Method(s): It was a descriptive study conducted in Manipal Teaching Hospital, Phulbari, Pokhara, Nepal between 1st January 2016 to 31st March 2016. The questionnare were constructed using socio demographic variables, knowledge and attitude questions on nosocomial infection. Data was collected by self-administered questionnaire. 120 staff nurses were participated in the study. Simple random sampling were used to select the sample. The data were analyzed using inferential statistics with SPSS 16 Windows Version.
Results: 88% of the participants were of the age group 20–30 years, and 49% of them had work experience more than 5 years. 75% of them had good knowledge and 69% had positive attitude. There was no association between socio demographic variables and other variables viz. knowledge and attitude ($p > 0.05$). There was a positive correlation between knowledge and attitude ($r = 0.7$, $p < 0.05$).
Discussion and/or Conclusion(s): Based on the findings a significant portion of the staff nurses had poor knowledge and attitude. Apart from these attitude is related with their knowledge. More emphasis on an in-service educational program, seminars, training, etc required on nosocomial infections to increase the knowledge and reduce incidence in the hospitals of Nepal.

ID: 5071

Scottish Reduction in Antimicrobial Prescribing (ScRAP) Update 2016

Anne Thomson[1], Jacqueline Sneddon[2], Gill Walker[3], Anthony McDavitt[4], Hazel Steele[5], Debbie Waddell[6], Edward James[7], John McKay[8], Jill Nowell[5], Fiona McMillan[3], Graeme Bryson[1]. *[1]NHS Greater Glasgow and Clyde, [2]Scottish Antimicrobial Prescribing Group (SAPG), [3]National Education for Scotland (NES), [4]NHS Shetland, [5]NHS Tayside, [6]Glasgow Caledonian University, [7]NHS Borders, [8]National Education Scotland (NES)/General Practice*

Background: A multidisciplinary reference group was established in summer 2016 to update and extend the successful 2013 ScRAP programme. The group aims to complete the resource by October 2016 for delivery from 2017.
Aim(s)/Objective(s): Update and develop the 2013 ScRAP resource, to support ongoing reduction in unnecessary antibiotic prescribing in community settings. Develop to include additional content on managing urinary tract infection (UTI).
Method(s): To inform the update, semi-structured interviews were undertaken with 6 randomly selected health boards. This builds on feedback received via e-survey since 2013.
GP practice audit and literature searches were used to inform the additional UTI content.
Examples of good practice were sought from across NHSScotland.
Results: Discussion with boards indicated a need for more flexibility around delivery to enable prioritisation depending on time available and learning need. The benefits of continued small group delivery were recognised, and access to data reports. Additional inclusion of practical solutions/resources was requested to support change.
Good evidence was identified for use of delayed prescribing in reducing antibiotic prescribing for UTI. Audit of current practice suggested improvements could be made in symptom recording and use of urinalysis (dipstick and culture) to support diagnosis.
Good practice examples for UTI management identified include use of care home symptom recording forms, and key information, audit templates, and patient group directive resources for community pharmacy.
Discussion and/or Conclusion(s): Using this intelligence, the resource pack is being designed to support a quality improvement approach. The pack includes faciliated sessions on 6 key topics, each designed to last around 30 minutes.

ID: 5076

Ebola – 'we're ready!' – The journey of a surge centre

Allison Sykes. *The Newcastle upon Tyne Hospitals NHS Foundation Trust*

Background: The unprecedented epidemic of *Ebola Zaire* of West Africa in 2014–15 put the UK on high alert to ensure readiness for safe management of cases entering the country.
This included the preparation of four surge centres in England to care for confirmed cases.
Aim(s)/Objective(s): This poster describes how one of these surge centres reached its readiness.
Method(s): Although the Trust had previously been one of two centres in the UK to manage patients with Viral Haemorrhagic Fever (VHF), the old unit had closed 6 years previously. Therefore there was very little in place before preparations began in July 2014, when the Trust was asked to be one of the surge centres.
An abundance of resources, training materials and policy documents were required, through liaison with a plethora of internal and external departments and training of many multidisciplinary staff from a variety of specialities. ID staff also gained experience working with a confirmed case at The Royal Free Hospital.
Results: 230 staff undertook training appropriate to their role; including 64 staff to manage confirmed Ebola/VHF cases in either a Trexler Isolator or PPE based High Level Isolation.
The Trust is ready to manage Ebola/VHF cases, however maintaining readiness and sustaining the workforce will require continued training and preparation.
Discussion and/or Conclusion(s): A substantial legacy has been left from this work which will be built upon to ensure readiness to manage any organisms requiring high level isolation; whether adult or paediatric, soon within a new state of the art facility.

Topic: Environment

ID: 4730

***Cupriavidus pauculus* bacteraemia linked to an aseptic pharmacy unit water supply**

Teresa Inkster[1], Pamela Joannidis[2]. *[1]Queen Elizabeth University Hospital, Glasgow, [2]NHS GGC*

Background: *Cupriavidis pauculus* is a Gram negative non fermentative organism which is ubiquitous in the environment. Reported infections, namely bacteraemias and meningitis, are rare in humans.
Aim(s)/Objective(s): We describe persistent colonisation of the water supply of an aseptic pharmacy unit with *C. pauculus*. A patient look back exercise during the period of contamination identified one patient with bacteraemia who was receiving total parenteral nutrition supplied by the unit.
Method(s): Monthly water testing of two sinks in the aseptic unit revealed persistent colonisation with *C. pauculus*. Infection control investigations revealed evidence of little used outlets and practice issues with the sinks in question. Decanting of TPN and contaminated water down the sinks occurred. The patient responded to treatment with intravenous meropenem.

Results: Typing of the blood culture and water isolates revealed the same strain of *C. pauculus*. Little used outlets were removed. Taps were cleaned and descaled. Dosing of the water supply was undertaken with silver hydrogen peroxide (Sanosil). Review of procedures in the unit and infection control education to unit staff was undertaken.
Discussion and/or Conclusion(s): *C. pauculus* is an environmental organism which can contaminate hospital water supplies and lead to infections in patients. Investigations should include identification of little used outlets, dead legs and identification of practice issues. Control measures include cleaning and descaling of taps and dosing with silver hydrogen peroxide.

ID: 4764
Air microbial sampling in operating theatres by active and passive methods: comparison with EU GGMP recommendation

Cesira Pasquarella[1], Francesco Auxilia[2], Martina Barchitta[3], Maria Luisa Cristina[4], Daniela D'Alessandro[5], Ida Mura[6], Marta Nobile[2], Antonella Agodi[3], Italian Study Group of Hospital Hygiene (GISIO)[7]. *[1]University of Parma, [2]University of Milan, [3]University of Catania, [4]University of Genoa, [5]Sapienza University of Rome, [6]University of Sassari, [7]Italian Society of Hygiene, Preventive Medicine and Public Health (SItI)*

Background: Within the GISIO-ISChIA study of surgical operations (Agodi et al., 2015) a significant correlation ($P < 0.001$) was found between airborne microbial contamination measured by active sampling (colony-forming units per cubic metre, cfu/m^3) and passive settle plate sampling (Index of Microbial Air Contamination, IMA).
Aim(s)/Objective(s): This was to obtain an equation that correlates the microbial air contamination values of cfu/m^3 and IMA, and compare the values obtained with the recommended limits defined by the EU Guidelines to Good Manufacturing Practice (EU GGMP, 2008) for clean areas used to manufacture sterile medicinal products. The EU GGMP values were: Grade B: 10 cfu/m^3, 5 cfu/settle plates 90 mm in diameter/4 h; Grade C: 100 cfu/m^3, 50 cfu/4 h; Grade D: 200 cfu/m^3, 100 cfu/4 h.
Method(s): The cfu/m^3 was measured during surgical operations by an air sampler and the IMA values obtained from the number of cfu that settled on 9 cm diameter settle plates during a one hour period.
Results: The following correlation equation was obtained: $y = 1.86 + 0.12x$, where "x" = cfu/m^3 value and "y" = IMA value. Using this equation, when cfu/m^3 values were 10, 100 and 200, gave IMA values of 3.06, 13.86, and 25.86, respectively, which compared well to EU GGMP values of 1.25, 12.5, and 25.
Discussion and/or Conclusion(s): The relationship between cfu/m^3 and IMA values obtained from active and passive sampling during the GISIO-ISChIA study are similar to those suggested by the EU GGMP for pharmaceutical manufacturing, and the EU GGMP relationship could be applied in operating theatres.

ID: 4816
The nasal carriage of MRSA among tobacco smokers

Galina Kuznecova, Sergejs Kuznecovs, Klara Jegina. *Preventive Medicine Institute*

Background: Smoking tobacco is known to suppress the immune system and disturbe normal nasal flora. Hypothetically tobacco smoking could be associated with *methicillin-resistant Staphylococcus aureus* (MRSA) formation in the upper respiratory tract.
Aim(s)/Objective(s): The aim of the present investigation was to detect the amount of MRSA carriers among tobacco smokers.
Method(s): Nasopharyngeal swabs MRSA and nasal tissue samples were taken from 4690 smokers and 4500 non-smokers enrolled for long-term study from 1998 through 2014. Person's smoking behaviour, age, gender, morbidity and use of antibiotics was recorded.
Results: MRSA nasal carriage was found in 1% of non-smokers and in 4% of tobacco smokers in 1998, in 1,5% of non-smokers and in 6% of smokers in 2000, 1,7% and 8,4% in 2001, 1,7% and 9,2% in 2002, 1,5% and 9% in 2003, and 1,2% and 10% in 2004, 1,3% and 12,1% in 2008, 2% and 13,6% in 2014. Male smokers ages 50–65 years ($p < 0.001$), antibiotic use ($p < 0.02$), rate of hospitalization ($p = 0.005$), and specific local IgE level ($p < 0.001$) were significantly associated with MRSA colonization.
Discussion and/or Conclusion(s): The nasal carriage of MRSA among tobacco smokers is high, undetectable, and growing. It is possible that tobacco smoking maybe the cause of nasal carriage of MRSA. From other risk factors for MRSA nasal carriage including antibiotics, rate of hospitalization, contact with health-care workers, previous MRSA infection, older age, diabetes and obesity, smoking is most significant because of its effect on immune system. Smokers becoming increasingly more contagious.

ID: 4847
Impact on incidence rates of multidrug-resistant *Pseudomonas aeruginosa* and *Klebsiella pneumoniae* after eliminating hand washing sinks in an intensive care unit

Evelyn Shaw, Pilar Ciercoles, Sara Grillo, Laura Gavaldà, Carmen Gutierrez, Dolors Garcia, Fe Tubau, Jordi Camara, Rosa Granada, Ariadna Padulles, Jordi Carratala, Miquel Pujol. *Hospital Universitari de Bellvitge-IDIBELL*

Background: Hand washing sinks have been recognised as reservoirs in long-term outbreaks of multidrug-resistant (MDR) Gram-negative bacteria (GNB). In our hospital, intensive care unit (ICU) had high rates of MDR *Pseudomonas aeruginosa* (MDR-PA) and *Klebsiella pneumoniae* (MDR-KP) despite implementing a standardised programme for controlling MDR-GNB since 2012. In August 2014, sinks from all patient rooms were removed and patient hygiene procedure was also changed.
Aim(s)/Objective(s): To assess the impact of removing hand washing sinks on incidence of clinical samples with MDR-PA and MDR-KP in a 24-bed ICU one year after the intervention.
Method(s): Patients with positive clinical samples with MDR-PA or MDR-KP were prospectively collected from January 2012 to December 2015. New cases are shown as number of cases and rates per 1,000 patient-days.
Results: A total of 152 patients with a first clinical sample were identified, 78 (51%) had MDR-PA [59 (40%) only susceptible to amikacin and colistin, and 19 (12%) carbapenemase-producing]; 74 (49%) had MDR-KP [64 (42%) Extended spectrum β-lactamase-producing and 10 (6%) carbapenemase-producing]. Incidence rates in 2012 and 2015 were respectively 5.7 and 1.3 per 1000 patient-days ($p < 0.001$) for MDR-PA and 4 and 0.9 per 1000 patient-days ($p < 0.001$) for MDR-KP.
Discussion and/or Conclusion(s): Removing hand washing sinks from patient rooms and changing hygiene procedure contributed in a significant reduction of MDR-GNB in this endemic ICU, although did not reach total eradication.

ID: 4971
Methodological approach of assessing present state of technical processes in hospitals regarding risk management of Legionella in UK, GER and CH

Thomas Leiblein[1], Matthew Tucker[2], Mal Ashall[2], Susanne Lee[3], Carsten Gollnisch[4], Susanne Hofer[5]. *[1]Liverpool John Moores University (PhD candidate) Zurich University of Applied Sciences (work), [2]Liverpool John Moores University, [3]Leegionella Ltd., [4]Hygieneinspektionsstelle für Trinkwassersysteme, [5]Zurich University of Applied Sciences (ZHAW), Institute of Facility Management*

Background: The complexity of hospitals is made up of the organisational structure as well as the technical systems within the building. Process owners act within a highly interdisciplinary field, recognising regulations and organisational barriers. Activities regarding risk management require interdisciplinary work. Literature merely reports on *Legionella* prevention seen from a clinical perspective rather than from a technical one. But technical services operate systems. They may have deeper knowledge of the system itself. Potential threats coming from the system are to be considered.

Aim(s)/Objective(s): An ongoing research project addresses people in hospitals responsible for services on built environments. The aim of this project is to systematically uncover the present situation of *Legionella* prevention in water systems in selected health care (HC) organisations in different countries. The project contributes to working out a 'reference system' guiding people responsible to identify, understand and properly take action for prevention.
Method(s): The stakeholder theory provides a suitable theoretical framework to analyse the relation between policy issues, responsibilities and activities of people participating in processes serving water systems to contribute to prevention and hygiene. The theoretical drive of this research is inductive, based on a qualitative approach of data collection, divided into two consecutive phases.
Results: Preliminary results exemplarily present the organisational structure, legislative frames regarding water safety and *Legionella* prevention, types water systems and related services and processes, seen from the FM/FS perspective with a technical focus.
Discussion and/or Conclusion(s): Each hospital representing a case study will work out further endeavour on managing risks properly according to organisation's specific necessities.

ID: 4983
Hand-held device decontamination within healthcare environment

Monika Muzslay, Samuel Yui, Shanom Ali, Peter Wilson. *University College London Hospitals*

Background: The use of mobile phones and tablet computers has become widespread in the clinical environment. These hand-held devices may be contaminated with microorganisms and become a potential reservoir for cross-transmission of pathogens between healthcare workers and patients.
Aim(s)/Objective(s): To determine the efficacy of the Codonics D6000™ UV-C disinfection technology to decontaminate hand-held mobile devices used in a hospital setting.
Method(s): D6000™ was introduced on two wards. Tablets were not disinfected on the control ward. After 2 months of use a cross-over was performed with a washout of one week.
Surface sampling using blood contact plates (25 cm^2) were taken from the tablet screen before and after disinfection and also from the tablet case (pre-disinfection only).
Results: The median aerobic colony counts (ACC) on tablets sampled on test and control wards was 8 [interquartile range (IQR) 4–14] cfu/25 cm^2 and 12.5 (IQR 5–30.5) cfu/25 cm^2 respectively (n = 102).
After UV disinfection the contamination reduced to 0 cfu/25 cm^2 on 80% of tablets, median ACC was 0 (IQR 0–0) cfu/25 cm^2.
The median ACC on cases sampled on test and control wards was 37.5 [IQR 21.3–59] cfu/25 cm^2 and 78.5 (IQR 38.3–146) cfu/25 cm^2 respectively.
Discussion and/or Conclusion(s): D6000™ effectively reduced contamination on tablets used in healthcare environment, but not all protective cases could be decontaminated by this method.
There is no generally accepted guidance how to reduce contamination on mobile devices in healthcare settings hence there is an obvious demand for novel approaches to ensure patient-safety and minimize risks posed by contaminated computers and mobile phones in clinical settings.

ID: 5125
Hand scanners – are they a risk?

Allison Sykes, Robert Forder, Audrey Perry, Manju Narayanan, John P. Perry. *The Newcastle upon Tyne Hospitals NHS Foundation Trust*

Background: Many hospital staff are obliged to use hand scanners to monitor their entry and exit into the workplace. We hypothesized that such scanners may provide an additional reservoir of pathogenic and antibiotic-resistant bacteria that may predispose to cross contamination between staff.
Aim(s)/Objective(s): A microbiological evaluation was conducted to assess hand scanner contamination, with door handles commonly used by staff sampled for comparison.
Method(s): The study had two stages:
Stage 1 – Six of the most commonly used scanners situated at the entrances to our hospital and door handles/push plates of the main male and female changing rooms were swabbed twice a day for 8 days.
Stage 2 – four hand scanners and four changing room door handles nearer clinical areas were swabbed twice a day for 8 days.
A total of 160 samples were taken and the samples cultured for *Staphylococcus aureus* (MSSA and MRSA), *C. difficile* and faecal organisms (Enterobacteriaceae and enterococci).
Results: Target bacteria were recovered from 13.8% of samples and included MRSA ($n = 1$), MSSA ($n = 18$) and faecal bacteria ($n = 3$).
Discussion and/or Conclusion(s): *Staphylococcus aureus* were recovered from hand scanners and door handles that are commonly used by staff despite the fact that hand scanners are cleaned twice a day. There was no statistical difference in the results from hand scanners versus frequently used staff door handles. Effective hand hygiene practices to prevent contamination of hand scanners needs to be re-enforced to minimize the risk of spread of pathogenic and antibiotic-resistant bacteria.

ID: 5162
MRSA and ultrasound – How does Isle of Man compare?

Muhammad Butt, Rohit Punj, Guy Sissons. *Nobles Hospital*

Background: With radiology playing an increasing role in diagnosis, Ultrasound (US) offers a relatively safe, radiation free method of diagnosing multiple conditions. It also poses a higher risk of pathogen transfer between patients, through the ultrasound equipment.
Aim(s)/Objective(s): To assess for *Staphylococcus aureus* and methicillin resistant *Staphylococcus aureus* found on US machines in Nobles Hospital, Isle of Man.
Method(s): We identified a total of 8 machines in the hospital. One in each of the emergency department, intensive care unit, coronary care unit, acute medical assessment unit and the gynecology department, with a further three in the radiology department. With swabs obtained from the microbiology department, we swabbed each machine in at least 7 different key areas looking for *Staphylococcus aureus* and methicillin resistant *Staphylococcus aureus*. These included the keyboards, control buttons, US machine screens, US probes, gel bottles and gel bottle holders. All samples were collected on the same afternoon.
Results: Of the 50+ samples obtained and analysed, none grew either of the tested organisms.
Discussion and/or Conclusion(s): The results from this study are overwhelmingly positive indicating health care workers at Nobles Hospital are prudent with infection control procedures. This can only be beneficial for patient care. This is in contrast to studies undertaken in both the UK and France, though these studies were over a longer time period. We plan to repeat pan cultures over a longer period to better understand the proficiency of infection control procedures in Nobles hospital, however these results are encouraging.

ID: 5172
The impact of environmental decontamination in a *Candida auris* outbreak

Joanne Shackleton, Silke Schelenz, Melissa Rochon, Anne Hall, Lisa Ryan, Rosie Cervera-Jackson. *Royal Brompton and Harefield NHS Trust*

Background: *Candida auris* (*C. auris*) is an emerging fungal pathogen in the UK.
51 patients found to be positive associated with an outbreak of *C. auris* in a critical care unit.
Environmental sampling found *C. auris* in the environments of positive cases.

Outbreak management focused on a two stage decontamination process: 1. NaDCC solution; 2. hydrogen peroxide (H2O2) vapour system.
Aim(s)/Objective(s): Evaluate association of patient bed placement with acquisition of *C. auris.*
Method(s): Retrospective audit.
Results: 217 patients who met cr69%iteria for sharing an environmental with a positive *C. auris* patient. 14% (30/217) of patents were subsequently found to be *C. auris* positive.
16 of the 30 positive patients had sequential bed occupancy that was previously occupied by a positive *C. auris* case.
14 of 30 patients had direct *C. auris* patient exposure suggesting a 20% (16/82) risk with sequential admission into a bed space previously occupied by a *C. auris* + patient, 10% (14/135) risk (if a direct positive patient exposure took place).
11/16 69% cases acquired *C. auris* despite the fact that the room environment had been decontamination prior to occupancy. Including three patients who were placed directly into single rooms.
Discussion and/or Conclusion(s): Environment poses risk of transmission of *C. auris*.
69% of patients acquired *C. auris* despite decontamination with 2 disinfectant process.
Further studies needed to demonstrate the efficacy of specific decontamination process used in controlling the risk of transmission from the environment. Finding may suggest that routes of transmission may be multifactorial not solely due to environmental contamination. No particular source including mobile medical equipment has been identified.

Topic: Fungal infections

ID: 4433
Mucocutaneous candidiasis in neonates and infants

Adnan Bajraktarevic[1], Amra Junuzovic Kaljic[1], Amra Dzinovic[2], Alisa Abduzaimovic[3], Aida Djulepa Djurdjevic[4], Faruk Alendar[5], Almir Masala[6], Marela Spahovic[7], Alija Drnda[8]. *[1]Public Health Institution of Canton Sarajevo-Health Center Vrazova Sarajevo-Department for Preschool Children, [2]Pediatrics Clinic Sarajevo, [3]Biochemistry and Microbiology laboratory, [4]General Hospital Sarajevo, [5]Dermatology Clinic Sarajevo, [6]Cantonal Government Sarajevo- Ministry for Education and Health, [7]Pharmacology Faculty-Department for Clinical Pharmacology, [8]Infectious Clinic Sarajevo-Department for Children Infectious Diseases*

Background: Candida infections are rarely serious in otherwise healthy children. Systemic candidiasis is the most serious Candida infection. It affects many parts of the body and is usually caused by an immune deficiency. Chronic mucocutaneouscandidiasisis a cluster of disorders of cell-mediated immunity that presents as chronic severe candidal infections of the skin and mucous membranes. The clinical manifestations of infection with *Candida* species range from local mucous membrane infections to widespread dissemination with multisystem organ fail.
Aim(s)/Objective(s): The clinical manifestations of *Candida* infection in the neonate and infants vary, ranging from localized infections of the skin and mucous membranes to life-threatening systemic infection with multisystem organ failure.
Method(s): The questions on test of dr Brian Martin help identify the severity level of Candida overgrowth condition. Scoring this children's Candida questionnaire should help us to evaluate the role Candida albicans contributes to child's health problems.
Results: There were 786 cases of mucocutaneous candidiasis during last twenty years in dispansery for preschool children Center Sarajevo. From that total number of children there were 502 (63,87%) cases in neonates or infants until 12 months.
Discussion and/or Conclusion(s): Symptomatic infections such as thrush and *Candida* diaper dermatitis may develop at any age thereafter, particularly following broad-spectrum antibiotic treatment. Systemic candidiasis is rare, but is a particular risk for premature infants.

ID: 4540
An unusual case of disseminated yeast infection

Tara Moshiri, Nikunj Mahida, Tim Boswell. *Department of Microbiology, Nottingham University Hospitals*

Background: Trichosporon Mycotoxinivoras is a yeast that was first isolated in 2004 from a termite hindgut. It has the ability to detoxify mycotoxins and was given the above name meaning "mycotoxin devouring" in Latin. It was first described as a human pathogen, in 2009, causing pneumonia in a patient with cystic fibrosis. In 2012, the first disseminated case was identified, in a patient with cystic fibrosis who had received a double-lung transplant.
Aim(s)/Objective(s): To the best of our knowledge, this is the first case of disseminated Trichsoporon Mycotoxinivorans infection in a cystic fibrosis patient, diagnosed outside North America and in the absence of lung transplantation.
Method(s): The patient was transferred from a peripheral hospital with severe, non-resolving pneumonia, to the intensive care unit for specialist cystic fibrosis management. Yeast was cultured from sputum, broncho-alveolar lavage and blood cultures. The organism could not be identified using chromogenic media or Vitek-2 (bioMérieux). Ambisome was started for broad-spectrum antifungal coverage whilst identification was pending.
Results: Reference laboratory techniques using Maldi-Tof provided the identification but the patient unfortunately had significantly deteriorated and a decision was made for palliative treatment.
Discussion and/or Conclusion(s): This case highlights an important pathogen for cystic fibrosis patients that hereto has not been seen in the UK. The recommended treatment option is a combination of Voriconazole and Ambisome. This combination of antifungal agents is not commonly used but could be considered in cystic fibrosis patients with suspected disseminated yeast infection until the organism is identified.

ID: 4552
An audit of the management of invasive candidiasis

Faiha Eltayeb, Vivienne Weston. *Nottingham University Hospitals*

Background: Candidaemia is associated with significant morbidity and mortality. National and international standards of care advocate specific measures regarding appropriate management.
Aim(s)/Objective(s): To evaluate management of invasive candidaemia against practice guidelines. A compliance of 85% is set as acceptable recognizing complexity of case and presentations.
Method(s): A retrospective study identifying twenty positive blood cultures together with recorded final identification and sensitivities. Administered antifungals, duration of management and outcomes were recorded from clinical notes. Audit templates has been driven from referenced guidelines, extracted data were examined against recommended standards.
Results: Of the 20 cases identified, 100% had final identifications and sensitivities. 80% of cases had central lines removal within 48 hours of positive cultures, 81% were started on appropriate antifungals, ocular involvement was sought and evaluated only in 36% of the cases. In 70% of cases treatment was not deescalated as recommended and only 40% of cases received 14 days of treatment after clearance blood culture as recommended.
Discussion and/or Conclusion(s): All isolates were identified and had appropriate sensitivities. There was timely removal of central lines with explanation documented in cases where lines weren't removed, escalation /de-escalation of management was less evident particularly in Candida albicans infection. Ocular involvement was recommended/sought in less than half of the cases. There need to be emphasis on advising 2 weeks of treatment following clearance blood cultures.

Management of invasive candidaemia is challenging, more emphasis is needed regarding review and follow up of individual cases to establish delivering appropriate management and care.

ID: 4680

Candidaemia in paediatrics – a 12 year retrospective analysis to examine changes in species distribution and antifungal susceptibilities

Alison Balfour[1], Kathleen Harvey-Wood[2], Carol Lucas[2]. *[1]NHS Greater Glasgow and Clyde South Sector Microbiology, [2]NHS Greater Glasgow and Clyde*

Background: Bloodstream infections (BSI) caused by Candida species are responsible for significant morbidity and mortality in hospitalised children. Identification of Candida to species level can predict antifungal susceptibilities, and the determination of Minimum Inhibitory Concentrations (MICs) to antifungal agents informs therapeutic options.
Aim(s)/Objective(s): We performed comparative analysis of two 6 year periods (2004-end 2009, 2010-end 2015) to calculate if there was statistically significant variation in prevalent species. Antifungal susceptibilities were examined to determine changes that would influence management.
Method(s): Laboratory records of all cases of candidaemia were examined retrospectively using CDC/NHSN 2016 surveillance definitions of BSI. Broth microdilution (Sensititre®YeastOne) was used to determine MICs to a range of antifungal agents.
Results: There was a decrease in overall number of isolates, episodes and patients in the second timeframe, but epidemiological shift with more *C. glabrata* and *C. lusitanae*. Calculation of p-values for species predominance did not reveal significance, possibly influenced by small sample numbers. All isolates from both timeframes were susceptible to amphotericin B. For fluconazole susceptibility, in the earlier timeframe 6.8% isolates were sensitive dose-dependent, in the later timeframe 4% were sensitive dose-dependent and 10.4% were resistant. All isolates were sensitive to voriconazole and caspofungin in the first timeframe, but 6% had reduced susceptibility to voriconazole and 2% to caspofungin in the later group.
Discussion and/or Conclusion(s): *C. parapsilosis* remains the prevalent species in this paediatric population. Of note is the increase in incidence of reduced susceptibility to certain antifungal agents. Continued vigilance is required to detect further changes in susceptibility and species distribution.

ID: 4760

Voriconazole therapeutic drug monitoring (TDM)

Aiden Joseph Plant, Hannah Burnett, Cressida Auckland. *Royal Devon & Exeter NHS Foundation Trust*

Background: Voriconazole is a triazole, broad-spectrum antifungal; active against yeasts, dimorphic and filamentous fungi and lacking activity against zygomycetes. Non-linear pharmacokinetics, cytochrome P450 polymorphisms and oral bioavailability ranging from 60% to 86% in children and the sick explains extensive variation in serum voriconazole concentrations. Therapeutic drug monitoring (TDM) is recommended for both prophylaxis and treatment.
Aim(s)/Objective(s): Assuming this as an auditable standard, we describe a Trust-wide assessment of voriconazole TDM.
Method(s): Pharmacy records of voriconazole dispensed from June 2015 to June 2016 were retrospectively reviewed. Adults and children receiving voriconazole for more than two-weeks as prophylaxis or treatment were included. Patient demographics, treatment indication and TDM results were recovered from the Trust's information management systems.
Results: Eight patients were identified, with a median age of 51 years (range 2–69) and no gender difference. Three patients received voriconazole prophylaxis during treatment for haematological malignancy. The remaining five received treatment: three had invasive aspergillosis, one had allergic bronchopulmonary aspergillosis and one had endophthalmitis. There was one episode of voriconazole TDM in these eight cases.
Discussion and/or Conclusion(s): There is insufficient voriconazole TDM in our patient population. Better outcomes are demonstrable in patients who receive voriconazole TDM versus no TDM, and supra-therapeutic troughs have been associated with toxicity. It is crucial that patients receiving either prophylaxis or treatment with voriconazole have TDM.
In response to this audit principles of good antimicrobial stewardship (speciality-specific seminars and clinical practice guidelines) are being introduced, with subsequent prospective audit and feedback to improve utilisation of TDM in voriconazole use.

ID: 4834

The use of (1→3)-β-D-Glucan testing in bronchoalveolar lavage samples in the diagnosis of invasive fungal disease and pneumocystis pneumonia

Felicia Lim, Nelun Perera. *University Hospitals of Leicester NHS Trust*

Background: (1→3)-β-D-Glucan (BDG) and Galactomannan (GM) are both biomarker tests that have been used in recent years to aid the diagnosis of Invasive Fungal Disease (IFD).
Aim(s)/Objective(s): We conducted a service evaluation to look at the utility of testing BDG compared to GM in BAL samples to aid the diagnosis of IFD.
Method(s): BAL samples from patients with haematological malignancies and bone marrow transplantation were tested retrospectively for BDG using the Fungitell® assay. Comparison was made between BDG and GM from BAL samples. The Computerised Tomography of the chest (CT chest) were reviewed for the same patients and were classified into probable and possible IFD based on the revised 2008 European Organization for Research and Treatment of Cancer/Mycoses Study Group (EORTC/MSG) definitions. BDG from BAL were also compared with results of *Pneumocystis jirovecii* DNA PCR.
Results: A total of 24 BAL samples had both biomarkers tested. Both BDG and GM had similar sensitivity in the diagnosis of probable/possible IFD (27.3% vs 25.0%). However BDG had a much lower specificity compared to GM (53.9% vs 84.7%).
BDG in BAL showed a good negative predictive value for *Pneumocystis jirovecii* DNA PCR positivity (NPV 92.9%, sensitivity 85.7%, specificity 56.5%).
Discussion and/or Conclusion(s): BDG testing in BAL was not shown to be of clinical utility in the diagnosis of IFD. However, it may be a useful assay for ruling-out the diagnosis of pneumocystis pneumonia in this patient population.

ID: 4851

Candida epidemiology and antifungal resistance: a ten year review of candida blood stream infections in University Hospitals of Leicester

Fadwa Elsanousi[1], Helen Kirk-Granger[2], Armin Ghanbari[2], Nelun Perera[2]. *[1]Clinical Microbiology University Hospitals of Leicester NHS Trust Level 5 Sandringham Building, [2]University Hospitals Leicester NHS Trust*

Background: Candida blood stream infection (CBSI) is one of the commonest causes of bloodstream infections among hospitalised patients and is associated with high morbidity and mortality. The incidence and antifungal resistance varies between countries and units.
Aim(s)/Objective(s): To review the epidemiology and antifungal resistance of CBSI in University Hospitals of Leicester (UHL) over a period of 10 years (2005–2015).
Method(s): Laboratory and clinical data of CBSI between 2005 and 2015 were reviewed retrospectively for patient demographics, species and antifungal resistance.
Results: A total of 337 patients with 337 episodes of CBSI were identified (mean 33.7 episodes of CBSI/year). 87% of the episodes were in adults with almost equal number of episodes among the two genders (170 F, 167 M). Majority of the episodes were from patients in

intensive care units followed by surgical patients and haematology/oncology patients.
Most isolates grew in both aerobic and anaerobic blood culture bottles. The predominant species was *C albicans* (51%) followed by *C glabrata* (25%) and *C parapsilosis* (14%). 74% of the isolates were sensitive to fluconazole. Resistance to fluconazole was common in *C glabrata*. A third of the CBSI had evidence of candida colonisation in one or more sites.
Discussion and/or Conclusion(s): Over the 10 year period, there has not been a significant difference in the incidence of CBSI in UHL. Majority of the isolates are *C albicans* and are susceptible to fluconazole.

ID: 4893
Uniform susceptibility of non-albicans Candida spp. from blood stream infections to the echinocandin class of antifungals at a geriatric hospital

Saugata Choudhury. *Tan Tock Seng Hospital*

Background: *C. albicans* is deemed uniformly susceptible to the commonly used antifungals while echinocandin resistance is emerging among non-*albicans Candida spp* (NACS).
Aim(s)/Objective(s): We aimed to evaluate the level of resistance among NACS from blood stream infections to the echinocandins at our institution.
Method(s): At our 1500 bedded tertiary care hospital, susceptibility is performed employing the Sensititre ® YeastOne ™ on index isolates from positive blood culture broths (BACTEC FX ™ Becton Dickinson). The LIS was interrogated to characterize the susceptibility profile for all strains of NACS isolated from the bloodstream between January 2014 and June 2016.
Results: Seventy two isolates {*C.glabrata*(41), *C.tropicalis*(23) and *C. parapsilosis*(8)} had a susceptibility test performed on them. Remarkably, all strains of *C. glabrata* tested uniformly susceptible to the three echinocandins. Uniform susceptibility was also noted for *C. tropicalis,* a species for which non susceptibility to the triazoles hovers in the vicinity of 20% locally.
Discussion and/or Conclusion(s): Nephrotoxic agents including amphotericin B may not find favour in a geriatric population like ours with liposomal formulations being several folds more expensive than the echinocandins.
The uniform susceptibility maybe attributable to our centre being a predominantly geriatric centre which does not share the vulnerable group of transplant patients where empirical/prophylactic echinocandin usage is rampant. Increasing echinocandin consumption serves as a harbinger of *C.parapsilosis* infections. Lack of resistance to the candins in our study was temporally associated with only 10 episodes of candidemia due to this species.
In this era of multidrug resistance, our virgin population could help elucidate the epidemiology of echinocandin resistance.

ID: 4990
Use of B-D-Glucan to aid diagnosis of Pneumocystis Jiroveci Pneumonia (PCP)

Juliette Mutuyimana[1], Juliette Mutuyimana[1], Nelun Perera[1], Aashima Saibudeen[1]. [1]*Leicester Royal Infirmary*

Background: Pneumocystis Jiroveci Pneumonia (PCP) causes serious infection in the immunocompromised patients, with mortality remaining high. Non-invasive diagnostic techniques including 1,3 Beta D-Glucan can be used for the presumptive diagnosis of PCP.
Aim(s)/Objective(s): To evaluate and compare the levels of serum 1,3, B-D-Glucan in patients with positive and negative PCP Polymerase Chain Reaction (PCR) at University Hospitals of Leicester over a 2.5 year period (2014–2016).
Method(s): Laboratory and clinical data of patients who had suspected PCP and had a bronchoalveolar lavage (BAL) or sputum for PCP PCR were reviewed. Data for all patients was analysed to determine whether or not they had B-D-Glucans tested and the serum levels were compared.
Results: A total of 304 patients with suspected PCP had PCP PCR tested in BAL or sputum. 65 patients tested positive and 239 patients tested negative.
Of the patients with positive PCP PCRs and B-D-Glucan tested, 11 patients (52%) tested positive, 9 patients (43%) tested negative, 1 patient (5%) was equivocal. 7 patients (64%) had levels in the upper range (300–500 pg/mL), and 4 patients (36%) in the lower range (80–299 pg/mL).
Of the patients with negative PCP PCRs and B-D-Glucan tested, 58 patients (72%) tested negative, 20 patients (25%) tested positive, 3 patients (4%) were equivocal. Of the patients with positive B-D-Glucans, 9 patients (45%) had levels in the upper range (300–500 pg/mL). However, all 9 patients had either candida in sputum/BAL and/or were already on treatment for PCP.
Discussion and/or Conclusion(s): 1,3-B-D-Glucan can help in the presumptive diagnosis of PCP and high levels appear to correlate with the diagnosis.

ID: 5004
Chronic pulmonary aspergillosis – are we referring patients to the national referral centre?

Alessandro Gerada, Liam Bailey, Mike Beadsworth. *Royal Liverpool University Hospitals*

Background: Chronic pulmonary aspergillosis (CPA) consists of a heterogenous group of conditions including aspergilloma, aspergillus nodule and cavitatory pulmonary aspergillosis. Treatment requiring posaconazole or voriconazole is prolonged and carries a high cost burden.
Aim(s)/Objective(s): We reviewed all patients in our Trust who have been prescribed voriconazole or posaconazole. In particular, we reviewed those with CPA, and whether they had been referred to the National Aspergillosis Centre at the University Hospital of South Manchester (Wythenshawe, Manchester).
Method(s): Patients dispensed voriconazole or posaconazole between 2013 and 2015 were included. Patients were identified by searching through inpatient and outpatient prescription records. We noted the following data:
- presence of immunosuppression,
- diagnosis,
- indication for antifungals
- radiology reports,
- microbiology results.

Results: 97 patients were dispensed voriconazole/posaconazole. Of these, 78 (80%) were immunosuppressed and were therefore not suitable for referral to the National Aspergillosis Centre. From the remaining 19, 8 (42%) patients fulfilled the referral criteria for the National Aspergillosis Centre, of which only one (12.5%) had been referred.
Discussion and/or Conclusion(s): Patients with CPA should be considered for referral to the National Aspergillosis Centre as this could lead lead to improved clinical care and improved antifungal stewardship. We aim to develop a care pathway to identify patients with CPA and collaborate with clinicians to arrange referral.

ID: 5027
Candidaemia in a London teaching hospital 2010–2015

Marcella Vaselli, Charlie Williams. *SGUL*

Background: Candidaemia is widely recognized as a major cause of mortality and morbidity in the healthcare environment. Guidelines published by the IDSA address diagnosis, investigation and management.
Aim(s)/Objective(s): To describe the epidemiology of adult candidaemia and adherence to published standards in a large teaching hospital.
Method(s): The microbiology Apex computer system identified blood cultures positive for Candida species between 2010 and 2015.

Electronic patient records and case notes were used to find demographic, microbiological and clinical information, and assess adherence to audit standards about antifungal agents, duration, removal of vascular catheters, and investigation for serious sequelae.
Results: There were 102 episodes in 94 patients (median age 63 years range 32–87 years), evenly distributed throughout the study period. 55% were C. albicans. 88.2% had sensitivity-testing and 74.6% fluconazole sensitive. 23 episodes had either fluconazole or itraconazole resistance, of which 20 were *C.glabrata*.
The most frequent predisposing factors were broad-spectrum antibacterial use and central venous catheters.
Where adherence to IDSA initial treatment guidelines could be assessed, there was 94% compliance and 90% received the correct course length.
29%(17/59) had an appropriately-timed retinal examination and 67% (68/102) had an echocardiogram.
Thirty-day mortality data 47.8%(32/67).
Discussion and/or Conclusion(s): Candidaemia remains a major source of healthcare-associated morbidity with a high mortality.
IDSA standards were met for therapeutics- likely attributable to antifungal stewardship ward rounds, easily accessible trust guidelines and that all positive blood cultures are telephoned by a medical microbiologist. Investigation for significant sequelae, which happens later, was not done well and reflects the need for greater education.

ID: 5037

Non-tuberculous mycobacterium and chronic pulmonary aspergillosis co-infection: management challenges and prognosis

Isabel Rodriguez Goncer[1], Chris Kosmidis[2], Stephanie Thomas[3], Pippa Newton[4], David W. Denning[5]. *[1]University Hospital of South Manchester, [2]National Aspergillosis Centre, University of Manchester, [3]National Aspergillosis Centre, University of Manchester, [4]National Aspergillosis Centre, University of Manchester, [5]National Centre Aspergillosis, University of Manchester*

Background: Chronic pulmonary aspergillosis (CPA) frequently coexists with non-tuberculous mycobacterial (NTM) infection. The infections may be diagnosed sequentially or concurrently; CPA arising during the course of treatment for NTM is a marker of worse prognosis. The optimal management of patients with NTM/CPA co-infection is not known and carries several difficulties.
Method(s): We retrospectively reviewed medical records of 42 patients with NTM/CPA co-infection followed in our CPA clinic from 2008 to 2015. Criteria for NTM infection and CPA were according to published international guidelines. We evaluated baseline characteristics, comorbidities, microbiology and radiological findings, treatment, side effects and outcomes.
Results: Twenty-six patients were males (61.9%). In 35 patients (83.3%) CPA followed, whereas in 4 patients it preceded NTM infection. Three patients were diagnosed with both infections simultaneously. All patients had microbiological and serological evidence of Aspergillus infection. The most common NTM species were *M. malmoense* (23.8%) and *M. avium* (21.4%). Fibrocavitary changes were observed on imaging in 73.8% of patients (n = 31) and COPD was the most common underlying condition. Eighteen patients received concomitant treatment for both infections; 72% of patients (n = 13) were alive at two years after diagnosis of coinfection. Most common regimen was Itraconazole + Clarithromycin + Ethambutol + Moxifloxacin (27.7%). Fifteen patients (83.3%) needed a treatment change, because of intolerance or clinical failure. Seven patients (38.9%) had IFN-gamma production deficiency. Mortality was not linked to a specific regimen.
Discussion and/or Conclusion(s): NTM/CPA coinfection is associated with significant mortality and frequent treatment modifications due to side effects. IFN-gamma replacement therapy may provide an alternative when antimicrobial treatment fails.

ID: 5070

Evaluating the importance of biofilms and their impact on antifungal therapy in recurrent vaginal candidiasis: an underappreciated and chronic condition

Leighann Sherry[1], Rebecca Metcalfe[2], Brian Jones[2], Gordon Ramage[1]. *[1]University of Glasgow, [2]NHS Greater Glasgow & Clyde*

Background: Vulvovaginal candidiasis (VVC) is estimated as the most common fungal infection worldwide, predominately caused by the fungus *Candida albicans.* Approximately 138 million women worldwide complain of >4 episodes of VVC per year, clinically defined as recurrent VVC (RVVC). One factor contributing to treatment failure and chronic infection is the lack of a thorough understanding of its epidemiology and pathogenesis.
Aim(s)/Objective(s): The aims of this study were to undertake epidemiology analysis of a RVVC group within NHS Greater Glasgow & Clyde and assess the pathogenesis and antifungal susceptibility of these isolates.
Method(s): All RVVC cases (n = 300) reported in Glasgow during May 2016 had isolates collected and species identified using MALDI-TOF. Minimum inhibitory concentration (MIC) testing was performed for fluconazole following CLSI guidelines. Isolates were screened for biofilm formation, and sessile susceptibility testing performed.
Results: Although *C. albicans* proved to be the most frequent species isolated (71%), its prevalence is substantially lower than ~95% currently reported. The remaining 29% of organisms consisted of *C. glabrata* (15%) and *C. dubliniensis* (6%). All isolates showed differential sensitivity to fluconazole, with majority of isolates requiring >32 mg/L to kill planktonic and sessile communities. Biofilm formation was shown to be highly variable across all isolates tested.
Discussion and/or Conclusion(s): We have observed a shift in prevalence of *Candida spp*, with an increasing isolation of non-*C. albicans* species. Reduced susceptibility to the frequently used VVC antifungal, fluconazole, was observed. It was demonstrated that VVC isolates could form biofilms in vitro, which has implications for antifungals, as azoles are notoriously resistance to biofilms.

ID: 5073

***Candida auris* is highly virulent and resistant, and capable of forming biofilms**

Leighann Sherry[1], Ryan Kean[1], Malcolm Richardson[2], Riina Rautemaa-Richardson[2], Gordon Ramage[1]. *[1]University of Glasgow, [2]University Hospital of South Manchester*

Background: *Candida auris* is an emerging pathogen, first reported in 2009, and has attracted attention due to its reduced antifungal susceptibility. More recently, it has been detected in a UK ICU, where 20% of patients colonised developed candidaemia. The ability of *C. auris* to form biofilms and resist antimicrobial therapy and host responses has not been studied.
Aim(s)/Objective(s): Therefore, we assessed *C. auris* pathogenicity in the context of biofilm forming capacity, susceptibility to a panel of antimicrobials, and its virulence *in vivo*.
Method(s): *Candida albicans* SC5314, *Candida glabrata* WT2001 and *Candida auris* M/67838 were used for minimum inhibitory concentration testing, for six antifungals in addition to chlorhexidine, following CLSI guidelines. Isolates were screened for biofilm formation, and sessile susceptibility testing performed. The *G. mellonella* model was used to assess pathogenicity *in vivo*.
Results: *C. auris* displayed intermediate biofilm formation, consisting predominately budding yeast and occasional pseudo-hyphae. Chlorhexidine was effective against *C. auris* biofilms unlike other antifungals, where >16 mg/L was required to kill the biofilm. Although *C. albicans* and *C. auris* had similar kill kinetics *in vivo*, *C. auris* infection achieved a 100% mortality rate more rapidly than *C. albicans*.
Discussion and/or Conclusion(s): *C. auris* is able to form biofilms and resist antifungals that are active against its planktonic counterparts.

These features not only contribute to its virulence, but also to its survival in hospital environments, increasing its ability to cause outbreaks. The results of the *in vivo* model mimic our clinical experience and highlight *C. auris* as a highly virulent species, equivalent to *C. albicans*.

ID: 5095

Candidaemia in hospital inpatients: An audit of management across three acute hospital trusts

Alex Howard[1], Caroline Corless[2], Jenifer Mason[2], Olusola Akinbame[3]. *[1]Mersey Deanery, [2]Liverpool Clinical Laboratories, [3]Aintree University Hospital*

Background: Despite increasing incidence of candidaemia, most clinicians lack experience in its management and it carries a mortality rate of 20–40%. Recently-updated international clinical guidelines recommend specific investigations and treatments for candidaemia.
Aim(s)/Objective(s): To audit candidaemia management against standards from Infectious Diseases Society of America (IDSA), European Society of Microbiology and Infectious Diseases (ESCMID) and Liverpool Clinical Laboratories (LCL) Standard Operating Procedure guidelines in three acute hospital trusts.
Method(s): A retrospective search was performed for patients at Royal Liverpool University Hospital, Aintree University Hospital and Liverpool Heart and Chest Hospital with candida species in blood cultures over 5 years. The management of their first episode of candidaemia was compared against audit standards using patient notes and computerised records.
Results: 161 cases were reviewed. 56% of patients received correct antifungals and doses. 42% received at least 14 days' treatment. 18% had transthoracic echocardiograms (TTE) and were considered for transoesophageal echocardiogram (TOE). 27% had fundoscopic examination by an ophthalmologist. 12% had blood cultures taken on alternate days until resolution of candidaemia. 76% were reviewed by infection specialists within 48 hours. 61% of CVCs were considered for removal. 98% of isolates were speciated, 57% had minimum inhibitory concentrations identified and 56% had appropriate sensitivities released.
Discussion and/or Conclusion(s): Many patients did not receive recommended management for their candidaemia, with source investigations and blood culture monitoring done particularly infrequently. Infection service departmental guidelines and a treatment bundle will therefore be developed to aid infection specialists and clinical teams before re-audit.

ID: 5097

***Homographiella aspergillata*, a non-aspergillus mould, causing fungal granuloma involving the anterior cranial fossa in an immunocompetent individual**

Dhara Shah[1], Rungmei Marak[1], Rabi Narayan Sahu[2], Sanjay Bihari[2], Ajai Dixit[2], Tapankumar Dhole[2]. *[1]Sanjay Gandhi Post Graduate Institute of Medical Sciences, [2]Sanjay Gandhi Postgraduate Institute of Medical Sciences*

Background: In recent years, the emergence of non-aspergillus moulds in brain infections has been observed. *Hormographiella aspergillata*, a filamentous basidiomycete present in compost/sewage, has previously been implicated in pneumonia, lung abscess, endocarditis and keratomycosis in patients.
Case Report: Forty-year old immunocompetent female presented with anosmia, headache, bilateral vision loss, vomiting, impaired olfaction/visual acuity, right optic atrophy without any facial hypoesthesia/asymmetry. Radiological Investigations revealed large basifrontal mass lesions in anterior cranial fossa, involving ethmoid & sphenoid sinuses, right cavernous sinus & optic nerve. Bilateral frontal craniotomy/total excision of mass was performed and multiple tissue pieces from olfactory groove mass were sent for laboratory investigations.
Method(s): Tissue pieces were homogenized and processed for KOH wet mount direct microscopy and culture on Sabouraud's Dextrose Agar (SDA)(25°C,37°C).
Results: Direct microscopy showed plenty hyaline septate fungal hyphae. Culture grew white-to cream-colored cotton-like colonies with white mycelia tufts & irregular margin after 11 days of incubation. Lactophenol cotton blue mount revealed hyaline hyphae, septate simple/sympodially branched conidiophores, apically bearing a cluster of conidiogenous hyphae which are septate & disarticulating into arthroconidia with smooth-walled, cylindrical conidia aggregating in slimy heads; morphologically identified as *Homographiella aspergillata*. Patient was treated successfully with voriconazole and liposomal amphotericin B. Follow-up (6 months) showed improvement without persistent infection.
Discussion and/or Conclusion(s): This is a rare case of *H.aspergillata* causing fungal granuloma of anterior cranial fossa in an immunocompetent individual. With the continuous expanding spectrum of fungi causing invasive disease, it is important to consider the clinical relevance of every fungus cultured from clinical samples for a successful outcome.

ID: 5111

An overview of the Fungal Service Evaluation Tool (FSET)

Harblas Ahir, Stuart Robertson. *Merck Sharp & Dohme Limited*

Background: Patients at a high-risk of neutropenia are administered antifungal prophylaxis to prevent breakthrough invasive fungal infections (bIFI). BIFI's are associated with a high morbidity and mortality rate within this patient group. The rate of bIFI's at hospital Trusts is unclear and the Fungal Service Evaluation Tool (FSET) can aid in providing optimal patient management. As of August 2016, there are currently 10 registered NHS Trusts using the tool.
Aim(s)/Objective(s): To enable NHS Trusts in:

- Determining the proportion of high-risk patients developing bIFI's.
- Analysing the management of high-risk patients developing bIFI's.
- Analysing the subsequent impact on healthcare resource use.

Method(s): The FSET is a computer-based tool, hosted on the secure UK NHS N3 network. The FSET can collect data on non-identifiable patient characteristics, underlying disease, details of diagnostic tests, antifungal management and hospital visits in the defined patient group. An amalgamation of the pooled data can generate simple visual reports that summarises the key outputs.
Results: The FSET allows hospital Trusts to extensively analyse patients cohorts undertaking prophylaxis with antifungals, capturing holistic resource usage incurred during the overall patient management pathway.
Discussion and/or Conclusion(s): The FSET produces a number of reports incorporating a variety of data, inputted for every patient. This covers a number of topics; ranging from patient demographics to the service costs associated with managing patients, who may or may not develop a bIFI. The FSET establishes an indicative level of resource utilisation which can help Trusts review antifungal patient management and estimate future budgetary resourcing.

ID: 5136

Invasive pulmonary Aspergillosis occurring in immunocompetent patients with influenza A

Christina Johnston[1], Aleks Marek[2], Mairi Macleod[2], Scott Farrelly[3], Rory Gunson[4]. *[1]NHS Greater Glasgow and Clyde, [2]Consultant Microbiologist, NHS Greater Glasgow and Clyde, [3]Biomedical Scientist, NHS Greater Glasgow and Clyde, [4]Consultant Virology Clinical Scientist, West of Scotland Specialist Virology Centre*

Background: Invasive pulmonary aspergillosis is a severe disease which most commonly occurs in immunocompromised patients. There are a small number of case reports that have been published

detailing invasive pulmonary aspergillosis in previously immunocompetent patients with influenza A.
Aim(s)/Objective(s): We describe two suspected cases of invasive pulmonary aspergillosis post influenza in previously immunocompetent patients occurring in Glasgow in 2015–2016.
Method(s): We discuss the details of these cases and compare to previously published case reports of aspergillosis post influenza in the literature.
Results: Invasive pulmonary aspergillosis can occur in previously immunocompetent influenza A patients.
Discussion and/or Conclusion(s): Invasive pulmonary aspergillosis is a rare complication during or following influenza infection and can occur in previously immunocompetent patients with influenza A.

ID: 5140
A rare case of fungal keratitis

Tara Moshiri[1], Craig Wilde[2], Susan Elizabeth Snape[1]. *[1]Department of Microbiology, Nottingham University Hospitals, [2]Department of Ophthalmology, Nottingham University Hospitals*

Background: Scopulariopsis species are common soil saprophytes widely distributed in nature, previously isolated from plant debris, air and moist indoor environments. S. brevicaulis appears to be the most commonly isolated species with S. gracilis being the second most common. Ocular involvement has only rarely been reported and there remains a paucity of cases of Scopulariopsis keratitis within the literature.
Aim(s)/Objective(s): This is a case of highly unusual Scopulariopsis gracilis fungal keratitis occurring in the interface between graft and host following a descemets stripping endothelial keratoplasty in which a contaminated graft was transplanted. To the best of our knowledge this is the first time Scopulariopsis gracilis fungal keratitis is reported and given its incidence following the implantation of a contaminated endothelial keratoplasty.
Method(s): The infection likely occurred secondary to contamination of the dextran transport medium in which the human cornea was transferred from an eye bank. Scopulariopsis gracilis was subsequently isolated by the reference laboratory.
Results: The slow growth of fungus was only detected on day 3 of culture. The sample was however released prior to this and implanted on day 2. Subconjunctival dexamethasone postoperatively may have encouraged the rapid growth of the fungus. The occular fungal infiltrates first enlarged despite therapy but later cleared after changing anti-fungal regime.
Discussion and/or Conclusion(s): Patient had good treatment response with complete resolution of the fungal keratitis. Diagnosis was made promptly and treatment initiated early (topical G voriconazole & Amphotericin as well as oral Voriconazole & Itraconazole). The infected graft was removed promptly with repeat intracameral injections of anti-fungal agents.

ID: 5153
A prospective surveillance study of airborne *Aspergillus fumigatus* in a Tertiary Referral Hospital

Tom Rogers[1], Katie Dunne[2], Alida Fe Talento[3], Niamh Murphy[3], Lisa Fetherstone[3], Catherine O'Reilly[3], Brian O'Connell[3]. *[1]Trinity College & St James's Hospital, [2]Trinity College Dublin, [3]St James's Hospital Dublin*

Background: *Aspergillus fumigatus* is a major fungal pathogen transmitted by the airborne route. Excavation of soil during construction/renovation is thought to increase the spore burden and risk of nosocomial acquisition. Air sampling is performed for hospital surveillance, particularly during major construction to ensure engineering controls are effective.
Aim(s)/Objective(s): We prospectively collected data over one year on *A. fumigatus* counts in order to obtain baseline levels in advance of a major build.
Method(s): Air sampling was performed twice-monthly at 13 hospital locations. Indoor locations included an intensive care unit (ICU), a Stem cell transplant unit, a Cardio-thoracic ICU, and a respiratory ward, each with different air handling arrangements. A dual head SAS air sampler was used to sample 1000L of air. Sabouraud dextrose agar was used to select *A. fumigatus* colonies, and Roswell Park Memorial Institute 1640 agar containing itraconazole/voriconazole screened for triazole resistant *A. fumigatus*.
Results: Areas with controlled ventilation, and sealed windows, generally had satisfactory counts. Two wards without controlled ventilation repeatedly showed high *Aspergillus* counts which was addressed by installing portable HEPA filters. The Stem cell transplant unit consistently had satisfactory results. *A. fumigatus* CFU counts outdoors were generally higher than those indoors. Our findings confirm that adequate environmental control is dependent on having units/wards with air handling systems that address patients' risk of developing nosocomial aspergillosis.
Discussion and/or Conclusion(s): Our results have provided a valuable baseline in advance of a major construction project and have allowed for immediate and effective responses in clinical areas identified with high *A. fumigatus* counts.

Topic: General

ID: 4449
Exploring needle stick injuries among health-workers in Mansoura University Hospitals and awareness of medical students for common types of hepatitis (A, B, and C)

Muhammed Alaa Ahmed Moukhtar Hammad, Lena Osama Shoaib, Nihal Mustafa Saleh, Mohamed Issam Kabsha, Mahmoud Magdi Mohamed Elsayed Ali Abdou, Sara Elhusseini, Sherouk Reda Elsheiwi, Hadeel Mohamed Morad, Nervana Mohamed Ashraf Khalil, Muhammed Galal Abou Elela, Hussam Abdulsalam Gad, Nebal Nash'at El-Naqeib, Maram Adel Abdel-Magied, Mohamed Galal Moawad Mansi, Rawan Nahel Ahmed, Mariam MohyEldin Shehata, Amal Ayman Khafagy, Mahmoud Mesbah Ahmed Albiomy, Mahmoud Salah Al-agouz, Mariam Mohammed Hisham Daba, Sayed Mohammed Heiba. *Mansoura Faculty of Medicine*

Background: Hepatitis A, B, and C have been encroaching into Egypt's cities in the recent years.
Aim(s)/Objective(s): Clinical level- Knowing all health-workers who had needle stick injury in the year 2015 in Mansoura University Hospitals and whether they received proper vaccination for Hepatitis B: 140 health-workers involved after which awareness talk is done to ensure they are updated on management of possible hepatitis B affliction. Academical level: Awareness has been done to medical students and healthcare workers on 3 major hepatitis in Egypt A, B, and C: 903 surveyors.
Method(s): Clinical level: survey on needle stick injuries is given to health-worker where we ensure confidentiality and then we aware of hepatitis B. Academic Level: A pre-survey is given to a medical student/healthworker assessing his/her knowledge of hepatitis A, B, and C. A general talk targeting certain basic info needed to be known by students and clinicians is then given. A post survey is then given to assess the talk.
Results: 53% of 140 health-workers got injured by a needle stick in the past 12 months. 81% didn't file incident report. 90 were not vaccinated for Hep B and 96 didn't receive training in management of needle stick injury. Out of 903 surveyors for general info on Hep, 40% answered all questions right in the pre-survey and 90% answered them right on the post-survey.
Discussion and/or Conclusion(s): More focus is needed to be put on informing health-workers and medical students on how to prevent needle stick injury, and they in general need to be aware of the common types of hepatitis here.

ID: 4506

Application of novel outcome evaluation criteria to UK social marketing campaigns focused on infections

Enrique Castro-Sanchez[1], Michiyo Iwami[2], Raheelah Ahmad[2], Alison Holmes[2]. *[1]National Centre for Infection Prevention and Management, Imperial College London, [2]Imperial College London*

Background: Social marketing interventions have been valuable in addressing communicable diseases. Outcome evaluation is a critical yet often excluded component of any intervention.
Aim(s)/Objective(s): We applied a novel set of evaluation criteria to UK social marketing campaigns focused on infections.
Method(s): Campaigns active between 2001 and 2013 were identified from literature and internet searches. Two researchers scored each campaign on 13 areas including (1) Understanding of problem and stakeholders; (2) Clear definition of outcome; (3) 'A priori' indication of required change for long-term effect; (4) Clear theory/plausibility of intervention mode of action; (5) Outcome measures that meet stakeholder needs; (6) Impact measurement; (7) Acceptability and sustainability; (8) Link between intervention and outcome; (9) Competing factors; (10) Unpredicted effects from intervention; (11) Evaluation strategy; (12) Economic analysis, and (13) Peer-reviewed publication. Campaigns received 0, 1 or 2 points depending on how well they conducted or reported on the indicators presented.
Results: 17 campaigns focusing on vaccination, sexual health, hand hygiene and others were identified. Median score for all campaigns was 14.2+/−2 (26 points maximum possible). Indicators 1 and 5 were best described (score 26; 34 points maximum possible). The lowest score (11) was achieved for indicator 'Link between intervention and outcome'. Indicators 3, 7, 10 and 12 were insufficiently or inadequately reported in 88% of campaigns.
Discussion and/or Conclusion(s): UK social marketing campaigns could improve their reporting of key outcome evaluation aspects. Sustainability, economic evaluation and unintended effects of campaigns require increased attention.

ID: 4517

Basal skull osteomyelitis: experience with OPAT and conservative management

Brama Hanumunthadu, Aodhan Breathnach. *St. George's University Hospital NHS Foundation Trust*

Background: Basal skull osteomyelitis is a challenging condition: surgery risks serious morbidity and mortality; the optimum duration of antibiotics is unknown. We have seen cases referred to the outpatient parenteral antimicrobial therapy (OPAT) service for conservative treatment.
Aim(s)/Objective(s): We wished to determine complications on OPAT, the duration of intravenous antibiotics, and overall treatment success.
Method(s): Retrospective analysis of a clinical OPAT database from 2009 to 2016, with individual review of case notes.
Results: We found six cases of basal skull osteomyelitis treated on the OPAT service. Of these, 4/6 had a complication requiring admission: 1/4 antibiotic side effect; 1/4 line thrombosis; and 2/4 related to worsening condition. Subsequently 3/4 were discharged back to OPAT. The mean duration of antibiotics on OPAT was 44 days, mean total IV antibiotic duration was 66 days and mean overall treatment duration including oral antibiotics was 94 days. OPAT treatment success, defined as completion of intended intravenous antibiotics whilst on OPAT was 5/6. Overall treatment success, defined as completion of intended intravenous (on OPAT and inpatient) and subsequent oral antibiotics was 6/6. Of note, one case failed a twelve week course of antibiotics but achieved success following a repeat twelve week course of IV followed by twelve weeks of oral antibiotics. Although all patients finished their intended course of antibiotics, 3/6 had ongoing morbidity including: hearing loss 2/3; and ear discharge needing surgery 1/3.
Discussion and/or Conclusion(s): OPAT services can effectively support the conservative management of basal skull osteomyelitis, despite a high complication and re-admission rate.

ID: 4625

"The devil is in the (clinical) details"

Michael Addidle, Vani Sathyendran, Tim Taylor, Yvonne Peckover. *Pathlab, New Zealand*

Background: Baseline auditing demonstrated that the provision of clinical details to the microbiology laboratory was very poor, despite various educational efforts.
It was decided to trial a mandatory clinical details policy, starting with infectious serology, and then extending into other areas of clinical microbiology.
If the sample arrives at the laboratory without clinical details then it is stored for a certain time period depending on type of sample, a message is sent back to the requestor, and processing does not proceed until clinical details are received.
Aim(s)/Objective(s): The aim was to have clinical details present on all sampes coming into the microbiology laboratory for the following reasons:

- To ensure that the correct tests are being performed.
- To facilitate interpretation of of borderline results or results of uncertain significance.
- To allow further tests to be performed by the laboratory or be recommended to the requestor for further consideration.
- To ensure the test is performed for diagnostic reasons.

Method(s): A thorough consultation process was carried out with all laboratory stakeholders. This was followed by a lead-in period before going live with the policy.
The details, exceptions and pitfalls of the policy will be described.
Results: So far, negative feedback has been limited. Clinical details are now received on the vast majority of requests, and unnecessary testing has been reduced. Post implementation audits are being performed.
Discussion and/or Conclusion(s): This is an important quality initiative. The initial implementation was difficult, but the long term quality benefits are very significant.

ID: 4692

Safe surgical hands in the operating theatre – sustained improvement following a multi modal hand hygiene campaign 2009–2016

Fiona Smith, Karen Wares, Eleanor McLeod, Mark Higgins, Elizabeth Irvine, Janet Mitchell, Angela Henderson. *NHS Grampian*

Background: Bacterial transmission in an operating room from patient to equipment and healthcare provider's hands and even to the next patient in the operating room has been associated with Healthcare Associated Infection. Hand hygiene will interrupt transmission of microbes between patients, healthcare workers and the inanimate environment. In 2009 the Operating Theatre team asked the Infection Prevention and Control Team for help implementing the World Health Organisation's concept of 'My five moments of hand hygiene'.
Aim(s)/Objective(s): To embed the concept of 'My five moments of hand hygiene' in the Operating Department.
Method(s): Direct observation was utilised by Infection Prevention and Control Nurses in the operating room in 2009. This established work flow of operating room staff to guide additional alcohol based hand rub placement, and measure baseline hand hygiene compliance rates using the World Health Organisation's observation method. Multidisciplinary operative staff interviews were undertaken in 2009 to establish training needs and understanding of 'My 5 moments for hand hygiene'. Infection Prevention and Control Nurses trained Operating Theatre staff to hand hygiene audit within their own department.
Results: A timeline will show a summary of the milestones demonstrating the ongoing collaborative improvement work since 2009.

A graph will display the Operating Room hand hygiene audits results dated 2009 – current (average 95% and above).
Discussion and/or Conclusion(s): Sustained compliance with the World Health Organisation's 'My five moments of hand hygiene' in the Operating Theatre has been achieved through multimodal strategies. Continuous improvement through education, audit and rapid feedback has helped to maintain focus on the importance of hand hygiene.

ID: 4724
The use of care bundles in low and low-middle income countries: a systematic review and meta-analysis

Fatima Taki[1], Charlotte Bell[2], Amie Wilson[1], David Lissauer[1], Aurelio Tobias[3], Arri Coomarasamy[1]. *[1]University of Birmingham Medical School, Institute of Metabolism & Systems Research, [2]University Hospitals Coventry & Warwickshire NHS Trust, [3]IDAEA-CSIC, Spain*

Background: Sepsis is a global problem with increasing incidence and mortality.[1] A number of sepsis care bundles have been produced and in high-income countries, the introduction of these bundles has shown to double survival.[1] However, the majority of these are seen to be unsuitable for use in low and low-middle income countries (LMIC) due to resource limitations.
Aim(s)/Objective(s): To review the effectiveness of the use of various care bundles in comparison to usual care in LMIC.
Method(s): We performed a systematic review of studies that included adult patients in LMIC and compared the use of bundled care to usual care. Bundles included those for sepsis, ventilator-associated pneumonia and catheter-associated UTIs. Outcomes included improved care with the use of a bundle, reduced incidence of infection and mortality and process outcomes.
Results: We identified one randomised controlled trial (n = 109) and nine non-randomised before-and-after studies (n = 87, 055). Meta-analysis of five studies showed an overall significant reduction in the incidence of infection with bundled care (rate ratio 0.58, 95% CI 0.48–0.70, $p < 0.001$). Three studies were included in further meta-analyses, showing no decrease in mortality rate and no significant reduction in severity score (APACHE II).
Discussion and/or Conclusion(s): The use of a care bundle in LMIC can significantly reduce the incidence of infections. There is no significant effect on mortality. These results may be used to consider developing care bundles for specific use in LMIC.
Reference
1. Damiani *et al.* Effect of performance improvement programs on compliance with sepsis bundles and mortality: a systematic review and meta-analysis of observational studies. *PLoS One*. 2015.

ID: 4739
Health care workers overestimate their hand hygiene compliance

Hannu Syrjälä, Raija Järvinen, Helena Ojanperä. *Department of Infection Control, Oulu University Hospital, Finland*

Background: Little is known about health care workers' (HCWs') hand hygiene (HH) compliance evaluated by HCWs themselves, by patients and the real life observations in the same institution.
Aim(s)/Objective(s): Aim of this study was to compare possible differences in three HH evaluation methods and escpecially the relevance of HCWs' self-evaluation.
Method(s): The study was conducted in Oulu University Hospital in Finland. Since 2013 infection control link nurses have observed HCWs' adherence to HH practices according to WHO guideline on the five moments (FM). A good HH adherence was regarded if a hand disinfection (HD) time was at least 20 seconds. Patients were asked by questionnaire about HCWs' HH practices in 2011 and 2016. HCWs' views to proper hand hygiene (HH) concerning FM were asked by web-based questionnaire in 2016.
Results: According to the self-evaluation, 81% of 74 doctors and 94% of 876 nurses disinfected their hands before patient contact. The 741 patients who answered the questionnaire considered that 51% of doctors and 65% of the nurses always disinfected their hands before treating them. Basing on real life observations proper HD before patient contact was performed by doctors in 28% and by nurses in 61% of the occasions. The range of successfully performed HD in five moments was 28–42% (n = 2632 observations) for doctors and 61–66% (n = 14953 observations) for nurses, respectively.
Discussion and/or Conclusion(s): Both doctors and nurses overestimate their HH practices. Patients consider HCWs' HH practices better than the real life observations. HCWs' especially doctors' hand hygiene practices needs improvement in our hospital.

ID: 4747
Bacteraemias in renal transplant patients: a single centre experience

Gabriel Wallis[1], Ali M. Shendi Mohamed[2], Mark Harber[1], Sophie Collier[1]. *[1]Royal Free Hospital, [2]Zagazig University*

Background: Bacteraemia remains a significant cause of morbidity and mortallity among recipients of renal transplants with an incidence 40 times higher than that of the general population.
Aim(s)/Objective(s): To better understand the epidemiology of bacteraemias among renal transplant recipients at Royal Free Hospital.
Method(s): A retrospective analysis of all positive blood cultures in renal transplant patients between 2009 and 2016 was carried out.
Results: Enterobacteriacease were responsible for 74% of positive blood cultures. Eschericia coli was the commonest individual organism (45%) followed by Klebsiella pneumoniae (18%) and Pseudomonas aeruginosa (7.5%)
Urinary tract was implicated as the source of bacteraemia in over half of our patients with gastrointestinal tractbeing the second commonest source.
Among the Enterobacteriaceae over 90% of isolates were found to be sensitive to carbapenems, amikacin, colistin and fosfomycin. Over 70% of isolates were found to be sensitive to piperacillin/tazobactam and gentamicin. Over 65% of isolates were sensitive to temocillin.
Greater than 40% of isolates were resistant to ciprofloxacin and ceftriaxone. Resistance rates to amoxicillin/clavulanic acid, trimethoprim, trimethoprim/sulfamethoxazole and amoxicillin were over 50%, 60%, 65% and 80% respectively.
Discussion and/or Conclusion(s): This study confirms findings previously described elsewhere regarding the common causative organisms and sources of bacteraemia among renal transplant recipients. This study demonstrates the growing problem of antibiotic resistance with almost fifty percent of isolates resistant to previously commonly used antibiotics (amoxicillin/clavulanic acid and ciprofloxacin) and gives us important information to inform empirical treatment for renal transplant patients presenting with sepsis.

ID: 4748
A new method of treating patients with diabetic foot ulcers and osteomyelitis using antibiotic impregnated calcium sulphate

Benjamin Kapur[1], Tarek El Gamel[2], Gillian Jackson[2], Simon Platt[2]. *[1]Wirral University Teaching Hospital, [2]Wirral University Teaching Hospital Trust*

Background: Osteomyelitis can be limb and life threatening and have devastating consequences. It can be managed medically or surgically. Antibiotics can be locally delivered using methyl methacrylate or impregnated absorbable gauze. Calcium sulphate-based antibiotic therapy allows high concentration local delivery of a combination of antibiotics. Diabetic patients are predisposed to infection with a varied and complex microbial load.
Aim(s)/Objective(s): To establish the outcomes of patients with diabetic foot ulcers and osteomyelitis treated with calcium sulphate (Stimulan) and antibiotics.
Method(s): Retrospective data collection of patients treated with stimulan for osteomyelitis of the foot treated by 2 consultants at Wirral University Teaching Hospital Trust between March 2014 and

December 2015. Clinic documentation, MDT outcome and imaging were reviewed.
Results: 49 patients treated. Vancomycin 1 g in stimulan in 7 patients and 42 with vancomycin and gentamicin 240mg. 38/49 forefoot, 9/49 hindfoot and 2/49 midfoot.
A multitude of organisms were identified including staphylococcus aureus, citrobacter, pseudomonas, haemolytic streptococcus, e. coli and enterococcus.
All patients were discussed at MDT. Patients received augmentin and the antibiotics were changed based on microbiology results.
86% (42/49) had no further surgery within 6 months. 14% (7/49) patients went on to have further surgery linked to their initial procedure.
Follow up 6 months – 24 months.
Discussion and/or Conclusion(s): In our experience, antibiotic loaded stimulan provides safe and effective local delivery of high concentration antibiotics in the presence of osteomyelitis reducing the need for more extensive surgery in a compliant patient.

ID: 4765
A randomised controlled trial to compare medical grade honey with mupirocin for MRSA decolonisation

Toney Thomas[1], Georgina Gethin[2], Deirdre Hughes-Fitzgerald[3], Hilary Humphreys[4]. *[1]Beaumont Hospital /RCSI, [2]NUI Galway, [3]RCSI, [4]RCSI/Beaumont Hospital*

Background: Mupirocin is an important component in MRSA control specifically for nasal decolonisation but resistance limits its use. Medical grade honey (MGH) is used for the treatment of burns and infected wounds. The antimicrobial activity of natural honey may offer potential in MRSA eradication. We report the results of a RCT on nasal MRSA decolonisation.
Aim(s)/Objective(s): To compare the efficacy of MGH to mupirocin 2% to eradicate nasal MRSA.
Method(s): MRSA colonised patients were recruited and MGH 30% or mupirocin 2% was applied intra-nasally. Up to two courses of either treatment, TDS for five days, was administered. Three consecutive negative MRSA screening results confirmed successful decolonisation.
Results: The mean age was 73.2 y and 36% female. Of the 100 study participants 93% were previously known MRSA, 89% had a history of attempted decolonisation with 34% receiving two or >courses of nasal mupirocin, 43% had concomitant MDRO colonisation and 68% non-nasal site MRSA. In total 57% (57) were isolated either in a single room or were cohorted with contact precautions. Of the 86 participants who completed the study protocol, 36% (18) in the intervention group and 50% (25) in the control group were decolonised ($P = 0.196$, $c^2 = 1.675$) in an ITT analysis. The success rate for MGH and mupirocin was 43% and 57% respectively, according to the PP analysis. Fourteen participants were lost on follow up, withdrawn or deviated from the allocated protocol.
Discussion and/or Conclusion(s): The first of its type RCTo results confirm the potential of MGH. However, further work is required to replicate the findings and optimise the concentration of MGH.

ID: 4843
Observational study on Klebsiella pneumoniae bacteraemia at University Malaya Medical Center

Shaharudeen Kamaludeen[1], Helmi Sulaiman[2], Nadia Atiya[2], Adeeba Kamarulzaman[3]. *[1]University Malaya Medical Centre, [2]University Malaya Medical Center, [3]University Medical Center*

Background: Klebsiella pneumoniae is a common gram negative bacteria causing infection and it is associated with high mortality. The incidence of Klebsiella pneumoniae bacteraemia (KPB) is increasing in trend and although many regional studies have been conducted on KPB, the data in Malaysia is limited.
Method(s): This is a retrospective study from May 2014 to April 2015, that analysed 127 patients with KPB, to identify the demographic factors, risk factors and outcomes associated with this infection. Cases were identified from the microbiology laboratory database. Organism identification and antimicrobial susceptibility testing were performed using VITEK 2 automated system.
Results: KPB occurred predominantly in the elderly age group in both community onset (CO) and nosocomial-onset (NO) infections; 62.5 and 64 years old respectively and diabetes predominates in both the groups (CO, 63.9%; NO, 43.6%). NO-KPB showed significantly higher ICU admission rates, and longer hospital and ICU stays. The commonest identifiable site of infection was pneumonia (CO 22.2%; NO 38.2%). The rate of liver abscess in CO and NO-KPB was 8.3% and 3.6% respectively. Antibiotics exposure up to one month prior to current infection ($p < 0.001$), and presence of foreign body ($p < 0.001$) were associated with a resistant phenotype (ESBL/CRE). APACHE II score (OR 1.168, 95%CI 1.045–1.306; $p = 0.006$) and time to appropriate antibiotic therapy (OR 0.549, 95%CI 0.347–0.868; $p = 0.01$) were associated with 30 days mortality.
Discussion and/or Conclusion(s): Severity of illness and time to appropriate antibiotics were associated with mortality. Identifying microorganism and sensitivity at a shorter time interval and streamlining antibiotics according to sensitivity results may reduce mortality.

ID: 4873
Evaluation of a pharmacist review of patients with Clostridium difficile infection

Danielle Stacey. *Dudley Group NHS Foundation Trust*

Background: A specialist pharmacist was seconded to support the management of Clostridium difficile infection (CDI).
Aim(s)/Objective(s): Measures for improvement were time to resolution (TTR) of diarrhoea, 30 day mortality, length of stay (LOS) and adherence to antimicrobial and proton-pump inhibitor (PPI) guidelines.
Method(s): The pharmacist reviewed CDI patients, aiming to improve outcomes. Outcomes were compared with similar cases in the previous year.
Results:
- 42/56 (75%) patients were reviewed by pharmacist
- 83% (35/42) required some intervention
- TTR of diarrhoea was 1.4 days shorter in the intervention group (5.9 vs 4.5 days)
- LOS was 27.9 days in the pre-intervention group and 35 days in the intervention group. It was noted that both groups had discharges delayed for reasons other than CDI
- For patients with recurrent CDI, TTR of diarrhoea was reduced by 6.6 days and length of stay decreased by 8.4 days
- 30 day mortality reduced from 20% to 7%, although significance of this is unclear
- Appropriate antimicrobial therapy within 72 hours increased from 88% to 100%.
- PPI review documentation increased from 58% to 100%.

Discussion and/or Conclusion(s): Appropriate antibiotic prescribing and PPI review demonstrate the quality benefits to patients, as well as improvement in TTR of diarrhoea. There are also organisational benefits: duration of isolation precautions can be reduced. As well as considerable reduction in TTR of symptoms in patients with recurrent CDI, earlier discharge was expedited, saving and estimated 56 bed days over 3 months.
Overall, the evaluation supports the value of pharmacist management of CDI and led to permanent recruitment of the post.

ID: 4881
On board the best practice express – "Diarrhoea roadshow"

Manjula Natarajan[1], Sonia Mellor[2], Dawn Westmoreland[2], Jennie Lovell[3], Martha Bird[3]. *[1]Kettering General Hospital Foundation Trust, [2]KGH FT, [3]KGHFT*

Background: KGH had a trajectory of 26 trust-attributed cases of C. difficile infection (CDI) for 2015/16. By 7 months, we had 20 cases. Root

cause analysis (RCA) and ribotyping of isolates did not uncover specific areas of weakness. A trend of non-compliance with preventative methods was felt to be the overarching theme.

Aim(s)/Objective(s): Primary aim was to raise awareness on preventive interventions to reduce HCAI. Infection Prevention & Control Team (IPCT) developed a new strategy which promoted staff engagement, ownership and healthy competition to improve quality of care to patients.

Method(s): IPCT had a 'light bulb moment' and the "diarrhoea road show" was born. Key elements were:

- Best practice express train with SIGHT pneumonic became screen savers
- A Carriage with key message added every fortnight
- Focus changed to 'CDI free days' and wards awarded for achievements
- Use SIGHT pneumonic to engage, refresh practice
- 'Colin' Oscopy was born, a mascot which captured everyone's imagination & won hearts & minds
- Discussions from ward to board

Results: Enthusiasm and ownership around being rewarded for achieving their trajectory for 'CDI free' days was infectious amongst all staff members. Launch of the quality improvement (QI) programme turned practice and focus to getting on board 'best practice express' and and achieve trajectory of 26 CDI cases, originally thought to be an impossible task.

Discussion and/or Conclusion(s): Visible Clinical leadership, innovation by IPC Team and Board engagement made this a sustainable and successful QI project. Next steps is to continue in 2016/17 and create more innovations and sustain improvements throughout the year.

ID: 4968

An observational study of the effect of chlorhexidine bathing on MDR organisms and bloodstream infections in the ICU

Hilde Jansens, Frank Van Laer, Emiel Goovaerts, Herman Goossens, Philippe Jorens. *University Hospital Antwerp*

Background: Colonization is a risk factor for infections with multi-drug-resistant organisms (MDRO).

Aim(s)/Objective(s): To investigate the effect of daily bathing of patients with chlorhexidine washcloths on the acquisition of MDRO and on the incidence of central line-associated bloodstream infections (CLABSI).

Method(s): We conducted a singlecenter observational study on the effect of daily bathing with no-rinse 2% chlorhexidine-impregnated washcloths in an intensive care unit (ICU) of a university hospital. The incidence rates of the acquisition of MDRO and the rates of CLABSI were compared.

Results: The overall rate of MDRO acquisition was 4.38 cases per 1000 patient-days before chlorhexidine bathing versus 2.03 cases per 1000 patient-days after the introduction of the wash cloths, a 53.6% reduction. The overall rate of CLABSI was 1.95 per 1000 catheter days at the start of the washing period versus 1.40 per 1000 catheter days at the end, a reduction of 28.2%.

Discussion and/or Conclusion(s): Introduction of daily chlorhexidine washing appeared to be an effective intervention to reduce the rates of MDRO acquisition and decrease the infection rates in the ICU.

ID: 4979

Characterising dynamics of Staphylococcus aureus carriage in healthcare workers in critical care

James Price[1], Kevin Cole[2], Andrew Bexley[2], Martin Llewelyn[3], John Paul[2]. *[1]Brighton and Sussex University Hospital NHS Trust, [2]Public Health England, [3]Brighton and Sussex Medical School*

Background: Colonised healthcare workers (HCWs) have been implicated as sources in nosocomial Staphylococcus aureus outbreaks. Despite this little is known about dynamics of S. aureus carriage in HCWs.

Aim(s)/Objective(s): We performed a detailed evaluation of S. aureus carriage in critical care HCWs.

Method(s): Consenting critical care HCWs in a teaching hospital in Southern England were serially screened for S. aureus carriage over 14 months. Data on demographics, co-morbidities, and medical care were collected. Longitudinal nasal carriage was defined using carriage profile indices (CPI) (total culture-positive swabs over total swabs). Measures of association were calculated using multivariate logistic regression.

Results: Of 198 HCWs 147 (74.2%) were female, 146 (73.4%) were <40 years and prevalence of co-morbidities was low. Nasal carriage at study entry was identified in 54/149 (36.2%) nurses, 16/40 (40.0%) doctors and 3/9 (33.3%) physiotherapists (8 MRSA (all nurses)) and was associated with concurrent nursing home employment (OR 11, 95%CI 1.2–106.1, $p = 0.038$) and living with a partner (OR 2.2, 95%CI 1.1–4.3, $p = 0.02$).

Serial screening revealed 73 HCWs (38.2%) intermittently carried S. aureus (CPI = 0.07–0.93), 36 (18.9%) were always culture-positive (CPI = 1) and 82 (42.9%) always culture-negative (CPI = 0). Of these serially screened HCWs, 54 (28.3%) (52 nurses, $p < 0.001$) received ≥1 course of antibiotics during the study. HCWs receiving antibiotics were twice as likely to carry S. aureus intermittently (OR 2.5, 95%CI 1.3–4.7, $p = 0.006$).

Discussion and/or Conclusion(s): Longitudinal nasal carriage of S. aureus in critical care HCWs reveal diverse intermittent carriage profiles associated with receipt of antibiotics. Further work is required to determine the implications of carriage profiles and transmission.

ID: 5001

Clinical factors associated with E-coli bacteraemia and risk factors associated with 30-day all-cause mortality in East Kent Hospitals

Nuzhath Khan[1], Srinivasulu Reddy[2], Nash James[2]. *[1]Microbiology Department, William Harvey Hospital, [2]East Kent Hospitals, Microbiology*

Background: Escherichia Coli (E. coli) bacteraemia is rising in incidence. It has a comparative mortality rate double that of other bacteraemia, including methicillin resistance S. aureus (MRSA).

Aim(s)/Objective(s):

1. Analyse clinical factors associated with E-coli bacteraemia;
2. Identify risk factors associated with 30-day all-cause mortality in cohort

Method(s): Retrospective analysis of 68 E. coli bacteraemia cases in East Kent Hospitals over three months was applied. Risk factors analysed included age, gender, antibiotic non-susceptibility, extended-spectrum β-lactamase (ESBL) production, number of hospitalisations in the previous year, co-morbidities and source of bacteraemia. Binary logistic regression model was applied to identify risk factors for mortality.

Results:

- Thirty-day all cause mortality rate was 20.6%
- Higher mortality rate associated with male gender ($p = 0.02$); underlying hepatobiliary focus ($p = 0.04$); and resistance to amoxicillin/clavulanate ($p = 0.06$)
- 25.0% resistance to amoxicillin/clavulanate and ciprofloxacin
- 10.3% of cases were ESBL E. coli
- 61.8% of patients had one or more previous hospital admissions in the previous year; 20.6% had an intervention in the previous year, including biliary intervention (11.8%); and 88.2% had one or more comorbidities

Discussion and/or Conclusion(s): Results suggest that elderly male patients may have a higher risk of mortality from E. coli bacteraemia. There is need to further investigate the possible link between higher mortality and hepatobiliary source. High rate of resistance to commonly used antibiotics such as amoxicillin/clavulanate highlights the need to maintain use of appropriate antibiotics.

ID: 5005

The effect of universal decolonisation to reduce MRSA bacteraemia in a critical care unit

Mark Garvey, Craig Bradley, Pauline Jumaa. *Univeristy Hospitals Birmingham NHS Foundation Trust*

Background: Isolation and decolonisation are the two main targeted control measures for reducing the transmission of MRSA in hospitals. Universal MRSA decolonisation in critical care units is thought to reduce MRSA incidence and be a cost-effective method of controlling MRSA in this setting. Before 2014 all critical care patients at UHB received MRSA decolonisation therapy. In June 2014 UHB implemented a revised strategy for the control of MRSA and discontinued the use of universal decolonisation in critical care.
Aim(s)/Objective(s): To review the effect of universal decolonisation on the incidence of MRSA acquisition and MRSA bacteraemia in a clinical care unit.
Results: There was an increase of 31 acquisitions (55%; $P < 0.005$) and increase in bacteraemias from 5 to 11 ($P < 0.005$) in the 1-year period following the changes compared to the previous 12 months. Given these significant increases in the incidence of MRSA bacteraemias universal decolonisation was reintroduced into critical care. There has been a reduction of 37 acquisitions (46%; $P < 0.005$) and decrease in bacteraemias from 7 to 2 in the 6 month period following the reintroduction of routine decolonisation in critical care. Audits revealed no significant changes in hand hygiene compliance; appropriate use of personal protective equipment or environmental cleanliness during these periods. The clinical activity in critical care did not change during this time.
Discussion and/or Conclusion(s): We suggest that routine decolonisation for MRSA in critical care is an effective strategy to reduce the spread of MRSA and the incidence of MRSA bacteraemia.

ID: 5018

Intra-hospital variation in blood culture contamination rates

Susan Williams, Christine Peters. *NHS Greater Glasgow and Clyde*

Background: Blood culture contamination reduces the usefulness of blood cultures as a diagnostic test and can contribute to over use of antibiotics.
Aim(s)/Objective(s): To examine the rates of blood culture contamination within a large city hospital. To identify areas within the hospital with high contamination rates and areas with low contamination rates – measured against the recommended benchmark of <3%. To identify factors which could account for the difference in rates.
Method(s): The Laboratory data system was interigated to identify all Blood culture results for a 6 month period Rates of positivity and Contamination rates were calculated for each clinical area within the hospital. Electronic clinical notes were utilised to ensure accurate allocation of contaminant status.
Areas of high and low rates were visited and a questionnaire completed to identify variations in practice which could account for the contamination rates.
Results: Contaminations rates varied from 0.0% to 17.7%, with highest rates in A + E and one Acute admission Unit.
Questioning of clinical areas with highest and lowest rates revealed a number of factors which could account for the difference in rates icluding ease of access to equipment and lack of standardised method of obtaining blood cultures.
Discussion and/or Conclusion(s): Key variance in practice between clinical areas with high rates of blood culture contamination and those with low rates include standardised method of collection and ease of access to equipment.
Strategies to reduce contamination rates within QEUH should focus on producing readily available standard methods and equipment kits.

ID: 5078

Using a Quality Improvement approach to improve infection prevention and control: Experiences of Trusts in the Midlands and East region

Debra Adams[1], Victoria Hine[1], Helen Bucior[2], Wendy Foster[3], Nyarayi Mukumbe[4], Jane Ryan Ryan[5], Sandra Smirthwaite[6], Jodie Winfield[7]. *[1]NHS Improvement, [2]University Hospitals North Midlands NHS Trust, [3]Northampton General Hospital NHS Trust, [4]West Hertfordshire NHS Trust, [5]Bedford NHS Trust, [6]United Lincolnshire Hospitals NHS Trust, [7]The Royal Wolverhampton NHS Trust*

Background: In 2016, NHS Improvement was formed. NHS Improvement is responsible for overseeing foundation trusts, NHS trusts and independent providers. It offers support providers need to enable them to deliver consistently safe, high quality, compassionate care to patients.
Infection prevention and control (IPC) remains high on the patient safety agenda in England. It is estimated that only around two-thirds of healthcare improvements go on to result in a sustainable change, which achieves the planned objective (Health Foundation, 2013). Sustainable change is more likely to result from a model that involves patients and staff in developing, designing and implementing changes, rather than from a 'command and control'/top down model (Health Foundation, 2013).
In response, to this the four Heads of IPC in NHS Improvement and the quality improvement support specialists developed a 90 day IPC quality improvement (QI) collaborative programme for 24 Trusts/ Foundation Trusts in England. The aim was to promote shared; learning, best practices and innovations with colleagues from other provider organisations and to cultivate new approaches to developing and sustaining effective IPC.
This poster discusses the collaborative approach used, and the experiences of the six Trusts within Midlands and East which participated; Bedford Hospital, Northampton General Hospital, The Royal Wolverhampton Trust, University Hospitals North Midlands, United Lincolnshire Hospitals and West Hertfordshire Hospitals.

ID: 5083

An audit of UTIs in pregnancy

Sarah Macalister Hall[1], James McDonald[1], Ashutosh Deshpande[2]. *[1]NHS GG&C, [2]NHS GGC*

Background: Urinary tract infection during pregnancy is associated with an increased risk of pyelonephritis, which may cause significant maternal and foetal morbidity. Pregnant women with asymptomatic bacteruria are also more likely to develop pyelonephritis compared to their non-pregnant counterparts.
The recommendations within national and local guidelines state that to ensure successful treatment of symptomatic and asymptomatic bacteruria, pregnant women should have a repeat urine culture 7 days after completion of antibiotic treatment.
Aim(s)/Objective(s): To audit compliance within NHS Greater Glasgow and Clyde (GGC) with the recommendations to repeat urine cultures in pregnant women with a previous positive urine culture.
Method(s): Retrospective review of urine cultures from pregnant women within GGC over a 6 month period.
Results: Between April and October 2015, GGC processed 240 positive urine cultures from 202 pregnant women.
Of the samples, 58% came from secondary care settings, 40% from primary care settings, with the remaining 2% from unknown locations. 38.6% and 49.6% of all samples were repeated within a 1-month and 2-month period respectively. At the time of analysis, 28% of samples had not been repeated. There was no significant difference between primary and secondary care.
Discussion and/or Conclusion(s): This audit shows that of the 236 positive urine cultures, less than half were repeated within a timely period, and a significant number were not repeated at all. This demonstrates a need for increased awareness of this recommendation.

We propose to perform an educational intervention targeting both primary and secondary care settings. We will then re-audit to assess the efficacy of our intervention.

ID: 5086
Intersectoral collaboration surrounding patients in need of infection control measures – how do we do it?

Bente Bloch. *Hospital of Southern Jutland*

Background: Today the patient care in hospitals is highly specialised and undertaken at high speed. Many patients receive complex treatment and care, which often continues in the primary sector, when the patient is discharged.
Aim(s)/Objective(s): The aim of the study was to investigate and analyse the intersectoral collaboration, to gain a better understanding of the collaboration across health sectors in relation to the patient in need of treatment/care where infection control plays an important role.
Method(s): The study is a qualitative, multiple case study, where semi structured interviews form the base of the empirical knowledge used. The theory behind the study is the perspective on intersectoral collaboration, examples of models of collaboration and the strength and weaknesses of collaboration.
Results: The study showed that the motivational factors for intersectoral collaboration were: focus on organisation and structure in the organisations, collaboration through networks, awareness of the importance of clear communications paths and focus on the professional competencies in relation to infection hygiene. A structured collaboration with the establishment of an actual infection control organisation resulted in access to expert knowledge, security among the personnel as well as motivation to work with infection control as an area of focus.
Discussion and/or Conclusion(s): Nosocomial infections in patients transferring from one health sector to another can likely be prevented by the introduction of knowledge of infection control to all levels of personnel in the sectors, and by entering into a formalised collaboration across the health sectors with the aim of establishing an intersectoral infection control organization.

ID: 5091
Is the use of Octenidine wash the answer to zero acquisition of Health-Care Associated Methicillin Resistant Staphylococcus aureus (MRSA) bacteraemia?

Marietta Niala, Rohinton Mulla, Sue Fox. *Luton and Dunstable University Hospital NHS Foundation Trust*

Background: Every year, Trusts in the National Health Service are given certain Health Care associated infection targets to meet and MRSA bacteraemia is one of them.
Aim(s)/Objective(s): The aim of the audit was to determine if the use of Octenidine Hydrochloride wash as prophylactic body wash had made an impact on the zero acquisition target of Health Care Associated MRSA bacteraemia for a year.
Method(s): Since September 2015, Octenidine Hydrochloride bodywash was introduced as a prophylactic body wash in the care of the elderly wards and as part of an MRSA admission decolonisation treatment on previous MRSA positive patients.
A trust wide audit was carried out from September 2014-August 2015 and September 2015-August 2016 to assess the effectiveness of the prophylactic body wash.
Results: A total of 239 patients were identified as MRSA positive in September 2014-August 2015 while 117 patients were identified as MRSA positive in September 2015-August 2016 following the introduction of prophylactic Octenidine Hydrochloride on patients admitted in the Care of the Elderly Wards and as part of decolonisation admission treatment in patients previously MRSA positive. Since the introduction of the prophylactic bodywash and the decolonisation admission treatment in the previous MRSA positive patients, there has been no further Health Care Associated MRSA bacteraemia.
Discussion and/or Conclusion(s): The introduction of Octenidine Hydrochloride bodywash has made a significant impact in MRSA general acquisition and to the zero acquisition target of Health Care Associated MRSA bacteraemia in a District General Hospital.

ID: 5103
Use of ICNet for clinical microbiology record keeping

Rosemary Fok[1], Cressida Auckland[2]. *[1]Derriford Hospital, Plymouth Hospitals NHS Trust, [2]Royal Devon and Exeter NHS Foundation Trust*

Background: Keeping clear clinical records is a necessity. Finding the optimum method for recording clinical microbiology advice and interaction with other healthcare professionals can be challenging, especially if there is no electronic patient record or consultations take place over the phone and away from the paper medical records. Bespoke electronic solutions are often costly to implement. We trialled the use of existing infection control surveillance software for the keeping of clinical microbiology records.
Aim(s)/Objective(s): To trial the use of ICNet for clinical microbiology record keeping.
Method(s): ICNet infection control surveillance software was already in use in the trust. We worked with ICNet to develop aspects of the software to suit our clinical microbiology record keeping needs. We replaced our existing method of record keeping with ICNet.

ID: 5124
Leptospirosis serological testing and clinical features: a retrospective Scottish single-centre study

Clark Russell[1], Michael E. Jones[2], Daire T. O'Shea[3], Kenneth J. Simpson[4], Ian F. Laurenson[5]. *[1]NHS Lothian, [2]HealthLink360, Musselburgh, [3]Regional Infectious Diseases Unit, Western General Hospital, Edinburgh, [4]Scottish Liver Transplantation Unit, Royal Infirmary of Edinburgh, Edinburgh, [5]Clinical Microbiology, Laboratory Medicine, Royal Infirmary of Edinburgh, Edinburgh, UK*

Background: Leptospirosis is a zoonotic infection occurring worldwide but is endemic in tropical countries. The clinical presentation is heterogeneous, ranging from an undifferentiated febrile illness to 'Weil's disease'. Serological testing is the main diagnostic modality.
Aim(s)/Objective(s): To review serological testing for Leptospirosis at our institution over a 10-year period and describe the clinical features of cases.
Method(s): We identified patients from two tertiary care hospitals in Edinburgh, United Kingdom, who had samples sent to a Public Health England reference laboratory for Leptospirosis testing between 2006–2016. Clinical, laboratory and microbiological information on cases was collected retrospectively. Complete details were unavailable for four cases.
Results: 480 samples were sent for Leptospirosis IgM ELISA testing: 450 were negative, 26 were positive and four were equivocal. There was no temporal trend to testing. The positive results came from 14 patients with a median age of 26 years. Nine cases were imported, mostly from Asia and with a history of fresh water exposure. Patients presented with non-specific symptoms: fever (10/11); myalgia (8/11); gastrointestinal symptoms (8/11); and headache (7/11). Laboratory evidence of hepatitis (8/10), acute kidney injury (5/10) and lymphopenia (8/10) was common. One patient developed 'Weil's disease' with multi-organ failure. Antimicrobials were administered in seven cases, usually doxycycline (5/7). There were no deaths.
Discussion and/or Conclusion(s): Leptospirosis is an uncommon infection in Scotland. Most cases are imported, in contrast to recent UK-wide data, and this may be attributable to the Scottish climate. The clinical presentation is protean and mild hepato-renal involvement is common even in the absence of organ failure.

ID: 5156

Safety and efficacy of outpatient parenteral antimicrobial therapy (OPAT) for infective endocarditis: a retrospective analysis

Judith Oguguo[1], Oliver Koch[2], Claire Mackintosh[3]. *[1]University of Edinburgh, [2]NHS Lothian, University of Edinburgh, [3]NHS Lothian*

Background: Infective endocarditis (IE) is known for both its diagnostic difficulties and continued association with high mortality and severe complications despite improvements in management. IE is treated with antibiotics and, according to the European Society of Cardiology guidelines, some cases may be amenable to Outpatient Parenteral Antimicrobial therapy (OPAT). However, there is currently little literature available on the use of OPAT for IE.
Aim(s)/Objective(s): This study aims to determine the safety and efficacy of OPAT in treating IE.
Method(s): All 43 IE patients (50 episodes) referred to the NHS Lothian OPAT clinic were reviewed, the gathered data analysed and Duke criteria fulfilment noted where possible.
Results: The mean patient age was 58 years, 27/43 were male and 41/43 were accepted to OPAT. Streptococci spp. were the infective organism in 23/50 episodes, with 9/50 and 4/50 for Staphylococcus spp. and Enterococcus spp. respectively. 11/50 episodes were prosthetic valve IE. 21/43 patients had a relevant co-morbidity. Adverse events were recorded for 8/50 episodes, of which 5 were drug-related and resolved with treatment change. 4 patients required elective valve replacement surgery following OPAT discharge. Of the 48 episodes completed over 3 months ago, there were 3 deaths, including both patients not accepted to OPAT, and one death due to unrelated causes.
Discussion and/or Conclusion(s): Therefore, in a selected group, it is possible to successfully treat IE using OPAT and thus reduce the number of inpatient days associated with this condition. This could potentially allow more cost-effective use of resources as well as reduce risks associated with prolonged hospitalisation.

ID: 5174

Food for thought: An unusual cause of mycotic aneurysm

Helena Bond[1], Emma O'Cofaigh[2], James Dunbar[2]. *[1]Friarage hospital, [2]South Tees NHS Foundation Trust*

Background: Non-typhoidal salmonella, NTS, infection commonly causes gastroenteritis after ingesting contaminated food. Bacteraemia is unusual and is associated with immunosuppression. The incidence of NTS bacteraemia increased with the HIV epidemic but as potent immunosuppressant medications become more widely used these patients will also be at risk.
Aim(s)/Objective(s): We present a case of recurrent NTS bacteraemia with a mycotic aortic aneurysm in a patient taking methotrexate.
Method(s): Case report: A 69-year-old man presented with fever and right flank pain, one month after starting methotrexate for Wegener's granulomatosis. Other co morbidities included angina, atrial fibrillation and chronic kidney disease.
Blood cultures grew Salmonella enteritidis. It transpired he been treated 4 months earlier for a bacteraemia with the same organism. CT showed a dissecting aneurysm of the abdominal aorta extending to the right common iliac artery, which was too large for surgical intervention. A plan was made for lifelong antibiotic suppression.
Results: His treatment was complicated by pancytopenia with ceftriaxone and seizures whilst on ciprofloxacin. He changed to trimethoprim and amoxicillin but repeat CT scan at 4 weeks showed progression of the dissection. He continued treatment but died 6 weeks later.
Discussion and/or Conclusion(s): NTS bacteraemia should prompt investigation for immunosuppression as well as a search for an underlying source.
Mycotic aneurysms with NTS have a high mortality. Surgical repair with an extended course of appropriate antibiotics is recommended. Patients may need lifelong suppressive treatment, which may be difficult to tolerate. Even with surgical resection of some infected material antibiotic suppression may still fail.

ID: 5178

Management of meningitis at a large teaching hospital: a clinical audit

India Wheeler, Libuse Ratcliffe, Kate Vaudrey, Sylviane Defres. *Royal Liverpool University Hospital*

Background: Bacterial meningitis and meningococcal sepsis are rare but important conditions associated with serious morbidity and mortality. Early recognition and treatment is essential to minimize deleterious effects. Management relies on appropriate use of neuroimaging, lumbar punctures (LPs) and prompt antibiotic therapy to avoid delayed treatment as exemplified in recent guidelines.[1]
Aim(s)/Objective(s): To investigate the management of meningitis in adults (>18 years) since the publication of updated UK joint specialist societies guidelines.[1]
Method(s): A retrospective audit of electronic and paper case notes from January 2015- June 2016 against current guidelines.[1]
Results: We reviewed 15 records; 73.3% (11) of patients entered through A&E, 11 (73.3%) were female with mean age of 40.3 years (SD: 17.65). Of those reviewed; 8 (53.3%) were likely bacterial meningitis: 4 (27%) pneumococcal, 1 (6.6%) HSV 1, 1 (6.6%) pharyngitis and 1 (6.6%) migraine.
Immediate LP was contraindicated in 26.7% (4) of cases. Immediate LP was carried out in 20% (2) of those with no contraindication. No LP was performed within 1 hour.
Antibiotics were administered at a median time of 274 minutes after arrival to hospital (IQR: 123–571 minutes). Only 7.1% (1) of patients had a LP before antibiotics.
Discussion and/or Conclusion(s): The results from this audit reveal delays in the initial management of suspected meningitis; this could be in part due to route of admission to hospital. It appears that the new guidelines have not had an impact but this may be due to lack of awareness in hospital departments. This issue could be addressed nationally through wider awareness campaigns.

Topic: Immunisation

ID: 4684

Adenovirus minigene vectors and novel vaccination strategies

Julia Colston[1], Burkhard Ludewig[2], Paul Klenerman[3]. *[1]Oxford University Hospitals NHS Foundation Trust, [2]Kantonsspital St. Gallen, Institute of Immunobiology, [3]NDM, University of Oxford*

Background: $CD8^+$ T cell memory inflation is a striking immunological response, first reported in murine cytomegalovirus (MCMV) infection and subsequently in human CMV (HCMV). It describes certain epitope-specific $CD8^+$ T cell responses that gradually increase over time and are maintained as functional effector memory populations in blood and tissues. These populations are of potential relevance to vaccine design. However, only a limited set of epitopes exhibit such responses, and thus directing these remains an issue.
Aim(s)/Objective(s): We have developed a simple and tractable adenoviral model to define the critical rules governing epitope-specific memory inflation, which in parallel informs us further on adenoviral vaccine T cell responses. We tested whether minimal epitope-insert adenoviral vectors (called "minigene vectors"), can provide effective, targeted vaccine responses against a range of epitopes.
Method(s): Vectors containing the Gp33 epitope (minigene) and full Gp protein, from Lymphocytic Choriomeningitis Virus (LCMV), were developed and tested in vivo.

Results: Using a murine model of immunisation and challenge with LCMV, we demonstrated robust virologic protection with these adenovectors.
Discussion and/or Conclusion(s): These data provide an important insight into the nature of adenoviral vector vaccination, and the potential for minimal epitope-insert adenovector vaccines. This is particularly of relevance in the setting of current novel adenoviral vaccines against pathogens such as Ebola, Malaria and RSV.

ID: 4763
Hepatitis B vaccination in HIV outpatients – are the updated British HIV Association guidelines being adhered to?

Ayoma Ratnappuli[1], Monica Desai[2], Charles Lacey[2]. *[1]YorSexual Health, [2]YorSexual Health and York University*

Background: Hepatitis B (HBV) vaccination is safe and well tolerated in HIV positive patients and significantly reduces risk of both new and chronic infection. National vaccination guidelines were updated in November 2015 recommending several changes to vaccination practice such as the dose of vaccine given, number of vaccines per schedule and time to assess response to vaccination. Few studies of adherence to vaccination guidelines exist and we know of none which relate to the updated guidelines.
Aim(s)/Objective(s): To evaluate adherence to the updated BHIVA Hepatitis B vaccination guidelines within an HIV outpatient services.
Method(s): A retrospective case note review auditing HBV vaccination practice in patients attending HIV out-patient clinic at Yorsexual Health between December 2015 – May 2016.
Results: 156 patients attended clinic within the audit period. 90% of patients were screened within a month of HIV diagnosis and 83% had HBV infection and immunity screened for within the last year. The majority of the cohort were HBV immune (81%) and of the non immune 55% were vaccine naive. All vaccine naive patients were offered primary vaccination with a 92% uptake. However vaccination practice had several flaws the most common being incorrect number of doses per primary schedule.
Discussion and/or Conclusion(s): There are several gaps in vaccination practice when compared to national guidelines. Although primary vaccination is offered according to BHIVA guidelines, updated recommendations such as dose of vaccine and most notably number of vaccines in vaccination schedule are not being met. In addition non-responders to primary vaccination are not being managed effectively.

ID: 4850
Attitudes of healthcare staff influencing the uptake of influenza vaccine

Muthu Saba[1], Eleanor Mc Namara[2]. *[1]Cherry Orchard Hospital, Health Service Executive (HSE), [2]Consultant Microbiologist Cherry Orchard Hospital, Health Service Executive*

Background: Irish and international guidelines recommend annual influenza vaccination of all healthcare workers(HCWs) to protect themselves and to reduce the risk of transmission from HCWs to patients. However, vaccine uptake among HCWs is below the national target (40%).
Aim: To identify the attitudes and beliefs of HCWs towards influenza vaccine and their influence on vaccine uptake.
Method(s):
Study Design: A qualitative retrospective systematic review.
Electronic data sources reviewed: These included CINAHL, Medline, Embase, Cochrane Library, PsycINFO and PubMed (2000–2015). The search was performed using defined MeSH terms and keywords. Studies related to influenza vaccination on patients were excluded.
Results: Filtering of 289 studies resulted in 18 studies that fulfilled the study criteria. 4 descriptive themes for declining vaccination emerged (a) Misconceptions about influenza vaccine, (b) Fear of adverse reactions, (c) Doubts about vaccine efficacy and (d) Perceived minimal personal health risk from influenza. These were balanced by 4 descriptive themes for accepting the vaccine, which were (a) Personal benefit (b) Patient benefit (c) Protect the HCW's family and (d) Professional responsibility as a HCW.
From these 8 descriptive themes, four key analytical themes emerged. Two were negative based on (1) Issues with the vaccine and (2) HCWs perception on personal health risk. However two were positive based on (1) the benefits of vaccination and (2) the role of a HCW.
Conclusion: Influenza vaccine uptake by HCWs is influenced by complex factors. Identification of these beliefs and attitudes could be used to impact positively on future influenza vaccine campaign for HCWs.

ID: 4854
Varicella immunisation in healthcare workers in a large London teaching hospital

Ons El Hayet Ben Ismail, Tabitha Mahungu, Joan Adeniji, Dianne Irish. *Royal Free NHS Trust*

Background: Varicella (chickenpox) is an acute, highly infectious disease caused by the varicella zoster virus (VZV).
In 2003, the Department of Health (DoH) recommended that non-immune healthcare workers (HCWs) should receive varicella vaccine. HCWs with a negative or uncertain history of chickenpox or shingles should be serologically tested and a full course of VZV vaccine offered only to those without VZV antibody.
Aim(s)/Objective(s): To determine the uptake of VZV vaccination in HCWs in a large London teaching hospital.
Method(s): A retrospective review of all the HCWs tested for VZV IgG between 01/01/2011 to 31/012/2015 was performed.
Results: 3456/3630 (95%) HCWs tested for VZV IgG antibody were positive. 152/3630 (4%) were negative and 22/3630 (1%) were equivocal.
75/174 (43%) of the susceptible HCWs received 2 doses of VZV vaccination. 20/174 (11%) received only one dose and 79/174 (45%) did not receive any doses.
Data from the 58/99 susceptible HCWs who did not receive the full course show: 6 had health reasons, 16 declined and 36 had left the Trust.
Of the non-immune HCWs, demographic data was available for 140/174: 60/140 (43%) were allied health professionals, 45/140 (32%) were nurses, 24/140 (17%) were doctors and 11/140 (8%) were administration Staff.
Discussion and/or Conclusion(s): Ongoing education of healthcare workers by Occupational Health departments and increased awareness of the importance of varicella vaccination are necessary for improved uptake by health care workers.

ID: 4907
Seroprevalence of pertussis, diphtheria and poliovirus antibodies among healthcare personnel in Singapore

Helen Oh, Subbiah Dnamodaran. *Changi General Hospital*

Background: Immunization against diphtheria, poliomyelitis and pertussis was initiated in 1938, 1958 and 1959 respectively in Singapore.
Aim(s)/Objective(s): The aim of the study was to examine the prevalence of pertussis, diphtheria and poliovirus antibodies in healthcare personnel in Changi General Hospital.
Method(s): Annual health screening of healthcare personnel in Changi General Hospital was conducted in September 2014. Residual sera from health care personnel were collected. Human IgG antibodies against Bordetella pertussis, diphtheria toxoid and poliovirus (all 3 serotypes simultaneously) were measured using enzyme-linked immunosorbent assays.
Results: A total of 352 healthcare personnel were recruited; 150 healthcare personnel in 21–30 age group, 150 in 31–40 age groups and 52 personnel in above 40 age group.
The seroprevalence of antibodies against all 3 serotype of poliovirus was 68.47% (95% CI 63.4–73.1%). It decreased significantly with age from 94% in 21–30 age group, 60% in 31–40 age group and 19.23% above

40 age group (P = 1.05). The presence of pertussis antibodies was demonstrated in only 38.06% of the healthcare personnel (95% CI 33.2–43.2%). The seroprevalence decreased from 44.6% in 21–30 age group, to 36% in 31–40 age group and 25% in above 40 age group (P = 0.026). The seroprevalence of diphtheria was found in 93.75% of healthcare personnel (95% CI 0.7–95.8%) and increased above 90% in all 3 age groups.

Discussion and/or Conclusion(s): Waning immunity against polio-virus beginning at age 30 was demonstrated. A significant proportion of healthcare personnel lacked immunity against pertussis. Routine pertussis and polio boosters should be given to healthcare personnel to ensure sustained immunity against these diseases.

ID: 5080

Fever in preterm neonates receiving Bexsero® immunisation on a Tertiary Neonatal Unit

Hannah Davies, Laura Hyrapetian, Donovan Duffy. *St Georges Hospital NHS Foundation Trust*

Background: On 1st September 2015, the United Kingdom became the first country to integrate Bexsero®, a vaccine against meningococcal group B into the national immunisation schedule. This vaccine is associated with higher rates of fever when given alongside routine immunisations compared to routine immunisations alone (51–61% versus 23% respectively). Public Health England have recommended the administration of prophylactic paracetamol to all infants receiving this vaccine in order to decrease unnecessary General Practice or Accident & Emergency attendances, alleviate parental concern and distress for the child. There are no data available regarding the incidence of fever in preterm neonates receiving this vaccine or recommendations on prophylactic paracetamol specific to preterm infants.

Aim(s)/Objective(s): The aim was to monitor the response to immunisation in this vulnerable population.

Method(s): We prospectively collected data on all preterm neonates receiving Bexsero® vaccine on a tertiary neonatal unit. We recorded the incidence of fever and other adverse events in the 48 hours following immunisation.

Results: Between September 15 and July 16, 38 infants were immunised. The gestational age at birth ranged between 23 + 2 and 36 + 3, with a median age of 26 weeks. They were immunised at a median age of 10 weeks. One infant (2.6%) developed fever >38 degress in the 48 hours post-immunisation. Other significant events that occured post immunisation were repiratory deterioration in 2 infants (5.3%) and suspected sepsis in 4 infants (10.5%).

Discussion and/or Conclusion(s): The incidence of fever greater than 38 degrees was significantly lower in our cohort of preterm infants than in term infants immunised with Bexsero®.

ID: 5087

What do Lebanese women know about cervical cancer and human papilloma virus? A report on awareness level in urban communities

Jacques Choucair[1], Sarah Abboud[2]. *[1]Hotel Dieu De France Saint Joseph University Beirut, [2]Hotel Dieu De France, Saint Joseph University*

Background: Few know about HPV and cervical cancer.

Aim(s)/Objective(s): To evaluate the knowledge of Lebanese women about cervical cancer's symptoms and risk factors and human papillomavirus (HPV) infection. To measure the uptake of the cervical cancer screening test (Pap smear) and that of HPV vaccination.

Method(s): 444 women residing in Beirut and Mount-Lebanon, with no medical background, filled out a 32 item questionnaire about cervical cancer and HPV. Collected data was exported to and analyzed in SPSS® v. 21.0.

Results: Most participants were young (45.7% aged 18–25), residing in Mount-Lebanon (51.8%), Christian (50.7%), single (49.3%), with high education qualifications (73.9%) and currently employed (49.1%) in a field not related to health (84.9%). 64.6% did not visit a general physician nor a gynecologist regularly. 85.6% were aware of cervical cancer. 53.9% correctly identified HPV infection involvement in the pathogenesis of cervical cancer. 35.6% were aware of HPV infection but 80.4% believed their information was lacking.

37.6% of participants had been screened by Pap smear for cervical cancer at least once in their lives whereas 9% did not know what a Pap smear was. Screening was significantly associated with cervical cancer awareness and regular visits to general health physicians and gynecologists. 11.7% of participants aged 18–35 were vaccinated against HPV. Vaccination uptake was significantly associated with cervical cancer awareness, religion, field of work and studies, and regular visits to gynecologists.

Discussion and/or Conclusion(s): Urban Lebanese women are not well informed about cervical cancer and HPV. Screening by Pap smear and HPV vaccination uptakes are non-satisfactory.

Topic: Outbreaks

ID: 4378

Strengthening early warning and surveillance in emerging threat and epidemics preparedness and intelligent response in sub Sahara Africa

Ernest Tambo[1], Oluwasogo Olalubi[2], Ahmed Adedeji[3], Jeanne Y. Ngogang[4]. *[1]Department Biochemistry and Pharmaceutical Sciences, Higher Institute of Health Sciences, [2]Department of Public Health, Kwara State University, Malete, Nigeria; [3]Department of Pharmacology & Therapeutics, Kampala international University, Kampala, Uganda; [4]Service de Biochimie, Center Hospitalier Universitaire, Yaoundé, Cameroon*

Background: The severity and impacts of Ebola and Zika viral diseases emerging epidemics public health threat of international concern in low and middle income countries has been echoed. The gravity and dangers of the lack of local and international functioning emergency preparedness and smart response actions remain of concern to African citizenry and the global community.

Aim(s)/Objective(s): The paper examines research and knowledge gaps in strengthening early warning and surveillance strategies in emerging threat and epidemics preparedness and intelligent response in sub-Sahara Africa.

Method(s): A systematic and quasi-explorative method was used to assess relevant peer-review literature on emerging Zika and Ebola threats and epidemics gaps in preparedness and emergency response in Africa continent.

Results: Our findings showed that the unprecedented Ebola and Zika epidemics gaps and consequences on population health and economy have thought us the value of establishing and sustaining local and national robust and reliable capacities and mechanisms to deal with evolving and future crisis. Hence, adequate partnerships in commitment and financial investment in scaling up operational research and R&D is imperative. Novel, more sensitive and rapid diagnosis, development of effective and safe Zika and Ebola treatment and vaccines, but also contextual early warning and surveillance strategies in evidence-based community alertness and education, engagement and participation, and coordinated efficient utilization of local and international assistance in smart response are paramount.

Discussion and/or Conclusion(s): The paper provides practical and programmatic recommendations in improving strategic early warning and surveillance strategies integration and alignment of local and national "One health" strategy priorities and programs in sub-Sahara Africa.

ID: 4466

A simple "bundle targeting hubs" approach for the management of an increased incidence of glycopeptide resistant *Enterococcus* without active surveillance

Manjula Meda[1], Victoria Gentry[2], Amanda Walker[2], Ian Fry[3]. [1]*Frimley Health NHS Trust,* [2]*Frimley Health NHS Foundation Trust,* [3]*Frimley Health Foundation NHS Trust*

Background: Recent data on glycopeptide resistant *Enterococcus* (GRE) incidence from PHE and Eurosurveilance indicate increase in rates of GRE in healthcare.
Aim(s)/Objective(s): To investigate and manage the increasing GRE incidence in the hospital.
Method(s): Between Jan-Jun 2015, the infection prevention and control team investigated the increase in the number of GRE reports issued by the laboratory using passive surveillance. All necessary data required for the investigation was collected prospectively. All isolates during the same 6 month period were sent for typing.
Results: The increase in incidence was localised to 4 specific "hub" sites in the hospital. These included the general surgical ward, critical care unit, haemato-oncology ward and general medical ward. Patients in the medical wards carried GRE in predominantly their urine samples, while patients on the surgical and critical care wards were more often colonised in wounds or on devices. Of the 40 isolates typed by PFGE, 18 were reported to be unique strains. Only one of these 40 had no contact with healthcare in the last year. There were three probable cross transmission events. Antibiotic use and presence of indwelling device was most common risk factors. An infection control bundle was instituted in July 2015 following which a significant reduction in GRE was noted.
Discussion and/or Conclusion(s): Targeted invention control bundle in surgical, critical care and haemato-onclogy wards which included 1. weekly antibiotic audits 2. enhanced environmental cleaning 3. cohorting/isolating patients, without recourse to active surveillance, and 4. emphasis on hand hygiene was successful in reducing incidence significantly in the trust.

ID: 4522

To what extent Arab pilgrims are aware of Middle East Respiratory Syndrome Corona Virus (MERS-CoV) and the protective precautions against it?

Mazin Barry, Abdulaziz Alsubaie, Meshal Alotaibi, Abdulrahman Aljadoa, Abdulaziz Alhamad, Turki Alotaibi, Khaled Almohaimede, Omar Alharbi. *King Saud University, College of Medicine, Riyadh, Saudi Arabia*

Background: Many cases of Middle East Respiratory Syndrome Corona Virus (MERS-CoV) have been confirmed worldwide. Around 80% of the cases have been diagnosed in the Kingdom of Saudi Arabia (KSA). The risk of international disease spread is especially worrying given the KSA's role as the home of the most important Islamic pilgrimage sites.
Aim(s)/Objective(s): To determine the knowledge about MERS-Cov among Arab pilgrims and to assess the relationship between the knowledge and different socio-demographic characteristics.
Method(s): A cross-sectional study was carried out during Ramadan 2015 in the Holy Mosque in Mecca, Saudi Arabia. Self-developed questionnaires were collected conveniently from 417 Arab participants
Results: The majority of the respondents were familiar with MERS-CoV (91.3%). Saudis had a significantly higher knowledge about MERS-CoV compared to non-Saudis. (56.92 ± 18.55 vs. 44.91 ± 25.46, P = 0.001). The average knowledge was significantly higher in respondents who had received health advice on MERS-CoV (56.08 ± 20.86 vs. 50.65 ± 22.51, P = 0.024). With respect to stepwise linear regression, knowledge about MERS-CoV tended to increase by 14.23 (B = 14.23%, P = 0.001) for participants who were familiar with MERS-CoV, and by 8.50 (B = 8.50, P = 0.001) for respondents who had perceived MERS-CoV as a very serious disease.
Discussion and/or Conclusion(s): The lack of awareness among the pilgrims about MERS-CoV, which is a potentially serious infection, especially during Ramadan and Hajj, indicates that health authorities in the pilgrims' countries of origin should take a more active role in sharing health education and awareness, especially in the absence of an effective treatment or vaccine for MERS-CoV.

ID: 4536

Clostridium difficile infection. What happened in 2015?

Thressia Puthussery Devassy, Sheila Donlon, Caoimhe Finn, Fionnuala Duffy, Helen Good, Helen Cox, Pauline Flood, Dorothy Costello, Eric Watson, Margaret Fitzgerald, Mairead Skally, Sinead McDermott, Karen Burns, Edmond Smyth, Hilary Humphreys, Lilian Rajan, Karina O'Connell, Fidelma Fitzpatrick. *Beaumont Hospital, Dublin*

Background: Clostridium difficile infection (CDI)
- Leading cause of infectious healthcare-associated diarrhoea
- C. difficile infected and colonised patients contaminate their environment with spores
- Spores have a key role in the acquisition and transmission of CDI
- In recent years, Beaumont hospital has managed number of CDI outbreaks, including the hyper virulent strains 027 and 078
- In February 2015, FIVE clusters of CDI were identified

Aim(s)/Objective(s): To reduce the number of hospital acquired CDI by improving:
- C. difficile laboratory testing protocol
- CDI treatment guidelines
- Decontamination practices of bedpans, urinals, jugs, commodes, mattresses and environmental surfaces

Method(s): Multidisciplinary approach:
Clinical
- Fidaxomicin as first line therapy
- Ward review of patients with CDI
- Updated CDI management sticker in clinical notes

Laboratory
- Change in the C. difficile testing algorithm
- Enteric Bio (PCR) and confirmation of positive PCR result with toxin EIA
- New interpretative comments on laboratory reports

Infection prevention and control
- Mattress audit and replacement programme
- Updated SOP for mattress check including tag with time and date of inspection
- Replacement programme for bedpans and commodes
- Introduction of Pulp disposal units (Macerators) for disposable bedpans in two areas
- Feedback of CDI figures in real-time to senior management team

Results: 57% reduction in hospital acquired CDI from Q1 to Q4 in 2015.
Discussion and/or Conclusion(s): This mutidisciplinary involvement included weekly measurement of CDI numbers to inform improvement in real time, changes in the testing for and treatment of CDI and the improvement to ensure effective decontamination of mattresses, commodes and bedpans. The overall result was 57% reduction in the number of hospital acquired CDI in 2015.

ID: 4661

No further regional spread of MRSA MLVA type 1352 in the Netherlands, will it decline?

Paul Gruteke[1], Thijs Bosch[2], Annelot Schoffelen[2], Leo Schouls[2]. [1]*OLVG Hospital Amsterdam The Netherlands,* [2]*National Institute for Public Health and the Environment (RIVM) Bilthoven The Netherlands*

Background: The Netherlands is known for its low prevalence of MRSA, also in long-term care facilities (LTCF). However, in 2011 MRSA MT1352, also known as *spa* t1081, was noted as an upcoming MRSA variant in health care facilities in the Amsterdam region. The striking similarity both epidemiologically and genetically with MRSA *spa* t1081 from Hong Kong have been described.
Aim(s)/Objective(s): Evaluate the course of the emergence of MT1352 in the Netherlands.

Method(s): Analysis of the national MRSA surveillance database at the RIVM.
Results: From virtually absent in 2008 and 2009, the number of MT1352 isolates increased to 191 of 2254 referred non-LA-MRSA isolates in 2015 (8.5%). From 2011 onward, MT1352 spread to the East and North-West of the country, but no new provinces were affected since 2012. The large province of Gelderland in the East saw rising numbers up to 2014, followed by a slight decline. North Holland faced the highest figures in 2015; 2016 numbers remained low up to May. MT1352 affected LTCFs more frequently than hospitals.
Discussion and/or Conclusion(s): MRSA MT1352 is part of Clonal Complex 45, and is PVL-negative. Colonization is common, and serious infections are rare. The strain is easily transmissible in healthcare settings. Reconstruction of transmission routes within and to LTCFs proved difficult. Little genetic variability of MT1352 limits the use of current typing methods to elucidate the micro-epidemiology. NGS might be helpful although sufficient numbers of strains and epidemiological data will be needed.
The next few years will learn whether MT1352 disappears or will remain at an endemic level.

ID: 4712
Outbreak Support Team; the Belgian answer to the emerging treat of multidrug resistant organisms (MDRO) and MDRO-outbreaks in care facilities

Barbara Legiest, Annie Uwineza, Beatrice Jans, Boudewijn Catry. *Scientific Institute of Public Health*

Background: Healthcare associated infections, caused by multidrug resistant organisms (MDRO), signifie a therapeutic impasse as infections are more difficult to treat and the hospitalisations last longer. Consequently morbidity, mortality, and hospital costs increase. Moreover, MDROs are easily transmitted and cause outbreaks often difficult to contain in care facilities.
Aim(s)/Objective(s): In Belgium, the Outbreak Support Team (OST) is created to give the opportunity to the care facilities, struggling with outbreaks involving MDROs, to call for help from an external partner without being blamed or stigmatized.
Method(s): This OST is a collaboration between the regional health authorities in charge of infectious diseases, the Scientific Institute of Public Health, and the National Reference Laboratories.
The help, offered by OST, includes scientific support, site visits, advice on prioritizing actions, and (rarely) enforcement.
Results: The contribution of the OST to outbreak management will be described. Several tools have been developed: a checklist to inventory the measures, transfer- and transport documents to standardize the communication about MDRO contaminated patients, initiatives to increase the knowledge of MDRO at other care sectors like nursing homes, revalidation centers, and homecare.
Based on our experience and on the hand of examples, some recurrent triggers for the development of and fitfalls in the control of an outbreak can be listed.
Discussion and/or Conclusion(s): Despite the expertise present and the measures taken in the hospitals, the OST can help to control the outbreak. At the national level, the OST contribute to a more coordinated approach to the MDRO battle.

ID: 4717
Management of a parainfluenza 3 outbreak on a Special Care Baby Unit including Neonatal ICU

Gavin Boyd, Jean Robinson, Christine Bishop, Sahar Musaad. *Calderdale and Huddersfield NHS Foundation Trust*

Background: In April 2016 four infants on the special care baby unit baby required ventilation over a 24 hour period, and two infants developed signs of a respiratory tract infection. A viral pathogen was suspected. We describe the control measures that we but in place before and after confirmation of the aetiological pathogen as parainflunza 3 virus.
Aim(s)/Objective(s): To share the timeline of the outbreak, describing how it evolved, the control measures that were put in place and our communication strategy.
Method(s): The outbreak was managed through a series of outbreak control meetings. Decisions around closure of the unit, cohorting, personal protective equipment for both staff and visitors, restrictions to the visitor policy, enviornmental cleaning and communication with parents and staff were all agreed and reveiwed at each meeting.
Results: Twenty infants were on the special care baby unit at the time the outbreak started. Four required intubation and mechanical ventilation. Two other infants were confirmed postive cases but did not require ventilatory support. The unit was closed to admissions for a period of four days. Visiting was restricted to parents only. PPE initally included full use of gloves, aprons and surgical masks. Cotside cleaning was increased to three times per day. Parents received daily written updates on the situation. We do not believe there was any further cross tranmission following identification that we had a potential outbreak.
Discussion and/or Conclusion(s): This was a rapidly evolving outbreak successfully controlled by the control measures described. Changes made in light of our experiences will hopefully prevent a similar outbreak in the future.

ID: 4719
The sink as a potential source of transmission of carbapenemase-producing Enterobacteriaceae in intensive care unit

Deborah De Geyter[1], Lieve Blommaert[2], Nicole Verbraeken[2], Denis Piérard[2], Ingrid Wybo[2]. [1]*University Hospital Brussels,* [2]*University Hospital Brussels/Microbiology and Infection Prevention*

Background: Carbapenemase-producing *Enterobacteriaceae* (CPE) are emerging pathogens that represent a major public health threat. In the University Hospital of Brussels, the incidence of new patients with CPE rose from 1 case in 2010 to 35 cases in 2015. Between January and August 2015, 6 patients became infected/colonized with CPE during their stay in the same room in intensive care unit (ICU).
Results: The time period between those patients was relatively small and although the strains belonged to different species with different antibiograms and mechanisms of resistance, the hypothesis was that the environment could be a possible source of transmission. Investigation suggested that the evil doer was a contaminated sink. Besides other strains, *C. freundii* type OXA-48 was frequently isolated from patients and sinks. To investigate the phylogenetic relationschip between those strains, PGFE was performed. The strains isolated from patients and the sink in the implicated room were highly related and pointed to sink to patient transmission. Samples in the other ICU rooms were also taken, revealing that 9 out of the 32 sinks were contaminated with CPE. To control the outbreak, the sinks and their plumbings were replaced by new ones with another structure, they were flushed every morning with a glucoprotamin solution and routines regarding sink practices were improved. In the eight months period after replacements of the sinks, only one new patient with CPE was detected in ICU.
Discussion and/or Conclusion(s): In conclusion, this outbreak highlights that sink drains can accumulate strains with resistance genes and become a potential source of CPE.

ID: 4820
Outbreak of respiratory syncytial virus in an adult haemato-oncology unit

Kirsty Ferguson, Alison Edwardson, Teresa Inkster. *NHSGGC Infection Control*

Background: Respiratory Syncytial virus (RSV) can cause upper respiratory tract infection and/or pneumonia in immunocompromised adults such as bone marrow transplant patients and those with lymphomas/leukaemia.
Aim(s)/Objective(s): We describe a recent outbreak of RSV on a 19 bedded adult haemato-oncology ward.

Method(s): During December 2015 three patients on the ward tested positive on the same day for RSV with one case discharged home, one asymptomatic case remaining on the ward and the final case nursed with infection control precautions in place due to the presence of symptoms. An outbreak was declared and the ward closed to admissions/transfers when a fourth patient case was confirmed. Infection control precautions included patient and staff screening, isolation/cohorting of cases, exclusion of symptomatic staff and personal protective equipment (including surgical face masks). Over the course of the outbreak the situation was assessed by an outbreak control team using the hospital infection incident assessment tool (HIIAT).
Results: A total of 8 patients and 2 staff tested positive during the outbreak. Four patient cases required treatment with Ribavarin and immunoglobulin. The ward remained closed for a total of 8 days, reopening when the outbreak was declared over. Asymptomatic patient carriers were detected and possibly contributed to ongoing cross transmission.
Discussion and/or Conclusion(s): A review undertaken has provided recommendations including, isolation of a patient when symptoms first detected, exploration of near patient testing and development of an early alert to highlight increased incidence in the community setting. In high risk patient groups asymptomatic carriage is an important consideration.

ID: 4853
A Tale of Three Cities – Lessons from three outbreaks of Pneumocystis jirovecii

Lindsay Chesterton[1], Richard Puleston[2], Tim Boswell[3], Efitia Yiannakis[4], Philip Monk[5], Katherine Packham[6]. [1]*Derby Teaching Hospitals NHS Foundation Trust,* [2]*Public Health England, Field Epidemiology Service East Midlands,* [3]*Nottingham University Hospitals NHS Trust,* [4]*Worcestershire Acute Hospitals NHS Trust,* [5]*Public Health England, East Midlands,* [6]*Public Health England*

Background: *Pneumocystis jirovecii* is a serious opportunistic fungal infection of immunosuppressed patients. Its incidence is increasing in England. Previously associated with HIV/Aids it is increasingly recognised in patients immunosuppressed due to cancer/transplant treatment.
Aim(s)/Objective(s): We describe the learning from investigating 3 outbreaks in one region, including diagnostic approaches, the availability, utility and interpretation of genotyping, the role of environmental sampling and control measures. We also describe the current national surveillance for fungal infections, including *Pneumocystis jirovecii*.
Method(s): Each incident was identified through clinical recognition and hospital based surveillance. Outbreaks were declared and control teams formed. Descriptive epidemiology and analytical case-control studies were undertaken. Genotyping was undertaken in 2 incidents. Limited environmental investigations were undertaken for one and detailed, repeated environmental sampling undertaken in another. PCR combined with clinical and radiological findings was used for diagnosis.
Results: Three outbreaks were identified (2012–2015) across three different teaching hospitals in one region (2 renal units and 1 across multiple specialities). 25, 88 and 12 patients were identified in the respective outbreaks. Genotyping was available for 2, showing clonality in the isolates obtained. Environmental deposition was identified in one incident (surfaces and air handling systems).
Discussion and/or Conclusion(s): *Pneumocystis jirovecii* outbreaks are difficult to investigate, not least because of the lack of systematic national surveillance. Culture is not currently possible, the diversity of genotypes in localities and nationally is underdeveloped and the ecology and epidemiology incompletely understood. Our investigations have advanced our understanding of these complex incidents which carry a substantial morbidity and mortality for affected patients.

ID: 4857
Genetic variation in *Mycobacterium tuberculosis* isolates from a London outbreak associated with drug resistance

Giovanni Satta[1], Adam Witney[2], Robert Shorten[3], Magdalena Karlikowska[4], Marc Lipman[5], Timothy McHugh[4]. [1]*Imperial College Healthcare NHS Trust – University College London,* [2]*Institute of Infection and Immunity, St George's, University of London,* [3]*University College London, Centre for Clinical Microbiology and Public Health Laboratory Manchester, Manchester Royal Infirmary, Manchester,* [4]*University College London, Centre for Clinical Microbiology,* [5]*Division of Medicine, Royal Free London NHS Foundation Trust, London and UCL Respiratory, University College London*

Background: The largest outbreak of isoniazid-resistant (INH-R) *Mycobacterium tuberculosis* in Western Europe is centred in North London, with over 400 cases diagnosed since 1995.
Aim(s)/Objective(s): In the current study we evaluated the genetic variation in a subset of outbreak clinical samples with the hypothesis that these isolates have unique biological characteristics that serve to prolong the outbreak.
Method(s): Fitness assays, mutation rate and whole genome sequencing were performed to test for selective advantage and compensatory mutations.
Results: The fitness and the mutation rate of the resistant isolates were not different from either the reference strain *H37Rv*, the other susceptible isolates in the lineage or unrelated isoniazid susceptible and resistant samples.
Deletions – Comparative analysis for the detection of deletions demonstrated extensive deletions in 16 genes compared with the control strains used.
SNPs – A total of 563 SNPs were identified with 33 virulence genes affected by at least one SNP.
Insertions – Comparative analysis did not reveal the presence of any insertion.
Discussion and/or Conclusion(s): This detailed analysis of the genetic variation of these INH-R samples suggests that this outbreak consists of successful, closely-related, circulating strains with heterogeneous resistance profiles and little or no associated fitness cost or impact on their mutation rate. Specific deletions and SNPs may be a peculiar feature of these isolates, which can potentially explain their persistence for years.

ID: 4862
***Pneumocystis jirovecii* detection in the hospital environment aids outbreak investigation**

Lindsay Chesterton[1], Justine Halliwell[1], Rebecca Turner[1], Deborah Gnanarajah[1], Milind Khare[1], Malcolm Guiver[2], Cath Noakes[3], Louise Fletcher[3], Michael Gormley[4], Richard Puleston[2], Maarten Taal[5]. [1]*Derby Teaching Hospitals NHS Foundation Trust,* [2]*Public Health England,* [3]*University of Leeds,* [4]*Heriot-Watt University,* [5]*University of Nottingham*

Background: *Pneumocystis jirovecii* (PJ), a human specific fungal pathogen causing pneumonia and significant mortality amongst immunocompromised patients remains poorly understood. Despite research, the life cycle, reservoir and the source of transmission are not yet fully elucidated.
Aim(s)/Objective(s): Between 2012 and 2015, 85 patients with positive PJ polymerase chain reaction (PJPCR) were identified in a single centre newly built hospital (completed in 2008) which led to further analysis of the healthcare environment.
Method(s): Samples from patients in whom Pneumocystis jiroveci pneumonia (PJP) was suspected were analysed with PJPCR in a single Public Health England (PHE) laboratory. Cycle times were provided and genotyped wherever possible. Cases were stratified according to clinical/microbiology and imaging data.
Environmental sampling was undertaken within the hospital ventilation and air handling unit (intake and extract filters), the surfaces and room air (impingers) within the hospital.

Repeat specimens were collected following an enhanced deep clean using acticlor and hydrogen peroxide vapour.
Results: The same genotype 811/81 was found in patients and the healthcare environment. 9/10 stacks (air handling unit) were PJPCR positive. 81/811 strain was present on the intake filter serving the renal ward and on another extract filter. In wards that had previously had patients with PJP, 7/12 surface samples from air vents, pathology chute, light fitting, supply air-vents were PJPCR positive. No genotyping was possible. Air sampling was negative for PJPCR. Following the deep clean, all samples were negative.
Discussion and/or Conclusion(s): Further work is required to understand the significance of environmental PJ and its role in the transmission and pathogenesis of PJP.

ID: 4863
A nosocomial outbreak of rotavirus infection on a Care of the Elderly ward – an under-recognised event?

Stella Barnass[1], Elizabeth Ashley[2], Linda Woodward-Stammers[3], Yolanda Hedges[3], Nupur Goel[3], Margie Meltzer[4], Farhana Butt[3]. *[1]West Middlesex University Hospital, Chelsea and Westminster NHS Foundation Trust, [2]Nuffield Department of Medicine, Centre for Tropical Medicine and Global Health, [3]West Middlesex University Hospital, Chelsea and Westminster NHS Foundation Trust, [4]North West London Health Protection Team, Public Health England*

Background: Two patients on a Care of the Elderly Ward were diagnosed as having rotavirus in stool samples taken on Friday 29 May 2015. The results were available on Monday 1 June. Three further patients developed laboratory-confirmed rotavirus infection between 1 and 6 June. Of the five cases, three had diarrhoea and vomiting, one had diarrhoea only and one had vomiting only. Typing results were available for four patients and all had the same non-vaccine strain: G12P8. All the infections were hospital acquired but it was not possible to establish the source.
Results: In all, 21 patients were assessed for gastrointestinal symptoms and thirteen had stool samples tested, of which five tested positive. The bays containing the symptomatic patients were closed, confirmed cases were transferred to side rooms, and remained there until at least 8 days after the onset of symptoms or until they had been asymptomatic for 48 hours, whichever was the later. Enhanced infection control (EIC) measures were implemented.
All the patients recovered. The bays were deep-cleaned and re-opened, and EIC measures were stood down on 17 June.
Discussion and/or Conclusion(s): In the literature rotavirus is rarely described as a cause of diarrhoea and/or vomiting in adults, and the outbreak highlights the need to test for this pathogen. While there is no specific treatment, identification of rotavirus enables advice to be given on the duration of isolation, important in a clinical setting where length of stay often exceeds the infective period.

ID: 4868
Duration of Zika virus RNA detection in semen

Christina Petridou[1], Fiona Thorburn[2], Barry Atkinson[2], Emma Aarons[2]. *[1]Rare and Imported Pathogens Laboratory, Public Health England, [2]Rare and Imported Pathogens Laboratory, PHE*

Background: The current explosive outbreak of Zika virus (ZIKV) and its potential for sexual transmission due to the presence of ZIKV in semen has significant consequences for pregnant women and couples planning a pregnancy due to the risk of adverse fetal outcomes if women become infected during pregnancy. ZIKV RNA has been reported in semen up to 62 days post onset of symptoms however the duration of viral persistence in semen is unknown and transmission has been reported in an asymptomatic couple. Detection of ZIKV RNA in the UK is performed at Public Health England, Porton Down by rRT-PCR.
Aim(s)/Objective(s): To determine the duration of detectable ZIKV RNA post onset of symptoms in semen samples received at PHE.
Method(s): rRT-PCR was performed on all semen samples and CT values determined. We offered a service of 2-weekly testing for patients with detectable RNA to determine whether clearance had occurred and looked at whether the patients had detectable RNA in urine and blood.
Results: The longest duration of virus in semen was 91 days, much longer than the previously reported 62 days.
Discussion and/or Conclusion(s): Our results suggest the duration of persistence of ZIKV in semen is variable but may be protracted in some individuals, indicating the potential for prolonged sexual transmission. Our findings are useful for establishing the likelihood of sexual transmission, informing family planning and national guidelines which currently recommend that asymptomatic males returning from countries with ongoing ZIKV transmission should only use barrier protection for 8 weeks to reduce the risk of sexual transmission.

ID: 4899
Failure of routine practice to detect a community MRSA cluster of EMRSA15: description of a public health investigation

Tom Williams[1], Michelle Toleman[2], Emmeline Watkins[3], Francesc Coll[1], Bernadette Nazareth[3], Belinda Sadler[4], Nicholas Brown[5], Julian Parkhill[6], Sharon Peacock[7]. *[1]University of Cambridge, [2]University of Cambridge, Wellcome Trust Sanger Institute, Cambridge University Hospitals NHS Foundation Trust, [3]Health Protection Team, PHE East of England, [4]Infection Prevention & Control Cambridgeshire & Peterborough CCG, [5]Cambridge University Hospitals NHS Foundation Trust, Public Health England, Clinical Microbiology and Public Health Laboratory, Cambridge, [6]Wellcome Trust Sanger Institute, [7]University of Cambridge, Wellcome Trust Sanger Institute, Cambridge University Hospitals NHS Foundation Trust, London School of Hygiene and Tropical Medicine*

Background: Here we report a public health investigation of a cluster of genomically related isolates of epidemic methicllin resistant *Staphylococcus aureus*-15 (EMRSA-15), the dominant lineage in UK hospitals and long-term care facilities. These isolates were identified through whole-genome sequencing (WGS) in patients residing in the same geographical area and registered to the same general practice. This cluster had not been detected by routine practice, including Post Infection Review (PIR).
Aim(s)/Objective(s): We aimed to identify related cases, epidemiological links between patients and the potential for ongoing transmission.
Method(s): Closely related MRSA isolates were identified using WGS from a 12-month prospective observational study that was conducted between 2012 and 2013 at a regional microbiological laboratory, and additional case-finding. Public health investigation consisted of a retrospective analysis of healthcare data to identify potential epidemiological links and prospective on-site observation and sampling to determine the potential for ongoing transmission.
Results: The cluster comprised 27 isolates from 15 cases, including two bacteraemias. The cluster lacked a clear epidemiological link to a single hospital, suggesting community transmission. On-site observation identified several areas where practice could be improved, but samples from staff and environmental sites were negative for MRSA.
Discussion and/or Conclusion(s): The dependence on WGS for identification of this community cluster of EMRSA-15, despite the presence of two fatal bacteraemias, suggests a potentially beneficial role for targeted WGS in routine practice. As highlighted by this study, community spread of MRSA is an increasingly recognised transmission pathway, but hospital-centric infection control procedures do not reflect this.

ID: 4908

A retrospective analysis of seven years of measles cases, their recognition and management in a London hospital

Beatrice Cockbain[1], Tehmina Bharucha[2], Jennifer Hart[2], Ons El Hayet Ben Ismail[2], Tabitha Mahungu[2], Dianne Irish[2], Tanzina Haque[2]. *[1]Royal Free Hospital, [2]Royal Free Hospitals NHS Trust*

Background: London is experiencing a measles outbreak: with the first half of 2016 seeing 138 cases, compared to only 91 across the UK in 2015.
Aim(s)/Objective(s): To better characterise this outbreak, a retrospective analysis of measles cases between 2010 and 2016 was performed at a large central London teaching hospital, which has had 12.3% of all measles cases in London in 2016.
Method(s): Electronic patient notes and laboratory reporting systems were used to retrospectively analyse the clinical course and demographic information of 60 patients with laboratory-confirmed measles diagnoses (RT-PCR positive and/or IgM positive/equivocal with IgG either positive/negative) between 2010 and 2016.
Results: Of the 60 patients with confirmed measles, 44 (73%) were aged 15 and older. Delayed diagnosis due to misattribution of the measles rash to a drug reaction was seen in 3 (5%) of patients. Of the 30 patients with full clinical information available, 23 (77%) were not placed in respiratory isolation within 15 minutes of arrival to A&E, thereby requiring contact tracing of large numbers of exposed patients. 3 (10%) presented to hospital up to more 3 times after their first visit. The median number of hospital doctors reviewing a patient pre-diagnosis was 2 (IQR 1–2; range 1–6).
Discussion and/or Conclusion(s): The reasons for delayed diagnosis include lack of recognition of measles by clinicians despite seemingly classical presentations, highlighting a clear need for improved awareness and education. Our measles control strategy therefore should focus on both clinician education as well as awareness regarding infection control measures.

ID: 4919

High mortality of the infections caused by hyper toxin producer *Clostridium difficile* 078

Milind Khare, Deborah Gnanarajah, Helen Forrest. *Royal Derby Hospital*

Background: PHE reported that there is a national rise in infections caused by hyper toxin producer *Clostridium difficile* 078. Its origin is thought to be from pigs and calves. There is increased incidence reported from other European countries as well.
Aim(s)/Objective(s): To evaluate *Clostridium difficile* 078 infections.
Method(s): In the teaching hospital, patients with C diff ribotype 078 were evaluated
Results: 16 patients have been identified with C diff ribotype 078 since January 2015. There were 6 females and 10 males. Mean age was 80 yrs (range 70–98 except one of 49 years). With the available data 4 had resolved within 30 days. 11/16 (69%) patients died following this infection. Six died within 30 days whilst 5 died after 30 days. All 16 of these cases have been linked to the same cluster using VNTR profile/DNA finger printing.
Discussion and/or Conclusion(s): Extensive mapping was done to see movements of these patients in the hospital. No single ward had been identified where all 16 patients have been through. They've been cared for in 18 different wards. Majority of the patients have been admitted through MAU. Public Health England also undertook patient mapping, no links (Trust or community) were identified. We believe that equipment and the environment is a key causative link, therefore cleanliness was the focus for the management of the outbreak. Hydrogen peroxide decontamination of enteric isolation rooms were done routinely as standard.
Hyper toxin producer *Clostridium difficile* 078 was associated with high mortality rate.

ID: 4925

An outbreak of *Malassezia pachydermitis* in a Neonatal ICU

Laura Cottom[1], Huma Changez[2], Gillian Mills[3], Kate Hamilton[3], Teresa Inkster[4]. *[1]Department of Medical Microbiology, Queen Elizabeth University Hospital, [2]Department of Microbiology, Glasgow Royal Infirmary, [3]Infection Control, Glasgow Royal Infirmary, [4]Department of Microbiology, Queen Elizabeth University Hospital, Glasgow*

Background: *Malassezia is a* basidiomycetous fungus that is a commensal of human and animal skin. Although rare, *Malassezia* species are an important cause of nosocomial infection and fungemia in preterm neonates and immunocompromised patients.
M.pachydermatis colonizes the stratum corneum of dogs, with reports of zoonotic transmission by healthcare workers being well documented. Risk factors for colonisation in neonates include the degree of prematurity, corresponding skin condition, endotracheal intubation and indwelling vascular catheters.
Aim(s)/Objective(s): In January 2016, 3 babies in a 13-cot neonatal unit isolated *M.pachydermatis* from ear swabs taken as part of routine microbiological screening. Following identification an outbreak investigation was initiated.
Before 2016 *M.pachydermatis* had never been isolated in the unit, furthermore no change had been made to the laboratory procedure for processing neonatal screens.
Method(s): As part of the outbreak investigation, all babies on the unit were screened weekly. Infection control measures included education on standard infection control precautions, hand hygiene and compliance with uniform policy. Equipment disinfection was also reviewed.
Results: A total of 9 babies isolated *M.pachydermatis* from ear swabs. To date this has represented colonisation only, with no evidence of infection being identified. Environmental screening cultured *M.pachydermatis* from the unit equipment. Staff screening was not undertaken.
Discussion and/or Conclusion(s): Following implementation of the infection control measures, no new cases of *M.pachydermatis* have been identified on neonatal screening or cultured from equipment in the unit. Human carriage of this ubiquitous opportunistic pathogen reinforces the importance of good hand hygiene.

ID: 4942

Influenza outbreak in an elderly rehabilitation ward

Virginia Ledda, Christopher Lawrence, Orla Whitehead. *County Durham and Darlington Foundation Trust*

Background: Influenza can cause significant morbidity and mortality in the elderly. Influenza vaccination is recommended in high-risk groups (elderly, significant co-morbidities) to prevent infection.
Aim(s)/Objective(s): To describe an influenza outbreak in an elderly rehabilitation ward and to audit diagnosis and management against Infection Control and Prevention Trust guidelines.
Method(s): Following identification of the Influenza A H1N1 virus, all patients were risk assessed and treated as per Trust protocol. Symptomatic patients had oropharyngeal swabs taken to confirm the diagnosis. They were treated with Oseltamivir. Influenza vaccination status was checked with patients or confirmed with patients' GPs. Anonymised data was collected.
Staff members were risk assessed and their vaccination status was checked. Staff was consented for use of anonymised data in research: data was recorded by staff type.
Results: 18 patients were present on the ward: 4 patients' vaccination status was unknown. 7 patients were vaccinated, 7 were not vaccinated.
Of the 7 vaccinated patients, 1 patient was symptomatic and influenza positive. Of the 7 non-vaccinated, 4 were symptomatic and found to be influenza positive. Zero patients with influenza died or required higher care.

Of the 41 staff members, 24 (58%) had been vaccinated before the outbreak. 10 staff members were found to be high risk: of these, 2 were not vaccinated while 9 were.
Discussion and/or Conclusion(s): As anticipated, vaccinated patients had a lower rate of Influenza infection.
The low rate of vaccinated staff members suggests that staff working with the elderly should be encouraged to undergo vaccination to reduce risk of outbreak transmission.

ID: 4950
Norway losing its antimicrobial innocence?

Kristin Stenhaug Kilhus[1], Dorthea Oma[2]. [1]*Department of Research and Development, Division of Patient safety and Infection Control, Haukeland University Hospital,* [2]*Department of Research and Development, Division of Patient Safety and Infection Control, Haukeland University Hospital*

Background: Norway is considered a country of prudent use of antibiotics and few problems with multidrug resistant bacteria. We describe the first hospital outbreak of vancomycin-resistant enterococci (VRE) in Norway and the control measures implemented to contain it.
Method(s): Main interventions were:
- Establishing a local VRE control committee
- Multidisciplinary communication and leadership
- Systematic surveillance screening and contact tracing
- Cohorting and contact isolation
- VRE labelling of patient journals
- Optimizing laboratory diagnostics
- Reinforcing environmental cleaning and disinfection
- Adherence to standard precautions
- Antibiotic stewardship

Results: From June 2010 to June 2016 499 cases with vancomycin-resistant *Enterococcus faecium* of the *vanB* genotype were identified. More than 90% (461/499) were asymptomatic carriers identified through screening or contact tracing. 11 blood culture isolates were identified. 21 different wards had at least one patient with VRE. Pulsed-field gel electrophoresis (PFGE) and Multi-locus sequence typing (MLST) indicated a single-strain outbreak.
Discussion: Containing the outbreak was costly and tedious. We believe this was mainly due to the lack of guidelines, standardized laboratory methodology and organizational culture. Despite increasing rates of colonization in our hospital, there have been few adverse outcomes related to VRE. What actually defines a cost-effective infection control intervention? Antibiotic resistance knows no geographic borders and VRE is said to be "a canary in the mine". Should VRE actually be one of our main concerns in the future?
Conclusion: VRE has not been eradicated form our hospital. We must remain vigilant to prevent another large outbreak but getting back to baseline may be illusive.

ID: 4970
Community-associated methicillin-resistant *Staphylococcus aureus* outbreaks in Belgian maternity wards

Annie Uwineza[1], Béatrice Jans[2], Barbara Legiest[2], Caroline Broucke[3], Hanna Masson[3], Wouter Dhaeze[3], Sofie Theunis[3], Isabelle Bendels[3], Olivier Denis[4], Sylvanus Fonguh[1], Boudewijn Catry[2]. [1]*The Scientific Institute of Public Health (WIV-ISP),* [2]*The Scientific Institute of Public Health (WIV-ISP), Outbreak Support Team,* [3]*Agency for Care and Health, Prevention Division, Infectious Disease Control and Vaccination, Outbreak Support Team,* [4]*Belgian National Reference Centre for Staphylococcus Aureus*

Background: In recent years, Community-Associated Methicillin-Resistant *Staphylococcus aureus* (CA-MRSA) prevalence increased in Belgium. Since 2014, at least 3 Belgian hospitals reported outbreaks involving PVL + CA-MRSA in maternity wards.
Aim(s)/Objective(s): Our aim is to describe the three CA-MRSA outbreaks.
Method(s): Healthcare facilities with outbreaks involving multi-drug resistant organisms (MDRO) can ask for support from the national Outbreak Support Team (OST).
Results: Outbreak1: September 2014-April 2015 (strain USA300, t008): 14 infected and 5 colonized persons among 10 families, several relapses observed. The index case had a history of non-investigated relapsing skin infections. The outbreak was reported 5 months after onset.
Outbreak2: September-December 2015 (strain USA300, t008): 3 families involved with 4 infected and 4 colonized cases. A HCW with a known CA-MRSA history started working in the ward few days before the index case was identified.
Outbreak3: January-April 2016 (strain USA400, t1931): 6 families involved with 6 infections (mostly breast abscesses) and 6 colonizations (4 patients, 2 HCW). The index case was a patient with non investigated relapsing skin infections who probably contaminated HCW1, who further contaminated HCW2. The outbreak spread among mothers and babies.
All outbreaks were successfully managed through close collaboration between OST, Medical direction, infection control teams, maternity HCW and laboratories.
Discussion and/or Conclusion(s): Controlling the spread of CA-MRSA requires carefully elaborated strategies. Although mothers are mostly in good health, compliance to hand hygiene recommendations remains essential in maternity wards. Early declaration of outbreaks is important. Screening mothers with skin disease history before delivery could be a protective measure.

ID: 4977
Healthcare associated infection incident epidemiology in NHSScotland (2015/16)

Catherine Dalziel, Lisa Ritchie. *Health Protection Scotland*

Background: In NHSScotland infection incidents (outbreaks) are reported to Health Protection Scotland (HPS) using the Healthcare Associated Infection Incident Assessment Tool (HIIAT) which assesses infection incidents as red, amber or green based on risk. Recently, HPS performed a descriptive epidemiological analysis of reported infection incidents between 01/04/2015 and 31/03/2016.
Results: As well as describing the organisms, infection categories and care settings involved in infection incidents during this time period the report also highlighted potential reporting biases. The report found lower levels of reporting of CDI and *Staphylococcus aureus* than expected given that there has been no significant change in infection incidence for these pathogens according to national surveillance; there was also considerable variation in reporting (no. of reports) between boards. Previously, NHS Boards were required to report all incidents assessed as amber or red to HPS, reporting of HIIAT green incidents to HPS was voluntary; if a bias exists it is possibly due to variation in application of the HIIAT resulting in under reporting.
Discussion and/or Conclusion(s): In April 2016 reporting of all non-norovirus HIIAT green incidents was made mandatory in NHSScotland. It is anticipated that this mandatory reporting will reduce potential reporting biases and enable HPS to provide a more accurate picture of infection incident epidemiology in NHSScotland. This study provides a baseline against which to measure the impact of non-norovirus HIIAT green reporting and may also provide an opportunity to improve consistency of healthcare associated infection incident assessment in NHSScotland.

ID: 5085
An outbreak of *Staphylococcus capitis* bacteraemia in a Scottish neonatal unit

Teresa Inkster[1], Huma Changez[2], Kate Hamilton[2], Elizabeth Dickson[2], Gillian Bowskill[2], Gillian Mills[2], Jennifer Slorach[2]. [1]*Queen Elizabeth University Hospital, Glasgow,* [2]*NHSGGC*

Background: *Staphylococcus capitis* is an emerging pathogen in the NICU setting. Recent outbreaks have been reported in the literature including the *S. capitis* clone NRCS-A, characterised by vancomycin resistance or heteroresistance. In a recent French study *S.capitis* late onset sepsis was found to be a risk factor for severe morbidity. With advances in laboratory methods and use of MALDI-TOF identification of Coagulase negative staphylococci (CNS) to species level is being performed more frequently.
Aim(s)/Objective(s): We describe an outbreak of *S. capitis* in a Scottish neonatal intensive care unit.
Method(s): 3 patients with *S capitis* bacteraemia were identified over a 16 day period. Blood culture isolates were identified using MALDI-TOF. During subsequent investigations a further case was detected taking the total number to 4 cases in 1 month. Two of the patients were treated for infection; the other two were considered contaminants.
Results: Pulsed field gel electrophoresis (PFGE) of the blood culture isolates revealed the same pulsotype. Infection control measures implemented included increased environmental cleaning, education and a review of staff skin health in the unit. Environmental screening was undertaken but was negative with no source identified.
Discussion and/or Conclusion(s): *S capitis* is an emerging pathogen in neonates. No source was found in our outbreak which was brought under control by implementation of infection control measures. Use of MALDI-TOF was pivotal in identifying this outbreak. Laboratories should give consideration to identifying CNS from neonatal units to species level to enable early outbreak detection.

ID: 5177

Antibodies to Ebola in international responders to the West Africa Ebola epidemic

Catherine Houlihan[1], Catherine McGowan[2], Steve Dicks[3], David Mabey[2], Richard Tedder[3], Judith Glynn[2]. *[1]UCL, [2]London School of Hygiene and Tropical Medicine, [3]Public Health England*

Background: The 2014/5 Ebola (EVD) epidemic in West Africa (WA) resulted in a large international humanitarian response. Health care workers (HCWs) from WA were disproportionately affected, and a few international HCWs were infected.
Aim(s)/Objective(s): Since asymptomatic EVD has been described, we tested international returnees for EVD antibodies.
Method(s): An online consent and survey link were distributed using a snowball technique. Eligibility criteria included having travelled to WA during the epidemic and never having tested positive for Ebola virus or received a filovirus vaccine. Oral fluid collection devices were posted and returned using standard mail. Samples were tested using an IgG capture ELISA. Non-exposed UK controls were tested.
Results: 268 individuals responded and submitted a sample; 152 (56.7%) were women. The majority (253, 94.4%) travelled to Sierra Leone. Roles included, but were not limited to; laboratory (95, 35.4%), clinical (124, 42.3%), epidemiologist/research (37, 13.8%), community engagement/burial (19, 7.1%) and water/sanitation/engineer (14, 5.2%). A total of 233 (86.9%) returnees spent time in Personal Protective Equipment (PPE), of whom 22 (9.4%) had concerns about exposure during removal, and 54 (20.1%) described possible significant EVD exposure. 57 (21.3%) described a febrile/diarrhoeal illness in WA or within 1 month of return. Of the 268 returnees, two had reactive results on IgG capture assay. Neither was reactive on a competitive ELISA using plasma.
Discussion and/or Conclusion(s): A high proportion of international responders reported potential exposure to EVD, and reported a febrile illness during the incubation period for Ebola. Improvements in training and procedures, and consistency in PPE equipment and removal may mitigate this.

ID: 5171

Community outbreak of invasive group A streptococcal infection amongst patients receiving care from the same district nursing team, August – September 2016

David Edwards[1], Hamid Mahgoub[2], Margaret Lewin[2], Vicki Chalker[3], Ngozi Elumogo[4], Juliana Coelho[3], Theresa Lamagri[5]. *[1]Health Protection Team – PHE East of England, [2]Health Protection Team – PHE East of England, [3]PHE Respiratory and Vaccine Preventable Bacteria Reference Unit, [4]Norfolk and Norwich University Hospital Trust, [5]PHE National Infection Service*

Background: In early September 2016, three cases of invasive Group A streptococcal (iGAS) infection were identified who shared the same rare *emm* type (*emm* ST9). These cases were investigated by the East of England Health Protection Team (HPT) to identify common links and oversee the implementation of control measures.
Aim(s)/Objective(s):
1. Identify and eliminate a potential source of exposure
2. Identify any further linked cases
3. Prevent ongoing transmission

Method(s): An incident management team (IMT) was convened. This discussed case epidemiology, possible mechanisms for transmission and further investigations. The HPT agreed actions with the community health healthcare trust infection control team (ICT) to prevent further transmission.
Results: Initial investigations identified that the cases were resident geographically close to each other (3 miles) and received wound care for bilateral leg ulcers from the same community nursing team. The community healthcare service provider infection control team (ICT) assessed the nursing team and preliminary findings identified two nurses who had visited all three cases during their incubation period, one of whom was symptomatic with tonsillopharyngitis. These staff were screened and antibiotic chemoprophylaxis arranged. A piece of equipment (bandage scissors) was also used between patients, subsequently taken out of use.
Discussion and/or Conclusion(s): This outbreak highlights the susceptibility of patients receiving wound care. Whilst prevention of transmission from asymptomatic carriage is not always possible, the importance of exclusion or temporary redeployment of healthcare staff with symptomatic infections should be highlighted.

ID: 5159

Pneumocystis pneumonia cluster outbreak at a Scottish Renal Transplant Centre

Andrew McClarey[1], Paul J. Phelan[2], Dáire T. O'Shea[2], Ian Laurenson[2], Lorna Henderson[2]. *[1]Doctor, [2]NHS Lothian*

Background: Pneumocystis Pneumonia (PCP) caused by Pneumocystis jirovecii is a potentially fatal opportunistic infection. Cluster outbreaks of PCP amongst renal transplant recipients have been documented worldwide.
Aim(s)/Objective(s): We aimed to describe a cluster of PCP diagnosed in nine renal transplant recipients from our centre between November 2014 and January 2016.
Method(s): A retrospective analysis of cases was carried out. We matched these cases with two case linked controls.
Results: Of the nine patients affected, the median age at presentation was 65 years (range 24–77 years). Median time to disease onset was 5.8 years post-transplant (range 0.5–10.4 years). At diagnosis, all patients had a functioning graft with a mean eGFR of 29.3 mL/min (range 15–41 mL/min), significantly lower than controls (70.0 mL/min +/–23.5) ($p = 0.0007$). There was no significant difference in immunosuppression regimens. All patients were lymphopenic at diagnosis (mean 0.2×10^9/L), significantly lower than our control population at corresponding time of diagnosis (mean 0.9×10^9/L) ($p = 0.028$). Four patients required mechanical ventilation and two required dialysis. Four patients died within three months of presentation.

Discussion and/or Conclusion(s): This study characterises a heterogenous cluster of renal transplant patients developing PCP. Notable clinical features included a universal lymphopenia, low eGFR, CMV viraemia and several patients being a considerable time out from transplant. A number of the cases overlapped in time and place such that cross-transmission is suspected and further characterisation of this is being undertaken. This cluster illustrates the persistent risk of opportunistic infection, many years from transplantation, and represents a precedent in Scotland, and an emerging challenge worldwide.

Topic: Pathogenesis

ID: 4710
Characterization of macrophage mediated immune responses to mycobacterial infections

Gunjan Kak[1], Brijendra K. Tiwari[2], Cecil Antony F[2], Yogendra Singh[3], Krishnamurthy Natarajan[2]. *[1]Dr. Ambedkar Center for Biomedical Research, [2]Dr. B.R Ambedkar Centre for Biomedical Research, [3]CSIR Institute of Genomics and Integrative Biology*

Background: Interferon-gamma (IFN-γ) is a key cytokine in immunity towards tuberculosis. IFN-$\gamma^{-/-}$ or IFN-γ receptor IFN-$\gamma R^{-/-}$ knockout mice rapidly succumb to tuberculosis. The pathogen has evolved many ways to mitigate the effects of IFN-γ. The down regulation of IFN-γR on the surface of macrophages is one such strategy.
Aim(s)/Objective(s): The objective of the study is to characterize IFN-γ mediated macrophage responses to mycobacterial infections, key host factors regulating IFN-γR expression on macrophages in response to M. tb infection and to explore the dichotomy in the profile and susceptibility patterns of this very immunologically relevant cytokine.
Method(s): Human THP-1 cell line, murine bone marrow derived macrophages (BMDMs) and human peripheral blood mononuclear cells (PBMCs) were used for study. Flow cytometry, confocal imaging and western blots were employed for investigations.
Results: Data shows that both M. tb and M. bovis BCG are potent down regulators of IFN-γR on macrophages. Many host factors and signalling pathways are employed by M. tb to exhibit this phenomenon. TLR pathway specifically, adaptor molecule TRAF6, calcium homeostasis, PKC and MAPK ERK are involved in aiding M. tb mediated receptor down modulation. Also, genes of calcium cysteine protease pathway which were previously identified by our lab and linked to mediating negative immunity against M. tb also regulate IFN-γR on macrophages in response to M. tb infections.
Discussion and/or Conclusion(s): Thus M. tb employs various host factors to elicit its immune suppressive effects to downregulate surface receptor expression of IFN-γR. By down regulating the receptor levels the pathogen is successfully able to avert the protective effects of IFN-γ.

ID: 5028
Pro-infectious agents can augment *Staphylococcus aureus* virulence

Emma Boldock[1], Daria Shamarina[2], Tomasz Prajsnar[2], Bas Surewaard[3], Stephen Renshaw[2], Simon Foster[2]. *[1]Sheffield Teaching Hospitals NHS Trust, [2]University of Sheffield, [3]University of Calgary*

Background: Staphylococcus aureus is an invasive human pathogen associated with significant mortality. Host-pathogen dynamics during infection are poorly understood but recent work demonstrates that with high dose inocula, an immunological bottleneck allows clonal expansion of few bacteria, which go on to cause abscesses. Models of S. aureus infection are characterized by the requirement for a large bacterial inoculum and the impact of surrounding microflora on S. aureus pathogenicity is under-explored.
Aim(s)/Objective(s): To interrogate the clonal expansion phenomenon further and to investigate the need for a large bacterial inoculum to establish S. aureus infection, mixed strain inocula were tested in both the zebrafish embryo and murine models of systemic infection.
Results: In both infection models, purified, particulate bacterial cell wall peptidoglycan was able to augment infection by low dose S. aureus but inert particulate beads or solubilised peptidoglycan did not. Commensal bacteria e.g. Micrococcus luteus were also able to augment pathogenesis of low dose S. aureus.
In the murine model, the infective dose could be lowered from 10^7 to 10^4 CFU in the presence of these potentiators and the liver appears to be the focal point of loss of immune control. Innate immune dysfunction and chemokine dysregulation have been shown to underpin this augmentation phenomenon.
Discussion and/or Conclusion(s): These results have important ramifications regarding human S. aureus disease as it may begin to explain how initiation of infection occurs, as S. aureus primarily enters via a wound or invasive procedure. These data demonstrate that other bacteria (and even their components) enable S. aureus to initiate infection.

Topic: Surgical site infections

ID: 4465
Can local champions help to drive forward initiatives to reduce cardiac surgical site infections?

Lilian Chiwera, Willian Newsholme, Neil Wigglesworth, Christopher Blauth. *Guy's & St Thomas' NHS Foundation Trust*

Background: Surgical site infections are a big challenge and have devastating consequences for patients. Adult cardiac Surgical Site Infection Surveillance (SSIS) at Guy's and St Thomas' NHS Foundation Trust commenced in 2009 as a patient safety initiative amid reported increased incidence of Surgical Site Infections (SSIs). Before this time, infection incidence was unclear because data collection was not standardised.
Aim(s)/Objective(s): We aimed to establish baseline SSI rates in adult cardiac surgery and employ targeted interventions as per Department of Health and National Institute for Health and Care Excellence (NICE) best evidence guidelines. This gave us an opportunity to standardise practice and improve patient outcomes, quality, safety and efficiency in line with organisational targets. We also aimed to embed the SSI detailed investigation protocol mirroring the NICE SSI quality standard (2013).
Method(s): We developed and established use of local data collection protocols in line with Public Health England recommendations and identified local champions. This strong SSIS leadership helped us to develop a multidisciplinary collaborative approach that eased the burden of data collection and optimised open communication. This enabled us to address potential practice concerns more effectively through a series of initiatives.
Results: SSI rates fell from 5.4% in 2009 to 1.1% in 2015 and CABG rates from 6.5% in 2009 to 1.2% in 2015; considerably below the national average (4.7%). We saved an estimated £706,000 over a 7 year period.
Discussion and/or Conclusion(s): The use of local champions and a multidisciplinary collaborative approach enabled us to successfully implement evidence based practice and demonstrate significant reductions in SSI incidence.

ID: 4562
Surgical site infection (SSI) after caesarean delivery – comparison of skin closure using staples and subcuticular suture

Gerard McIlvenny, Mark McConaghy, Eileen Morelli, Lourda Geoghegan. *Public Health Agency*

Background: The most common methods for caesarean section skin closure are metal staples or absorbable sutures. Both oppose skin edges to facilitate wound healing. Staples are regarded as quicker and easier than sutures to use. To date no large study has conclusively

demonstrated that staples are associated with an increased risk of SSI. The morbidity associated SSI that may be increased with the use of staples would outweigh the increase in time required for closure with sutures.
Aim(s)/Objective(s): To evaluate the risks of surgical site infection (SSI) after caesarean-section wound closure with surgical staples versus absorbable subcuticular suture.
Method(s): NHS hospitals in Northern Ireland performing c-sections are mandated to perform prospective SSI surveillance during the inpatient stay and in the community setting. CDC-NHSN definition of SSI was used. Information collected included age, BMI, previous c-sections, ASA-score, urgency of operation, closure used, procedure duration and antibiotic prophylaxis. We compared SSI rates for staple and suture closure, in low transverse C-sections, during 2008–2015.
Results: 39,752 C-sections were included; 29,834 received sutures and 9,918 had staples. Of those closed with staples, 0.8% developed an SSI in hospital, compared to 0.4% in the sutures group ($p < 0.001$). At the end of community follow-up the incidence was 12.1% in the staple group and 9.3% in the suture group ($p < 0.001$). Median operative time was longer in the suture group compared with staples (37 vs. 35 minutes).
Discussion and/or Conclusion(s): This is one of the largest studies to demonstrate that staple closure was associated with significantly higher SSI rates compared with suture closure.

ID: 4656
Surgical site infections (SSIs) after spinal surgery in university-associated pediatric hospital: Impact of nutritional insufficiency?

Marie-Laure Valdeyron[1], Vincent Cunin[2], Christine Bruchon[3], Selilah Amour[4], Anne Tristan[5], Isabelle Poirot[6], Jacqueline Grando[3], Noel Peretti[7], Philippe Vanhems[8]. *[1]Unité d'Hygiène et d'Epidémiologie Hospices Civils de Lyon – Groupement Hospitalier Est, [2]Service de chirurgie pédiatrique, Hospices Civils de Lyon, Groupement Hospitalier Est, [3]Unité d'Hygiène et d'Epidémiologie Hospices Civils de Lyon, Groupement Hospitalier Est, [4]Unité d'Hygiène et d'Epidémiologie Hospices Civils de Lyon, Groupement Hospitalier Centre, [5]Laboratoire de microbiologie, Hospices Civils de Lyon, Groupement Hospitalier Est, [6]Service de rééducation pédiatrique, Hospices Civils de Lyon, Groupement Hospitalier Est, [7]Service de gastro entérologie pédiatrique, Groupement Hospitalier Est des Hospices Civils de Lyon, [8]Service Hygiène Epidémiologie et Prévention, Groupement Hospitalier Sud des Hospices Civils de Lyon, Saint Genis Laval, France*

Background: Wound infections are a serious complication of spinal fusion, often requiring re-operation and prolonged antibiotic therapy.
Aim(s)/Objective(s): The objectives were to determine the rate of Surgical Site Infections (SSIs) after spinal surgery, to identify the risk factors (RF) associated with SSIs and to suggest corrective means.
Method(s): SSIs had been identified by active prospective surveillance. RF were collected retrospectively. Multivariate analysis was performed. The setting was a university-associated pediatric hospital. Patients were children aged from 4 to 25 years old with a neuromuscular or idiopathic scoliosis, who underwent spinal surgery between 01/01/2011 and 31/12/2015.
Results: There were 21 infections following 326 fusions (6.4 per 100 operations). The sex ratio (M/F) was 0.41. The yearly SSIs attack rates were 1.6%, 10.3%, 5.7%, 4.2% and 10.5%. The mean age of infected (Inf.) and not infected (N. inf.) patients were similar (16.2 years) in both groups. The infection involved S. aureus (46%) and enterobacteriae (28%). Concerning patient-associated RF, there were statistical difference for the weight (Inf.: 36.4 ± 19.3 kg; N. inf.:43.5 ± 15.3 kg; $p = 0.008$), and the size (Inf.:142.8 ± 21.8 cm; N. inf.:150.8 ± 17.7 cm; $p = 0.041$). If the Body Mass Index is inferior to 15 kg/m^2, the rate ratio was 4.09 (95%CI: 1.5–10.7; $p = 0.004$) and with multivariate analysis, only this condition was a RF (95%IC: 0.117; 0.884; $p = 0.028$). ASA score was also a RF (Chi2 test: $p = 0.048$). Concerning surgery-associated RF, the mean duration of surgery was statistically different (Inf.: 270 ± 68 cm; N.inf: 231 ± 86 cm; $p = 0.011$).
Discussion and/or Conclusion(s): Our results suggest to decolonize patients with mupirocine five days before surgery and to offer them an enteral nutrition one year before intervention.

ID: 4681
Measuring compliance with infection prevention practice across the surgical pathway: pilot study of the OneTogether Assessment Toolkit

Jennie Wilson[1], Kathryn Topley[2], Deborah Xuereb[3], Tracey Radcliffe[4], Deborah Pike[5], Sophie Singh[2], Dawn Stott[6], Reg Lloyd[7], Ruth Collins[8]. *[1]University of West London, [2]3M, [3]Mater Dei Hospital, Malta; [4]Betsi Cadwaladr University Health Board, [5]College of Operating Department Practitioners, [6]Association of Preoperative Practitioners, [7]NHS Lothian, [8]Belfast Health & Social Care Trust*

Background: OneTogether is a collaboration between professional organisations focused on the prevention of surgical site infection. A lack of knowledge and variation in application of guidance had been identified as barriers to implementation of infection prevention practice (IPP) in theatres. To address this we developed an assessment toolkit for systematic evaluation of adherence to IPP across the surgical pathway.
Aim(s)/Objective(s): To undertake a pilot study of an assessment toolkit for assuring practice for SSI prevention.
Method(s): An assessment framework of seven IPP standards was developed, based on evidence-based guidance and divided into discrete elements. Each element measured standard 'present' and 'applied' and was scored as 2 (compliant), 1 (partially compliant), 0 (non-compliant). Performance was measured as percentage compliance for each standard. Pilot study participants were recruited by the partnership and chose the theatre specialties to assess. Data was captured on practical problems encountered, ease of application/ interpretation, and omissions.
Results: The toolkit was used by seven hospitals in 15 theatres. Overall compliance was 62.1% (range 47.1–88.9%); scores were higher for standard 'applied' (77.4%) than 'defined' (67.3). Compliance scores were highest for instrument asepsis (96%) and lowest for pre-op warming (42%), skin disinfection (55%) and surgical environment (58%). The toolkit was reported as easy to use and valuable for identifying gaps in IPP.
Discussion and/or Conclusion(s): This pilot study has demonstrated non-compliance with recommended IPP for surgical patients and found that the assessment tool was valuable for identifying and addressing deficiencies. The toolkit has been revised to incorporate feedback from the pilot study and the final version made available.

ID: 4716
Review of neurosurgical spinal infections in Queen Elizabeth University Hospital, Glasgow from 1st January 2015 to 31st August 2015

Hannah Soulsby[1], Christine Peters[2], Teresa Inkster[2]. *[1]Greater Glasgow and Clyde NHS Trust, [2]Queen Elizabeth University Hospital, Glasgow*

Background: Documented infection rates vary with the type of spinal surgery but can be from 0.75% to 11.9%. A review of neurosurgical spinal infections in Queen Elizabeth University Hospital, Glasgow from 1/1/15 to the 31/8/15 was performed.
Aim(s)/Objective(s): The Public Health England document Surveillance of Surgical Infection in UK hospitals 2013/2014 quote a spinal infection rate post surgery of 1.1%. This data was obtained from surveillance of inpatients and readmissions in 30 hospitals in England from April 2009 to 2014, a cohort of 33,053. As England is also in the UK with a similar patient demographic, this was taken as an

acceptable standard for comparison. There is currently no active surveillance of neurosurgical infections in Scotland.
Method(s): A cohort of 457 patients was obtained. Discharge summaries were scanned for mention of either a superficial skin infection, or deep infection. Telepath, the microbiology laboratory system, was also scanned to identify any organisms isolated from microbiological samples during these episodes.
Results: Interpretation of data showed the rate of infection to be 6.13%. This is over five times the rate recorded in the Public Health England Surveillance document.
Discussion and/or Conclusion(s): This highlights the difficulties of surgical site surveillance when there are no clear guidelines on acceptable rates of infection.
Many factors will affect this rate such as patient characteristics, co-morbidities, type of surgery, length of surgery, operating conditions, aseptic techniques, skin prep and antibiotic prophylaxis. A full range of quality improvement measures mapped to the NICE standards for SSIs have been implemented.

ID: 4775
Unexplained differences in the risk of post-surgical infection in Norway and England

Theresa Lamagni[1], Hinta Meijerink[2], Hanne Merete Eriksen[3], Suzanne Elgohari[1], Pauline Harrington[1], Oliver Kacelnik[3]. *[1]Public Health England, [2]Department of Antibiotic Resistance and Infection Prevention, Norwegian Institute for Public Health, Oslo, Norway; European Programme for Intervention Epidemiology Training, European Centre for Disease Prevention and Control, Stockholm, Sweden; [3]Department of Antibiotic Resistance and Infection Prevention, Norwegian Institute for Public Health, Oslo, Norway*

Background: Marked differences in surgical site infection (SSI) rates in different European countries have been observed.
Aim(s)/Objective(s): To understand the degree to which differences in reported SSI rates in Norway and England are attributable to methodological differences, a collaborative study was undertaken.
Method(s): A comprehensive review of national surveillance methods, participatory requirements and data quality was undertaken. Data from September 2012 to January 2015 were pooled for categories of surgery included in both programmes and analysed using logistic regression (adjusted for sex, age, ASA score, wound class, post-operative hospital days, operation duration).
Results: Whilst both countries broadly followed CDC/ECDC protocols for SSI surveillance, notable differences were identified in the application of post-discharge case finding methods and case definitions for superficial infection. Comparison of surveillance categories in common to both countries – coronary artery bypass graft (CABG), colon surgery, cholecystectomy and hip prosthesis – identified significant differences in patient populations (ASA score, wound contamination), length of stay, duration of surgery. Multivariable analysis restricted to inpatient and readmission-detected deep incisional and organ/space infections within 30 days of surgery identified significantly higher rates of SSI in Norway than England for colon surgery (aOR = 0.43, 95% CI 0.36–0.52), total hip (aOR = 0.21, 0.17–0.26) and partial hip replacement (aOR = 0.11, 0.08–0.14). In contrast, SSI rates were comparable for CABG and cholecystectomy.
Discussion and/or Conclusion(s): Residual differences in SSI rates not explained by patient or surgical risk factors were apparent for colon and hip replacement surgery. Further cross-border investigation should be undertaken to explore these differences and identify opportunities for reducing SSI rates.

ID: 4878
Changes in the use of an ultra clean orthopaedic operating theatre monitored during joint replacement surgery by settle plates

Andrew Thomas[1], Christina Bradley[2], Martyn Wilkinson[2], Adam Fraise[2]. *[1]The Royal Orthopaedic Hospital, [2]Hospital Infection Research Laboratory, University Hospital, Birmingham*

Background: The relationship between airborne contamination and deep infection in joint replacements was demonstrated by Charnley. Recent Registry data show that deep infection rates in joint replacement surgery may be deteriorating. We used settle plates to monitor air quality in a contemporary operating theatre during joint replacement surgery.
Aim(s)/Objective(s): Initially (first phase) we compared practice to Charnley's data. We then (second phase) had all staff using body exhaust systems. We then (third phase) used data from laser imaging airflow studies to predict optimum locations for the surgical instrument trolleys. Our aim was to use settle plates to localise contamination on the instrument trays.
Method(s): Operations were carried out in an Howorth Exflow ultra clean enclosure. In phase 1 and phase 2 packs of 10 Petri dishes were placed with five dishes on the instrument trolleys and five dishes around the periphery of the operating theatre. Dishes were opened when the incision was made and closed one hour later. In phase 3 eight petri dishes were placed, four on each trolley in defined positions. Petri dishes were incubated for 48 hours and the number of colonies counted.
Results: Phase 1 average growth was 0.2 colonies/plate/hour. Second phase growth was 0.04 colonies/plate/hour. Third phase growth was 0.31 colonies/plate/hour. The heaviest contamination was at the opposite end of the instrument trolley next to the surgeon.
Discussion and/or Conclusion(s): We have demonstrated the standard which can be achieved in a contemporary operating theatre. The study sets a standard for during surgery monitoring of ultra clean air operating enclosures.

ID: 4930
A multifaceted intervention to decrease surgical site infections following craniotomy

Miquel Pujol, Pilar Ciercoles, Evelyn Shaw, Dolors Somoza, Carmen Cabellos, Ivan Pelegrin, Ana Hornero, Guillermo Cuervo, Jordi Carratala, Andreu Gabarros. *Bellvitge University Hospital*

Background: Surveillance of surgical site infection (SSI) after craniotomy was initiated in 2012 because of presumption of high infection rates. About 200 procedures are performed yearly in our hospital. From 2012 to 2015 the yearly rate of SSI rate increased from 7.7% to 14.9%. The aetiology was gram positive cocci and Propionibacterium acnes in 64% of cases and gram negative species, particularly Enterobacter spp and P. aeruginosa in 36% of cases.
Aim(s)/Objective(s): To describe a multifaceted intervention to reduce the SSI in craniotomy and the impact of these interventions on SSI rates.
Method(s): Prospective surveillance of SSI in a 700-bed university hospital in Barcelona, Spain. All patients admitted for elective or urgent craniotomy from October 2012 to May 2016 were prospectively followed for 30 days after surgery or 1 year if implant.
Interventions: In November 2015 we implemented the following interventions: (a) head wash inside the operating room with povidone-iodine and saline (b) surgical antibiotic prophylaxis within 30″ prior incision, (c) vancomycin powder (1 g) in subgaleal space before skin closure, (d) sterile head wash at the end of surgery and (e) coverture of surgical incision with a sterile absorbent wrap to prevent moisture.
Results: From January to June 2016, 58 patients were followed; 50% women, median age 52y (range: 20–80), 90% with implants. During this period no surgical site infection was observed.
Discussion and/or Conclusion(s): The introduction of a multifaceted intervention of SSI prevention in craniotomies was safe and drastically reduced the number of infections. However, a longer surveillance is needed to verify these outstanding results.

ID: 4947

Are there differences in risk factors for organ space surgical site infections in patients undergoing elective colon or rectal surgery?

Aina Gomila[1], Josep Maria Badia[2], Evelyn Shaw[3], Carmen Nicolás[4], Marta Piriz[5], Montse Brugués[6], Fina Obradors[7], Enric Limón[3], Francesc Gudiol[3], Miquel Pujol[3], On behalf of Vincat Program[3].
[1]Bellvitge University Hospital, [2]Fundació Hospital Asil de Granollers, [3]Hospital Universitari de Bellvitge, [4]Hospital Universitari Mutua de Terrassa, [5]Hospital Parc Taulí Sabadell, [6]Consorci Sanitari de l'Anoia, [7]Fundació Althaia de Manresa

Background: Surgical site infection (SSI), particularly organ space infection (OE), is the most frequent and serious complication after colorectal surgery.
Aim(s)/Objective(s): To determine differences between risk factors for OE-SSI in patients submitted to colon or rectal surgery
Method(s): Multicenter prospective cohort study of patients undergoing elective colorectal surgery in 10 Spanish hospitals from January 2011 to December 2014. Follow-up: from day of surgery to 30 days after.
Results: Overall, 3,701 patients were included, 2,518 (68%) after colon surgery and 1,183 (32%) after rectal surgery. Mean age was 68 (SD:12) years and 2,289 (61.8%) were male. Main indication for surgery was neoplasia (94.6%). Overall, 669 (18.1%) patients developed a SSI, 414 (16.4%) after colon surgery and (21.6%) after rectal surgery and 336 (9.1%) were organ space. In colon surgery, male sex (OR:1.57,95% CI:1.14–2.15) and stoma (OR:2.65,95%CI:1.8–3.92) were independent risk factors for OE infection while laparoscopic surgery (OR:0.5,95% CI:0.38–0.69) and oral prophylaxis (OR:0.7,95%CI:0.51–0.97) were protective. In rectal surgery, male sex (OR:2.11,95%: CI:1.34–3.31) and surgery duration (OR:1.49,95%CI:1.03–2.15) were independent risk factors for OE infection while oral prophylaxis (OR:0.49,95%CI:0.32–0.73) was protective. Readmission (8.1% vs 4.7%, p 0.001) and length of stay (13d ± 14d vs 11d ± 12d, $p < 0.001$ were significantly higher in rectal compared to colon surgery. There were no differences in clinical cure and mortality rate between groups.
Discussion and/or Conclusion(s): Colon and rectal surgery differ in incidence and risk factors for organ space SSI although clinical cure and mortality rate were no significantly different.

ID: 4948

First 3 years surveillance of organisation-wide surgical site surveillance in a UK NHS Trust

Vanessa Whatley, Claire Hayward. *Royal Wolverhampton NHS Trust*

Background: Surgical site infections (SSI) account of up to 20% of HCAI, and cost on average £2,100 per case with reports of increased mortality and morbidity. A dedicated SISS Team was introduced in September 2012. All knife-to-skin procedures in in-patients were surveyed, with post discharge surveillance at 30 or 90 days.
Aim(s)/Objective(s): To present one Trusts first 3 years results following the introduction a whole system approach to surgical site infection surveillance (SSIS) exceeding national UK expectations.
Method(s): Data was collected using a combination of electronic and manual methods in elective and emergency patients excluding day cases. Monthly feedback was given to surgeons on individual SSI rates and by procedure with comparison to specialty performance.
Results: From September 12 to September 15 an average of 509 patients per month were surveyed with a total of 18,338 in the period. The SSI rate for confirmed infections fell from 10% to 2.6% during the period with varying results in specialities. A positive impact on length of stay and number of readmissions was also identified. Expanded results will be presented in the poster.
Discussion and/or Conclusion(s): Investment in the SSIS Team and procurement of a surveillance system, with subsequent feedback of results has resulted in reductions in SSI. This has impacted positively on Trust resources and patient safety.

ID: 4949

Audit of antimicrobial prophylaxis in spinal surgery as part of SSI surveillance and improvement activity

Manjusha Narayanan. *Royal Victoria Infirmary, Newcastle upon Tyne NHS FT*

Background: Data collected as part of SSI surveillance of spinal infections with a view to improve practice on all fronts to reduce SSI rates. New protocol for antibiotic prophylaxis in spinal surgery was introduced last year and it was agreed at SSI meetings to audit this.
Aim(s)/Objective(s): Aim: To audit use of antibiotic prophylaxis in spinal surgery – to look at timing (time difference from KTS), extended dose of antibiotic in operations lasting more than 3 hours and choice of the antibiotic agents used. Data collected as part of SSI surveillance of spinal infections with a view to improve practice.
Method(s): Retrospective data collection of various elements of antibiotic prescribing in relation to the antibiotic protocol was carried out for a period of 4 weeks.
Results: Data for timing of antibiotic administration in relation to KTS (knife to skin), choice of antibiotics, repeated doses of cephalosprin in prolonged operations and post op antibiotic cover was analysed.
Discussion and/or Conclusion(s): Timing of antibiotic administration was poor overall (within 30–60 min of KTS), there was unnecessary administration of antibiotics post op, choice of antibiotics used as per protocol was satisfactory.
Detailed analysis of data is being fed back to relevant anaesthetic and surgical teams to help address change in practice.
Data collection was difficult as it was documented in many different places – surginet checklist, WHO checklist, E record, but not very often on intra op anaesthetics paper chart.
To share the audit with other surgical teams.

ID: 5007

Mapping current and future priority areas for surgical site infection (SSI) prevention and surveillance locally and nationally

Rachael Troughton[1], Susan Hopkins[2], Alison Holmes[1], Gabriel Birgand[1].
[1]Imperial College London, [2]Public Health England

Background: National surveillance of surgical site infections (SSI) in England is coordinated by the Surgical Site Infection Surveillance Service (SSISS) at Public Health England (PHE). A survey of NHS Trusts commissioned by PHE in 2014 showed that priorities for Trusts are mismatched with the sugical categories currently under surveillance in the SSISS.
Aim(s)/Objective(s): This study aims to map surgical procedures that have the highest associated SSI burden (in terms of volume, risk and cost) with current surveillance activities to shape current and future surveillance priorities, both on a national and a local level.
Method(s): This mapping study compares multiple surgery types by patient volume, infection rate, excess length of stay and excess costs attributable to SSI, proportion of hospitals currently undertaking surveillance, and mean priority ranking as reported in the 2014 PHE survey of Trusts. For the national mapping, the study uses data from Hospital Episode Statistics, SSISS, and from the literature. At a local level, the patient volume, risk, and cost are calculated from laboratory data, patient administrative data and financial data, and these figures compared with local surveillance arrangements.
Results: The results are displayed in a matrix using heat mapping. Colour matching along rows indicates a high degree of agreement between risk, burden, cost, and current and future priorities. Caesarean section (CS) has low agreement.
Discussion and/or Conclusion(s): There are some significant mismatches between SSI burden and current surveillance, particularly for caesarean section which has a high SSI risk and patient volume but no national surveillance, while many Trusts indicate CS is a priority area.

ID: 5038

Development of a patient information leaflet: "Taking Care of Your Vascular Graft: A short guide on how to care for your graft after surgery"

Stephanie Thomas[1], Abdul Shaffi[2], Jay Turner-Gardner[1]. *[1]University Hospital South Manchester, [2]Manchester University*

Background: Prosthetic Vascular Graft Infection (PVGI) is a significant complication of arterial reconstructive-surgery. Incidence is 1–6% depending on surgical location. Treatment is extremely challenging and involves graft removal, revascularization, debridement and often empirical broad spectrum antibiotics for prolonged courses.
Early postoperative grafts are especially at risk. Transient bacteraemia secondary to; poor dental hygiene, skin breakdown/diabetic complications, recurrent urinary-tract infection, constipation, poor general hygiene all pose significant risks to the in-situ graft.
Prevention is better than cure!
Aim(s)/Objective(s): To develop a patient information leaflet, given to patients at pre-op clinic, to inform, educate and limit the risk of PVGI.
Results: A patient information leaflet was constructed clearly stating risks of transient bacteraemia.
Specifically encouraging:

- Good general hygiene; good hand hygiene and genitourinary cleanliness (especially if the surgery scar is located in the groin), keeping dressings clean, checking for signs of infection and contacting the GP if concerned, no sharing of personal items like razors/ toothbrushes.
- Maintenance of good skin care: keeping the skin moisturised to prevent cracking, regular diabetic check-ups and good glucose control.
- Maintaining good dental hygiene; preventing plaque build-up, regular dental check-ups, avoiding rinsing after brushing.
- Treatment of genito-urinary infections: good toilet habits and avoiding constipation, keeping hydrated, for males over 60 years old reporting problems that many be prostate related.

Discussion and/or Conclusion(s): The simple but effective leaflet addresses a previously neglected area. It gives basic information on maintaining good health after surgery and may help prevent the catastrophic complication of graft surgery in the form of PVGI.

ID: 5046

Surgical site infections (SSIs) from peripheral vascular bypass (PVBY) surgeries in a Governmental Hospital in Kuwait

Mona Salama[1], Sheikhah Al-Hajeri[2]. *[1]Mubarak Al- Kabeer Hospital, Ministry of Health, [2]Infection Control Directorate, Ministry of Health, Kuwait*

Background: While advances have been made in infection control practices, SSIs remain a substantial cause of morbidity, prolonged hospitalization and death. Surveillance of SSI with feedback of appropriate data to surgeons has been shown to be an important component of strategies to reduce SSI risk. A successful surveillance program includes the use of epidemiologically-sound infection definitions and effective surveillance methods, stratification of SSI rates according to risk factors associated with SSI development, and data feedback.
Aim(s)/Objective(s): To report the SSIs from PVBY surgeries stratified by risk index.
Method(s): This is a prospective study in which all cases of PVBY surgeries are reported in a special denominator sheet and all infected procedures are reported on numerator sheet. Case definition of health care associated SSI is adopted from National Health Safety Network (NHSN). The study started from January 1st 2015 until December 31st 2015. Cases are stratified by risk index which assigns surgical patients into categories based on the presence of three major risk factors: operation lasting more than the duration cut point, wound class and ASA score.
Results: The total number of PVBY was 29, 12 with risk index 0 and the remaining 17 were under risk index 1. Two procedures out of the 12 with risk index 0 were infected with cumulative incidence 16.7. Five procedures out of the 17 with risk index 1 were infected with cumulative incidence 29.4.
Discussion and/or Conclusion(s): This study demonstrates the value of calculating surgical site infection rates by operative category.

Topic: Surveillance and epidemiology

ID: 4477

The epidemiology of HCV and HIV among African immigrants crossing towards Europe

Mohamed Ali Daw[1], Aghnyia Dau[2], Abdallah El-Bouzedi[3], Mohamed O Ahmed[4]. *[1]Department of Medical Microbiology &Immunology, Faculty of Medicine, P O BOX 82668, Tripoli-Libya, [2]Faculty of Medicine, Tripoli University, [3]Department of Laboratory Medicine, Faculty of Biotechnology, Tripoli, [4]Department of Microbiology and Parasitology, Faculty of Veterinary, Tripoli University*

Background: Immigration is considered to be a dynamic vector for transmission of viral diseases. This study aimed to determine; 1- Prevalence of HCV, HIV and HCV genotypes among African immigrants crossing towards Europe; 2- Demographic and attributable factors involved.
Methods: A total of 14205 serum samples collected within three year period (2013–2015) from immigrants of North and Sub-Saharan Africa resided in African immigrant campus, Tripoli-Libya. The participants were interviewed, and relevant information was collected, including socio-demographic, ethnic, and geographic variables. Each sample was tested for HCV and HIV using ELISA. The genotypes were assigned using specific genotyping assay and correlated with demographic factors.
Results: Of the immigrants studied, 1078(7.6%) were positive for HCV, 192(1.4%) HIV and 479(3.4%) for both HCV &HIV. The prevalence of HCV was higher among individuals from Nile river (3.6–18.7%) of North Africa(NA), followed by those from West Africa(WA) (2.1 to 14.1%), Horn of Africa(HOA)(6.8–9.9%) and less among those from Maghreb countries(1.4 to 2.7%). HIV and HCV/HIV co-infection were higher among HOA (60 (1.7%)&175 (5%) and WA (95 (1.9%) & 211(4.2%). Five genotypes were detected including genotypes 4, 1 and 2 accounted for 329(36.1%), 326(35.8%) and 131(14.4%) followed by genotype 3 for 87(9.5%) strains. Genotype 5 was isolated from HOA 18 (2%) and WA 20(2.2%) individuals. The prevalence of HCV, HIV and HCV/HIV co-infection were considered to be high with a unique disparate distribution among African immigrants crossing towards Europe. This should be reflected on the prevention efforts in Europe and North & sub-Saharan Africa.

ID: 4485

Preventing spread of influenza: health-care workers vaccination and mask wearing awareness campaign

Apolline Adé, Elise Seringe, Karin Lebascle, Pascal Astagneau. *CClin Paris-Nord*

Background: In addition to non-mandatory vaccination, protective measures are recommended to decrease the transmission of influenza in health-care facilities (HCF).
Aim(s)/Objective(s): The aim of the study is to assess vaccination coverage among health-care workers (HCW) in 2016, the organization of vaccination and mask wearing awareness campaigns.
Method(s): A descriptive study was carried out during the 2016 flu epidemic. Data were collected via an online platform available to Infection Control Teams (ICT) of all HCF of the region. Requested items were HCW vaccination coverage, type of information/vaccination campaigns, information about masks.

Results: The response rate was 20% (N = 148 HCF/731). The overall influenza vaccination coverage was 19.9% [17.4–22.3] (N = 132) including 35.6% [30.0–41.2] (N = 105) for doctors, midwives, and 18.4% [14.9–21.8] (N = 111) for nurses, nursing assistants. The overall coverage was steady for 34% of HCF between 2015 and 2016. Most of the HCF (87%) organized an information campaign. Main topics were influenza vaccination strategy (71%), protective measures (54%). 97% of HCF carried out a vaccination campaign. The organization was shared between Occupational health team (OHT) (43%), ICT (43%), the hospital pharmacy (43%). HCW were vaccinated by their colleagues (53%), OHT (47%), ICT (17%). Posters reminding wearing a mask were present in 79% of HCF, mainly in the hospital entrance. Masks were available in the emergency, maternity and pediatric departments.
Discussion and/or Conclusion(s): Despite broad and well-documented vaccination campaigns, the coverage remains low for all HCW categories. Implementing behavioral change in HCW is warranted as well as providing masks and guidance for appropriate use beside vaccination.

ID: 4514
Geo-spatial distribution of multi-resistant *Acinetobacter baumannii* among injured military personnel over the battlefields in Libya, 2011–2015

Mohamed Ali Daw[1], Aghnyia Dau[2], Mohamed O Ahmed[3]. [1]*Department of Medical Microbiology &Immunology, Faculty of Medicine, P O BOX 82668, Tripoli-Libya,* [2]*Department of Surgery, Tripoli Medical centre, faculty of Medicine, Tripoli Libya,* [3]*Department of Microbiology and Parasitology, Faculty of Veterinary medicine, Tripoli Libya*

Background: Libya is a large country in North Africa with the longest coast in the Mediterranean basin has experienced a major military fighting since 2011. This was associated with high rate of injury complicated with emergence of multi-resistant Gram-negative bacilli particularly *Acinetobacter baumannii.*
Aim(s)/Objective(s): This study aimed to analyse; 1-Molecular characterization of *A. baumannii* associated with combat-related injuries.; 2-Geographic and spatial distribution of *A baumannii* in the four regions (East, West, North & South) of Libya during the conflict period.
Method(s): A total of 731 different isolates confirmed to A *baumannii* were collected from injured people arriving from the battlefields over all the Libya regions within five years-period(2011–2015). Antimicrobial susceptibility and genetic analysis of these isolates were determined using 12 different antibiotics and pulsed-field gel electrophoresis (PFGE) to characterize the isolates. spatial-epidemiological analysis was conducted to reflect the changing pattern of *A baumannii* within the country.
Results: The genetic analysis showed eight distinct PFGE patterns varied from one region to another with a significant increase of Clone 1 in West and East regions. The strains showed a high resistance to all antibiotics tested with few strains were sensitive to gentamicin and Carapenems.
Discussion and/or Conclusion(s): The emergence and spread of multidrug-resistant *A. baumannii* among Libyan hospitals care settings suggest an urgent intervention programs to prevent the colonization and infection by resistant pathogens.

ID: 4534
Point prevalence study of healthcare-associated infections in primary care hospitals in Helsinki and Uusimaa district, Finland

Marjaana Pitkäpaasi[1], Jaana-Marija Lehtinen[2], Mari Kanerva[1]. [1]*Inflammation Center, Division of Infectious Diseases, Helsinki University Hospital and University of Helsinki,* [2]*Inflammtion Center, Division of Infectious Diseases, Helsinki University Hospital and University of Helsinki*

Background: No routine surveillance of healthcare-associated infections (HAIs) in primary care hospitals in Helsinki and Uusimaa hospital district (population 1.6 million).
Aim(s)/Objective(s): To show the burden of HAIs and to introduce a surveillance method. Data on patient characteristics, prevalence of catheters and antimicrobials were also collected.
Method(s): 19 municipalities were invited in this voluntary point prevalence survey (PPS) in September 2015. The infection control nurses of the hospitals were instructed to collect the data form the patient charts. The questionnaire (a modification of HALT-2 protocol by ECDC), data analysis and feedback were provided by our study team.
Results: Twenty-two hospitals from 16 municipalities participated and collected data on 2218 inpatients. Of these, 48% were receiving acute care, 32% rehabilitation, 18% long-term and 2% terminal care. On the study day, 11% (range by hospital, 4–24%) of the patients had at least one HAI, one-third originating from other hospitals. The most common HAIs included lower respiratory tract infections (24%), urinary tract infections (15%) and skin infections (13%). Fourteen percent had a urine catheter and 18% had a vascular catheter. Twenty-nine percent were receiving least one antimicrobial. The most commonly used antimicrobials were cefuroxime, cefalexin and fluoroquinolones; 41% of the antimicrobials were used for HAI. No MRSA infections were detected.
Discussion and/or Conclusion(s): HAI surveillance and prevention in primary care hospitals require improvement in primary care. PPS is an appropriate tool. The prevalence of antimicrobial use was high, especially the fluoroquinolones. Resistant microbes were rare, so far.

ID: 4557
Comparative analysis of adolescent-adult pertussis outbreaks in schools using mathematical models

Hiroshi Kamano, Sachi Nagao. *Kagawa University, Health Center*

Background: Outbreaks of adolescent-adult pertussis became a public health problem in various parts of the world. Pertussis outbreaks were matter of public concern in Japan also.
Aim(s)/Objective(s): We have studied the epidemiology of pertussis outbreaks in schools in several countries. In this comparative analysis, we investigated the epidemic curves of pertussis outbreaks using regression analysis and an equation relating basic reproduction number and we developed pertussis simulation models.
Method(s): Outbreak: Outbreak cases in Europe and Japan were analyzed. Regression analysis: We analyzed pertussis outbreaks using a Gompertz function. Simulation model: We used SIR models.
Results: Regression analysis: We studied the adolescent-adult pertussis outbreaks using following equation; $R(t) = a \times \exp(-b \times \exp(-c \times t))$. Simulation model: We investigated the outbreaks using a SIR model followings, $dS(t)/d\,t = -\beta \times S(t)I(t)$, $dI(t)/dt = \beta \times S(t)I(t) - \gamma \times I(t)$, $dR(t)/d(t) = \gamma \times I(t)$, $N = S(t) + I(t) + R(t)$. The definitions are as follows: N: total population, $S(t)$: susceptible population, $I(t)$: infectious population, $R(t)$: recovered population, β: rate of infection, α: rate of attack, γ: rate of recovery. We drew simulation curves using these differential equations.
Discussion and/or Conclusion(s): We analyzed several cases of adolescent-adult pertussis outbreaks mathematically. We estimated basic reproduction numbers of adolescent-adult pertussis in schools.

ID: 4607
A statewide antimicrobial use surveillance: different outcomes for different health administration systems

Filipe Piastrelli[1], Ícaro Boszczowski[2], Denise Brandão[3], Maristela Freire[2], Geraldine Madalosso[4]. [1]*Hospital Sapopemba,* [2]*Hospital das Clínicas, FMUSP,* [3]*Centro de Vigilância Epidemiologica Alexandre Vranjac, Sao Paulo,* [4]*MPH, Sao Paulo State Health Department*

Background: As increasing healthcare acquired infections caused by multidrug resistant organisms (MDRO), antibiotic use surveillance systems play a role in improving this practice.
Aim(s)/Objective(s): This study describes a statewide antibiotic use surveillance system in São Paulo, Brazil.

Method(s): Antimicrobial use and incidence of MDRO in bloodstream infections are mandatorily reported by intensive care units to Sao Paulo State Health Department. Antibiotics were grouped by class and expressed in defined daily doses (DDD) per 1000 patient-days(pd), from 2009 to 2013. MDRO were grouped into resistant to 3rd generation cephalosporins, carbapenems and oxacillin and compared to carbapenems, polymyxins and glycopeptides use. Hospitals were grouped in private, philanthropic and public. Public hospitals were divided into social organization (SO) or not, the former is privately managed with public funding. Correlation between MDRO incidence and antibiotic use was investigated for 2012 and 2013.
Results: Between 2009 and 2013, mean number of reporting hospitals was 198. 35% of reporting hospitals were public and 33% of these were SO. Cephalosporins were the most prescribed drugs, although there was a decreasing trend in the period. Polymyxins had the greatest increase in use (125%), mostly in public hospitals. Among public hospitals, comparing SO and public administration there was a difference in antimicrobial use for glycopeptides, carbapenems and polymyxins (p = 0.04, 0.008 and 0.001). There was no difference in MDRO incidence.
Discussion and/or Conclusion(s): In conclusion, we observed a significant increase in polymyxin use. In the public level, we observed a discrepancy between the incidence of MDRO and broad-spectrum antibiotics use in different administrative regimens. These data should guide public health policies.

ID: 4671
Long-term validity of preventive measures against needlestick injuries in the operating theatre

Shigeru Koyama, Yuko Momoi. *Tokyo Metropolitan Hiroo Hospital*

Background: Due to the high reporting rate of needlestick injuries in the operating theatre, we implemented new preventive measures in 2006. These preventive measures were previously found to be effective in a 4-year research project (J Hosp Infect. 2010 Oct (76): S64).
Aim(s)/Objective(s): To estimate the long-term validity of our preventive measures against needlestick injury in the operating theatre.
Method(s): We examined reports of needlestick injury between 2001 and 2015, and compared the 5 years before the implementation of the preventive measures (Period I: 2001~2005) with the subsequent 10 years (Period II: 2006~2015) to evaluate the validity of these measures in the operating theatre.
Results: A total of 439 reports were made between 2001 and 2015, including 114 reports from the operating theatre. The reporting rate fell significantly from 32% (52/164) in Period I to 23% (62/275; p = 0.0036) in Period II. Analysing the contents, rates at intraoperative management and delivery of instruments were significantly reduced from 17% to 12% (p = 0.015) and from 7% to 3% (p = 0.015), respectively. Conversely, the rate at equipment disposal showed no change (4%). The rate of hepatitis C virus-positive injuries showed no significant change (Period I, 15%; Period II, 16%), suggesting that the submission rate of reports was largely static. Results after implementation were also similar, comparing the first 5 years with the subsequent 5 years.
Discussion and/or Conclusion(s): Our preventive measures against needlestick injuries in the operating theatre were confirmed as valid in this long-term research. Further measures are needed to prevent injuries during equipment disposal.

ID: 4679
Does observational hand hygiene auditing reduce the incidence of bacteraemia? A retrospective time series analysis with control group

Maura Smiddy[1], Anthony P Fitzgerald[2], Olive M Murphy[3], Eileen Savage[4], John Browne[5]. *[1]Department of Epidemiology and Public Health,University College Cork, [2]Department of Statistics / Department of Epidemiology and Public Health, University College Cork, [3]Bon Secours Hospital, Cork, [4]Catherine McCauley School of Nursing and Midwifery, University College Cork, [5]Department of Epidemiology and Public Health, University College Cork.*

Background: Observational hand hygiene auditing (OHHA) involves a trained observer monitoring healthcare worker compliance with five identified moments for hand hygiene. The effectiveness of OHHA is uncertain despite widespread adoption.
Aim(s)/Objective(s): To examine the effect of OHHA on the incidence of methicillin resistant *Staphylococcus aureus* (MRSA) and vancomycin resistant enterococci (VRE) bacteraemia.
Method(s): We conducted a retrospective time series in four acute hospitals in the Republic of Ireland over the period 2009 to 2014. The OHHA intervention was introduced to three sites in 2011; the fourth site acted as a control and did not introduce OHHA. We compared the change in the incidence of methicillin resistant *Staphylococcus aureus* (MRSA) bacteraemia, vancomycin resistant enterococci (VRE) bacteraemia and alcohol based hand gel (ABHR) consumption, in intervention versus control sites.
Results: There was a significant reduction in MRSA bacteraemia in the control (p < 0.01) but not the intervention (p = 0.77) sites over the study period. When the difference of the differences was compared there was no statistically significant difference (p = 0.09) between intervention and control sites. There was no significant reduction in VRE bacteraemia in the control (p = 0.18) or intervention (p = 0.42) sites. There was a significant increase in ABHR consumption in the intervention (p = <0.01) sites and a decrease in ABHR consumption in the control (p = 0.05) site. When the difference of the differences was compared this was not statistically significant (p = <0.07) in either the intervention or control sites.
Discussion and/or Conclusion(s): The implementation of OHHA does not appear to be associated with a reduction in bacteraemia or with an increase in ABHR consumption.

ID: 4689
SABs, What's Your Source, What's Your Solution

Alan Milne[1], Carolyn Sinclair[1], Fiona Smith[1], Benjamin Parcell[1], Karen Wares[2]. *[1]NHS Grampian, [2]NHG Grampian*

Background: Enhanced *Staphylococcus aureus* Bacteraemia Surveillance (eSABS) to standardise the reporting of SAB infections were introduced nationally in 2014. The Infection Prevention and Control Team (IPCT) formed a group to facilitate the appropriate data collection. Focusing on risk and contributory factors the group aimed to determine if SABs were avoidable or not. All cases were reviewed to ensure they were managed in line with guidance on management of proven or suspected *SAB* in adults
Aim(s)/Objective(s): This initiative aimed to better understand the cause of the SAB, determine the potential avoidance, to intervene to minimize the risk of a SAB occurring due to the same cause again.
Method(s): Using the Plan Do Study Act cycle and the national eSAB tool, a surveillance form was created for the IPCT to investigate the SAB. Identifying the entry point, source and record procedures/ interventions in the last 30 days. Assessments were made regarding medical history, device placement, and whether the patient had any prosthetics. For quality improvement the group reviewed the implementation and completion of bundles such as Peripheral, Central Vascular and Urinary Catheter.
Discussion and/or Conclusion(s): The IPCT along with the multidisciplinary team discuss the results of the surveillance and identify quality improvement. Audits ar carried out if the SAB is found to be related to a device. IPCT engage with clinical teams to assist with the implementation of bundles and support auditing. Clinicians in charge received a letter detailing the outcome of SAB surveillance, offering the chance to respond to the information. The Microbiologists offer to attend educational meetings for further discussions.

ID: 4693

Point prevelance survey of asymptomatic carriers in a Community Foundation Trust

Kath Hughes. *Birmingham Community Healthcare NHS Foundation Trust*

Background: Morbitity and mortality of patients with Clostridium difficile Infection (CDI) increases. Infection and Prevention Nurses (IPCN) we investigated how to prevent transmission of asymptomatic CDI in patient areas to prevent further harm to others from asymptomatic carriers, cross infection, contamination from fomites, staff hands and equipment they use.
Aim(s)/Objective(s): Following a serious CDI outbreak, a research question hypothesised to identify asymptomatic carriage. C.diff has been the source of serious life-threatening outbreaks and had difficulty determining association in the same environment within the same period. Others proposed screening asymptomatic patients on admission may prevent Healthcare Associated CDI.
Method(s): IPCNR proposed that a total of 413 patients be interviewed, notes reviewed, samples of skin and faeces were sent to the laboratory. 30 item questionnaire designed.
Results: 11 adult hospital inpatient wards (7) and inpatient units (4) were included in the study.
A total of 407 patient samples collected. 154 faeces samples were analysed.
253 skin swabs were collected and analysed.
A total of 22 faecal samples were positive
0 skin swabs were shown not to have any carriage.
Positive asymptomatic carriers had received antimicrobials, received proton pump inhibitors, received care in an Acute Hospital in the last 3 months.
Discussion and/or Conclusion(s): Predicted rate of colonisation was 20%. Actual results were 14.3%
This study adds to the growing knowledge base of C.diff research would benefit from larger scale studies to draw relevant conclusions. Isolating identified asymptomatic carriers of C.diff potentially confines and prevents further contamination of the environment, staff employing extra precautions concerned with source isolation together protects patients in the vicinity.

ID: 4697

A service evaluation assessing the follow-up of contacts of multidrug-resistant tuberculosis cases at the Birmingham and Solihull TB service

Thomas Harrison[1], Clare Treharne[2], Rohan Aggarwal[2], Martin Dedicoat[3]. [1]*Heart of England Trust,* [2]*University of Birmingham,* [3]*Heart of England trust*

Background: Between 2004 and 2011, the proportion of UK tuberculosis diagnoses proven to be multi-drug resistant tuberculosis (MDR-TB), increased from 1.1% to 1.6%, equating to 50–80 cases per year. Outcomes for MDR-TB are poor with cure rates under 50% in Europe compared to 98% for drug sensitive TB.
The World Health Organisation, European Centre for Disease Control and National Institute for Clinical Excellence recommend monitoring MDR-TB contacts for two years through chest radiography (CXR) and clinical examination.
Aim(s)/Objective(s): This service evaluation retrospectively analysed surveillance of 103 contacts of MDR-TB cases managed by Birmingham and Solihull TB service between 2010 and 2015. Of these, four were extra-pulmonary MDR-TB contacts.
Method(s): Service standards were set as: all contacts ≥18 years old require three CXRs, four clinician contacts, and if ≤35 years old, a mantoux/IGRA test within a three year window. A proforma was created and data were obtained from electronic medical records.
Results: Analysis of pulmonary contacts found 14% had ≥3 CXRs whilst 32% had $1 \leq x \leq 3$ CXRs. 53% had no CXR. 11% completed 24 months of follow-up. 63% had partial follow-up, 24% had none and 2% had ongoing follow-up. Of the eligible cohort, 65% had IGRA/Mantoux.
Discussion and/or Conclusion(s): Results were presented at a local TB meeting. Given that standards were not met, an action plan for enhanced follow-up was agreed. In addition to a quarterly cohort review of all TB cases, an annual cohort meeting for MDR-TB will be implemented, supplemented by weekly discussion at the TB multidisciplinary team meeting. Re-audit will be undertaken in two years.

ID: 4708

Surveillance of multi-resistant *Staphylococcus capitis* in a large tertiary centre for newborn care

Carolyne Horner[1], Kavita Sethi[2], Miles Denton[1]. [1]*Public Health England,* [2]*Leeds Teaching Hospitals NHS TRust*

Background: Leeds Centre for Newborn Care is one of the largest neonatal services in the UK, providing specialist care for approximately 1800 babies/year from the Yorkshire region and beyond.
Aim(s)/Objective(s): We investigated the prevalence of a multi-resistant strain of *Staphylococcus capitis* in this centre over 11 months.
Method(s): Cefoxitin-resistant coagulase-negative staphylococci (FOX-R-CNS) from blood cultures of neonates >72 hours old were speciated using matrix-assisted laser desorption/ionisation time of flight (MALDI-ToF) spectrophotometry. Cefoxitin-resistant isolates of *S. capitis* were sent to the Staphylococcus Reference Unit, London for further work.
Results: Between 1st July 2015 and 31st May 2016, 102 CNS were isolated. There were 38 FOX-R-CNS grown from 26 neonates. A male baby born in Leeds at 31 weeks gestation grew *S. capitis* from blood cultures in the third week of neonatal unit stay. The isolate was confirmed to belong to the same multi-resistant clone seen in other neonatal units worldwide. The source of the late-onset CNS bacteraemia was thought to be a central venous catheter used for administration of total parenteral nutrition in this very low birth weight baby (1.22kg). The intravenous catheter was removed and the baby was successfully treated with daptomycin.
Discussion and/or Conclusion(s): Within the Leeds Centre for Newborn Care, there is currently a low prevalence of the multi-resistant *S. capitis* strain that has caused clonal outbreaks in neonatal units worldwide, including UK. There is a need for on-going surveillance given vancomycin selective pressure in neonatal units and we will continue to monitor for the emergence of this multi-resistant strain.

ID: 4727

Comparison of the impact of different kinds of nosocomial infections acquired in intensive care units until hospital discharge: a retrospective nine years study

Joris Muller[1], François Severac[2], Pierre Tran Ba Loc[2], Stéphanie Deboscker[1], Gilles Prevost[3], François Lefebvre[2], Mickael Schaeffer[2], Francis Schneider[4], Thierry Lavigne[1]. [1]*Strasbourg University Hospital; Infection control and prevention unit,* [2]*Strasbourg University Hospital; Public health service,* [3]*University of Strasbourg, Faculty of Medicine, EA7290,* [4]*Strasbourg University Hospital; Medical intensive care unit*

Background: The impact of different kinds of nosocomial infections (NI) acquired in intensive care unit (ICU) on the whole hospital stay is still a subject of controversy especially due to statistical challenges.
Aim(s)/Objective(s): Our objective was to provide comprehensive and accurate metrics concerning the risk of death and the excess in length of stay due to NI acquired in ICU.
Method(s): NI (nosocomial pneumonia, central venous catheter related infection, bacteraemia and urinary tract infections) were continuously recorded from 2004 to 2012 for every patient hospitalised more than two days in one 30 beds medical ICU according to the protocol of the French's Survey Network for ICU-Acquired Infection (REA-RAISIN). We merged data from the local diagnosis-related group system (PMSI) to add information about the whole hospital stay, including primary diagnosis. For each type of NI, we assessed the impact of NI with the state-of-the-art statistical models: extended

Cox models for mortality risk and multistate models for extra length of stay.
Results: Among the 6069 inpatient stays, 771 (12.7%) presented at least one NI. The proportion of in-hospital death was 1.6 times higher among patients with NI. However, the adjusted hazard ratio was not significant (HR = 1.13, CI95% 0.99–1.29). The crude excess length of stay was 39 days and, albeit lower, it remained significant with multistate analysis (13 days, CI95% 9–17). These analyses were performed for each kind of NI.
Discussion and/or Conclusion(s): Our results are in favour of a significant effect of the ICU-acquired NI on length of stay without any significant effect on mortality.

ID: 4741
Epidemiology of healthcare associated infections (HAIs) in the neonatal intensive care unit (NICU)

Miguel Rosales. *Complejo Hospitalario Universitario de Granada*

Background: Newborns to preterm, have the highest infection rates of all pediatric patients, it was found that the introduction of a monitoring system of the lead HAIs to a decrease in these rates.
Aim(s)/Objective(s): To know the incidence of HAIs appeared in our unit during 2015.
Method(s): We performed a prospective observational epidemiological study. All patients who remained in the NICU more than 24 hours were included.
The classification criteria of HAI were the NEO- KISS.
Incidence rates and cumulative incidence of various infections, as well as their confidence intervals were calculated.
Results: 118 patients, 65 men and 53 women were studied, and 38% of patients had a weight less than 1500 grams.
The incidence density overall was 11.7 per thousand stays, and accumulated incidence in 17.8% patients, bacteremia associated central venous catheter 9.3 per thousand catheter days, I am not going no pneumonias associated with mechanical ventilation. Preterm infants less than 1000 grams had the highest infection rate 24.5%.
The most frequent germ were Escherichia coli.
Discussion and/or Conclusion(s): The most frequent bacteremia infection has been associated with central venous catheter 8.2 per thousand catheters day.
The OR of having a HAIs according to weight at birth is 13 for those under 1000 grams compared to children of 2,500 grams or more.
In relation to infection and sex, we found that men have a slightly higher risk of infection women, 27.1% versus 17%.

ID: 4751
An economic evaluation of additional costs due to *Clostridium difficile* infection in an Irish Hospital

Fidelma Fitzpatrick[1], Padhraig Ryan[2], Mairead Skally[3], Fionnuala Duffy[3], Mary Farrelly[3], Leah Gaughan[3], Pauline Flood[3], Elaine Mc Fadden[3]. *[1]Beaumont Hospital and Royal College of Surgeons in Ireland, [2]Centre for Health Policy and Management, Trinity College Dublin, Ireland; [3]Beaumont Hospital, Dublin, Ireland*

Background: Irish Public hospitals receive annual block funding based on historical spending and activity patterns, without explicit adjustment for the rate of hospital acquired infection.
Aim(s)/Objective(s): We aimed to ascertain additional financial cost per routine case of *Clostridium difficile* infection (CDI) and the cost of a CDI outbreak in our hospital.
Method(s): A micro-costing approach was used to estimate the additional cost of CDI per patient identified during August 2015 and for a CDI outbreak managed that month. Resource use was quantified based on review of patient charts, pharmacy prescribing data, prospective collection of administrative resource input, and records of cleaning expenditure.
Results: The additional cost of routine (non-outbreak) CDI in 13 inpatients in August was €75,680 (mean €5,820/patient) with cleaning, pharmaceuticals, and additional length of stay (LOS) being key cost drivers. Additional LOS ranged from 1.75 days to 22.55 days. Seven patients were involved in a CDI outbreak. Bed closures (58 lost bed days, estimated value €34,585), five outbreak control meetings (mean staff cost/meeting €546, aggregate cost €2,728), and additional outbreak-related cleaning (costing €9,654) represented the additional CDI outbreak-associated costs. Excluding the value of lost bed days, outbreak costs were €12,382. Therefore total spending on CDI during August was €88,062 (a mean of €6,773 across all patients).
Discussion and/or Conclusion(s): Investment in disease prevention may be offset by cost savings. This analysis suggests that investment in *C. difficile* prevention could offer a net financial benefit in some circumstances, as well as improving value for money and clinical outcomes.

ID: 4752
Utilising VNTR typing to identify a dominant EMRSA-15 clone in Birmingham (UK)

Calum Thomson[1], Katie Hardy[2], Peter Hawkey[1]. *[1]University of Birmingham, [2]Public Health Laboratory Birmingham (Public Health England)*

Background: EMRSA-15 (ST 22) is the dominant MRSA clone in the United Kingdom (UK), and understanding the epidemiology is key to control.
Aim(s)/Objective(s): We have utilized whole genome sequencing (WGS) and variable number tandem repeat typing (VNTR) to establish the epidemiology and evolution of EMRSA-15 in a large UK conurbation over time.
Method(s): 171 EMRSA-15 isolates sampled between 1985 and 2015 across Birmingham were whole genome sequenced and VNTR typed. WGS data was mapped to the reference strain HO50960412 and single nucleotide polymorphisms (SNP) from the core genome were used to generate a phylogenetic tree using Bayesian phylogenetics.
VNTR data was generated by PCR amplification of 7 tandem repeat loci.
Results: 5082 SNP-sites were used to construct a phylogenetic tree revealing a distinct clade of 91 (52%) isolates (BHM clade) that diverged from the rest of the Birmingham population in 1995. The remaining 80 isolates were more diverse with a wider range of divergence dates (1986 to 2015). Variation in repeat number was only observed at loci L13, L16 and L21, with L21 and L16 showing the highest variability. Mapping of VNTR data onto the tips of the tree revealed that all isolates with two tandem repeats at L13 (n = 91) mapped to the BHM clade while isolates with 3, 4 or 5 tandem repeats were dispersed throughout the rest of the tree.
Discussion and/or Conclusion(s): WGS provides a high degree of discrimination amongst the Birmingham isolates, highlighting the presence of a highly related clade, which is identifyable by a specific repeat number at one loci with VNTR.

ID: 4762
Community management of *Escherichia coli* bacteraemia cases diagnosed in Wye Valley NHS Trust September 2013–September 2014

Alison Johnson[1], Emma Sneed[2]. *[1]Wye Valley NHS Trust, [2]Worcestershire CCG*

Background: A review of *Escherichia coli* bacteraemia cases diagnosed in Wye Valley NHS Trust between September 2013 and September 2014 was undertaken to determine whether there may be any opportunities in the community to prevent admission.
Method(s): A questionnaire was submitted to GPs of all cases.
Results: 90 cases were reviewed; 59 (65%) were female; average age 72 with range 0–97 and mode 88; 39 (43%) were ≥80 years old; 13 (14%) were care home residents; the commonest source of the bacteraemia was urinary – 54 (60%); 77 had dehydration status recorded on admission; 13 (20%) of the patients admitted from home were recorded as dehydrated compared with 5 (38%) of the patients

admitted from care homes; 24 of the patients with urosepsis had been seen by their GP. Five of these patients had received an antibiotic to which their isolate was sensitive; 5 had received an antibiotic to which their isolate was resistant; only two of the admissions followed a urinary catheter change; in 7, an alternative diagnosis had been made and urosepsis not considered; in the remainder, there was no information available.
Discussion and/or Conclusion(s): Prevention of admissions due to *E coli* bacteraemia should focus on the elderly and on measures to prevent urosepsis. However only 24 (44%) of the patients with urosepsis had seen their GP before admission and only in 5 of these might there have been an opportunity to prevent admission if the correct antibiotic was used. The study does reinforce that it is important to match antibiotic formularies to local sensitivities.

ID: 4786
When flu goes bad: an audit of the management of influenza infections on an intensive care unit 2014–2016

Tehmina Bharucha, Jennifer Hart, Ons Ben Ismail, Beatrice Cockbain, Paul Griffiths, Tanzina Haque, Tabitha Mahungu, Dianne Irish. *Royal Free Hospital*

Background: Influenza infections lead to an estimated 250,000–500,000 deaths annually worldwide. Our ability to predict and avert complications depends on rigorous epidemiological analyses of severe cases.
Aim(s)/Objective(s): To characterise influenza infections on ITU in a large teaching hospital over two consecutive flu seasons.
Method(s): Retrospective audit of influenza infections admitted to ITU 2014–2016.
Results: We identified 29 cases; 14 (November 2014-April 2015) and 15 (October 2015—March 2016). Median age 61 years (IQR53–71); 41% were female, and 93% had risk factors for complications. 38% had received the seasonal flu vaccination. In 2014–2015 60% had Influenza A (6 H3; 3 not-typed), and 40% Influenza B (one patient had both). In 2015–16, 93% were Influenza A (11 H1; 1 H3; 2 not-typed) and 7% Influenza B.
Median time to sampling from admission was 4 days (IQR2–6). Length of inpatient stay was 11 days (6–16), and length of ITU admission 17 days (IQR10–28). Repeat respiratory sampling was performed at day 5 in 51%, with 52% remaining positive, and day 10 in 65%, with 21% remaining positive. All patients received Oseltamivir, median duration 6 days (IQR5–9) with 13 (45%) receiving a prolonged course or escalation to Zanamivir (Nebulised/Intravenous) due to ongoing symptoms. An Oseltamivir resistant mutation (E119V) was detected in 1 of 3 patients tested. 5/29 (17%) patients died during the illness.
Discussion and/or Conclusion(s): Results suggest an urgent need to improve vaccination uptake. Equally, they highlight the importance of increased clinical suspicion and speed of diagnostic sampling, as well as repeat sampling to demonstrate response to antivirals and timely instigation of resistance testing.

ID: 4803
Hepatitis E virus in the transplant patient population

Ian Reekie[1], Tehmina Bharucha[1], Thomas Fox[1], Douglas Thorburn[1], Mark Harber[1], Samreen Ijaz[2], Richard Tedder[2], Tabitha Mahungu[1], Tanzina Haque[1], Paul Griffiths[1], Mallika Sekhar[1], Dianne Irish[1]. *[1]Royal Free Hospital, [2]Public Health England*

Background: Hepatitis E virus (HEV) is a common cause of acute viral hepatitis worldwide. Traditionally associated with a self-limiting illness, infection can become chronic in immunosuppressed populations with associated significant morbidity and mortality. At present there are no clear guidelines for testing and monitoring for HEV in transplant recipients.
Aim(s)/Objective(s): To determine the point prevalence of viraemic HEV infection in solid organ transplant (SOT) and haematopoietic stem cell transplant (HSCT) recipients undergoing transplantation between January 2013 and December 2015.
Method(s): Stored extracts of whole blood from patients undergoing SOT (liver and/or kidney) or HSCT were tested using a commercial real-time reverse-transcriptase polymerase chain reaction kit for HEV RNA. Samples were tested at baseline, 30, 60 and 90 days post-transplant.
Results: 259 HSCT, 262 Liver and 349 kidney transplant patients were included with 2452 samples meeting the inclusion criteria. Prevalence of HEV viraemia in HSCT patients was 0.65% at baseline, 0.85% at 30 days, 0.96% at 60 days and 1.08% at 90 days and in liver transplant patients was 0.43% at baseline, 0.43% at 30 days, 1.06% at 60 days and 0.72% at 90 days. None of the kidney transplant patients had HEV viraemia.
Discussion and/or Conclusion(s): Prevalence of viraemic HEV infection in SOT and HSCT patients is low at baseline and remains low throughout the early post transplant phase. Prospective studies are necessary to inform monitoring guidelines in this population.

ID: 4811
Investigation of unbalanced influenza subtype data reveals a wave of H1N1 from outside of Singapore

Timothy Barkham[1], Sebastian Maurer-Stroh[2], Janice Leong[1], Masafumi Inoue[3]. *[1]Tan Tock Seng Hospital, [2]Bioinformatics Institute, Agency for Science, Technology and Research, [3]Experimental Therapeutics Centre, Agency for Science, Technology and Research*

Background: Some samples with a positive Influenza A matrix result presented without an H1N1 or H3N2 subtype in our routine one tube multiplex. None were associated with travel or especially severe disease so H5N1 or other more virulent subtypes were not suspected.
Aim(s)/Objective(s): We investigated to determine the 'unknown' subtypes as part of pandemic planning.
Method(s): Samples reported to be Influenza A without subtype by the clinical laboratory between May 1st and August 14th 2015 were further interrogated with singleplex assays. Haemagglutinin sequences were compared with online sequences collected in 2015 (GISAID).
Results: Of 925 Influenza reports, 66 were reported as Influenza A with subtype undetermined. These cases first appeared on May 4th, reached a peak at 5 cases per run in mid June and then faded away with the last one on August 14th. In 38 of these 66 the ct was considered so weak that a mismatch between matrix and subtype could be expected. Of the remaining 28 one was H3N2 but 27 were identified as H1N1 with mutations affecting both primers and the probe but still within the pdm09-lineage; 16 clustered with A/Bangladesh/4001/2015 A /H1N1.
Discussion and/or Conclusion(s): Investigation of unbalanced results enabled us to witness a wave of imported influenza which may be connected with the numerous immigrant Bangladeshi workers in Singapore. It is a reminder of the normal movement of influenza and its potential for unseen global travel. The mutations are expected to interfere with the WHO recommended primers/probe; one mutation is in the probe and two in the reverse primer region.

ID: 4821
Perinatal antibiotic consumption in Małopolska in the years 2012–2013

Anna Różańska, Jadwiga Wojkowska-Mach, Agniszka Pac, Małgorzata Bulanda. *Jagiellonian University Medical College*

Background: According to official data, infections after delivery in Poland are rare.
Aim(s)/Objective(s): The objective of this study was the assessment of perinatal antibiotic consumption as a method to verify some official data on infections in an obstetric patient population.
Method(s): For the evaluation of perinatal antibiotic consumption, data on the antibiotics purchased in outpatient care were used (years 2012–2013). The analysis took into consideration antibiotic

prescriptions within 30 days from the date of delivery. In order to evaluate the consumption of antibiotics, daily defined dose (DDD) per 100 deliveries was used.
Results: In the analyzed period, 68,088 deliveries were recorded in the Małopolska province, out of which 56.5% were vaginal and 43.5% by cesarean section. The average length of hospital stay was 4.1 days. In this group, 7.4% of women purchased antibiotics as part of the outpatient obstetric care. The average consumption of antibiotics in studied population was 108.3 DDD. Increased consumption of antibiotics was observed in case of C-sections, among the youngest patiens and the patients from the countryside.
Discussion and/or Conclusion(s): According to official data in years 2013–2014, fewer than one patient per 100 births by C-sections developed a surgical site infection. According to the Polish PPS data, rate of all forms of infections among obstetric patients was 1.2%. These ratios are much lower than the literature data for this patient population (5–7%). Presented results of antibiotic consumption show that surveillance of infections in this population poses a challenge for infection control teams and staff looking after the patients in Poland.

ID: 4839
A retrospective analysis of contact screening for pulmonary and non-pulmonary tuberculosis cases in Lothian, Scotland

Millicent Goodwin[1], Eleanor Strong[1], Ceri McSparron[2], Susan Vaughan[2], Janet Stevenson[2], Adam T Hill[2], Ian F Laurenson[2]. *[1]University of Edinburgh, [2]Lothian TB service, Royal Infirmary of Edinburgh*

Background: The NICE tuberculosis clinical guideline (NG33) update in January 2016 amended guidance to only offering screening to contacts of patients with pulmonary or laryngeal TB. The revision was to "limit testing to contacts of people with potentially infectious TB" suggesting that non-pulmonary TB (NPTB) infection did not pose such a risk.
Aim(s)/Objective(s): To assess the possible impact of the changed guidance.
Method(s): Outcomes of contact screening pulmonary (PTB) and NPTB cases within Lothian prior to the guideline amendment were assessed by reviewing records of patients with PTB or NPTB and their contacts over an 8 year period (2008–2015 inclusive) within Lothian, Scotland. All contacts were screened for latent and active infection using a combination of IGRA testing, chest Xrays, and tuberculin skin testing.
Results: 1502 contacts of PTB cases and 519 contacts of NPTB cases were successfully screened. 142 (9.45%) contacts of PTB cases had latent TB infection, whilst 27 (1.80%) had active TB infection. In contrast, 67 (12.91%) of NPTB contacts had latent TB infection, and 13 (2.50%) were considered to have active TB. Latent TB was identified more frequently in NPTB contacts ($p = 0.03$) but no difference in active TB cases ($p = 0.3$).
Discussion and/or Conclusion(s): These results demonstrate that NPTB in addition to PTB is an excellent target for screening as significant case finding of both latent and active TB cases are identified. This study provides clear evidence that not screening contacts of NPTB cases will hinder Scotland achieving the WHO target of elimination of TB by 2050.

ID: 4841
Nosocomial bloodstream infections following surgery in a Finnish tertiary care hospital, 2009–2014

Kirsi Skogberg[1], Keiju Kontula[1], Asko Järvinen[1], Outi Lyytikäinen[2]. *[1]Helsinki University Central Hospital, [2]National Institute for Health and Welfare*

Background: Surgical patients are one of the most common patient groups acquiring nosocomial bloodstream infections (BSI). Since the risk of BSI is related to length of hospital stay, BSI rates are usually reported by patient-days. However, the risk likely varies by patient characteristics and operation types.
Aim(s)/Objective(s): We evaluated the risk and outcome of BSIs following surgery by different operation types.
Method(s): Data on BSI cases was collected in Helsinki University Hospital (1922 beds) during 2009–2014 as a part of the national hospital-wide surveillance for nosocomial BSIs and the number of operations was obtained from the hospital database. Unit of pediatric surgery was excluded.
Results: A total of 711 BSIs (29% of all nosocomial BSIs) following 427518 operations were identified; 244 (34%) were related to intensive care. The rate was highest in cardiovascular (8.7/1000 operations) and urogenital (3.6/1000) surgery and lowest in gynecology (1.0/1000) and orthopedics (1.2/1000). Of the BSIs, 347 (49%) were primary and 364 (51%) secondary. Surgical site infection was the most common source of secondary BSIs. The most common pathogens in primary BSIs were coagulase negative staphylococci (16%) and Staphylococcus aureus (14%) and in secondary BSIs S. aureus (26%) and Escherichia coli (20%). 28-day case fatality ranged from 0% in gynecology/obstetrics to 21% in cardiovascular surgery.
Discussion and/or Conclusion(s): Risk and outcome of BSI varied considerably by operation type, most likely partly related to patients' underlying illnesses. Besides surgical site infections, remarkable proportion of BSIs was associated to central lines, providing an additional focus for preventive efforts.

ID: 4842
Efficacy of an infection control program to reduce the circulation of carbapenem-resistant Klebsiella pn. in intensive care units at a large Italian hospital

Cristiano Alicino[1], Cecilia Trucchi[1], Daniele Roberto Giacobbe[2], Federico Grammatico[1], Angela Battistini[3], Barbara Guglielmi[3], Filippo Ansaldi[1], Angelo Gratarola[4], Paolo Pelosi[4], Claudio Viscoli[2], Andrea Orsi[1]. *[1]Department of Health Sciences, University of Genoa, [2]Infectious Diseases Unit, I.R.C.C.S. University Hospital San Martino – IST National Institute for Cancer Research, Genoa, Italy; [3]Hygiene Unit, I.R.C.C.S. University Hospital San Martino – IST National Institute for Cancer Research, Genoa, Italy; [4]Intensive Care Unit, I.R.C.C.S. University Hospital San Martino - IST National Institute for Cancer Research, Genoa, Italy*

Background: In recent years, carbapenem-resistant *Klebsiella pneumoniae* (CR-Kp) has become endemic in Italy and effective strategies are needed to reduce its burden in the hospital setting, particularly in high risk wards.
Aim(s)/Objective(s): To assess the effect of intensified infection control measures, including active surveillance of gastrointestinal colonized patients, on reducing the circulation of CR-Kp and the incidence of the CR-Kp bloodstream infection in the intensive care units (ICUs), equipped with nearly 40 beds, of the tertiary 1,300 acute-care beds regional referral center university hospital, I.R.C.C.S. AOU San Martino-IST of Genoa, Liguria region, north-west Italy.
Method(s): The intervention effect was analyzed with interrupted time series regression analysis. The study included a pre-intervention period (January 2009 – December 2011) and an intervention period (January 2013 – December 2015). During 2012, intensified control measures, particularly routine rectal screening, were implemented and reached high level of adherence. Monthly incidence of first positive culture result for CR-Kp, either including or excluding rectal swab, and CR-Kp BSI were compared.
Results: Preliminary results demonstrated that the incidence of first positive culture results for CR-Kp, including rectal swab, significantly decreased in the intervention period compared with pre-intervention period (slope: –0.15; p-value: <0.05). A similar result was obtained also excluding rectal swab (slope: –0.17; p-value: 0.005). A decreasing trend, even though not statistically significant, was observed for the incidence of CR-Kp BSI (slope: –0.08; p-value: 0.11).

Discussion and/or Conclusion(s): Intensified infection control measures combined with routine rectal surveillance cultures resulted effective in reducing the circulation of CR-Kp in the ICUs.

ID: 4844

Prevalence of healthcare-associated infections and antimicrobial use in a tertiary acute-care university hospital of north-west Italy: a three-years' experience

Andrea Orsi[1], Cristiano Alicino[1], Daniele Roberto Giacobbe[1], Laura Sticchi[1], Valerio Daturi[2], Antonella Talamini[2], Chiara Paganino[1], Ilaria Barberis[1], Valeria Faccio[1], Cecilia Trucchi[1], Valerio Del Bono[3], Giancarlo Icardi[1]. *[1]Department of Health Sciences, University of Genoa, [2]Hygiene Unit, I.R.C.C.S. University Hospital San Martino – IST National Institute for Cancer Research, Genoa, Italy; [3]Infectious Diseases Unit, I.R.C.C.S. University Hospital San Martino - IST National Institute for Cancer Research, Genoa, Italy*

Background: Healthcare-associated infections (HAI) point prevalence surveys, repeated periodically, provide an effective epidemiological tool for monitoring the extent of the phenomenon.
Aim(s)/Objective(s): i) To estimate HAI prevalence and antimicrobial use, (ii) to study microbial ecology and (iii) to identify risk factors for HAI at the tertiary 1,300 acute-care beds regional referral center university hospital, I.R.C.C.S. AOU San Martino-IST of Genoa, Liguria region, north-west Italy.
Method(s): During January-February of three consecutive years (2014–2016), we conducted three point prevalence surveys of HAI and antimicrobial use by adopting the protocol of the European Center for Disease Prevention and Control (ECDC), Version 4.3.
Results: Overall, we enrolled 2820 patients, with a median age of 73 years (IQR: 57–82), a male:female ratio = 0.96:1 and a median hospital stay of 8 days (IQR: 3–17). Nearly half of the patients had a ultimately or rapidly fatal McCabe score. HAI prevalence decreased from 15.5% in 2014 to 13.2 in 2016. Bloodstream and low-respiratory tract infections represented the most frequent site of HAI. Antibiotic treatment prevalence remained nearly 47% in the period. We observed an increase in the isolation of Klebsiella pneumoniae and Escherichia coli. At multivariate analysis, statistically significant risk factors for HAI resulted length of hospital stay, worst McCabe score, presence of central and peripheral line, and presence of urinary catheter.
Discussion and/or Conclusion(s): The study allowed us to increase knowledge for the prompt implementation of appropriate preventive interventions, aimed at controlling one of the most important public health problems in our country.

ID: 4855

Similar outcomes for individuals colonised with Pneumocystis jirovecii and those with Pneumocystis pneumonia (PCP) in Northern Ireland; should we decolonise?

Lynsey Patterson[1], Peter Coyle[2], Tanya Curran[2], Shane McAnearney[2], Jillian Johnston[1]. *[1]Public Health Agency, [2]Belfast Health and Social Care Trust*

Background: Pneumocystis jirovecii colonisation is a risk factor for the development of PCP disease. Few studies have compared individuals with P. jirovecii colonisation to those with PCP disease.
Aim(s)/Objective(s): To describe the epidemiology of *P. jirovecii* colonisation and PCP disease in order to inform preventive measures.
Method(s): From July 2011-July 2012 information on demographics, clinical severity and clinical features for all hospital inpatients in NI aged ≥18 years with *P. jirovecii* confirmed in any respiratory tract sample. We defined PCP or *P. jirovecii* colonisation using clinical and radiological findings. We compared demographics and clinical variables for PCP compared to *P. jirovecii* colonisation calculating adjusted median unbiased estimate (AMUE) of the odds ratio (OR) using multivariable exact logistic regression, adjusting *a priori* for age and sex.
Results: There were 13 *P. jirovecii* colonisations and 36 PCP cases, with no difference in age (P = 0.1) or sex (P = 0.4). There was no difference in the proportion admitted to ICU (P = 0.9), the length of stay following *P. jirovecii* detection (P = 0.9) or 30-day all-cause mortality (P = 0.8). The odds of PCP increased with exposure to chemotherapy (AMUE OR 8.73; 95% confidence interval (CI) 0.84, ∞), immunosuppressive drugs (AMUE OR 12.1; 95% CI 1.94, ∞) and an HIV diagnosis (AMUE OR 16.2; 95% CI 1.71, ∞).
Discussion and/or Conclusion(s): Our study showed no difference in clinical severity between individuals colonised with *P. jirovecii* and those with PCP. Given the higher odds of PCP in those exposed to chemotherapy, immunosuppressive drugs and those with HIV we propose decolonisation should be considered in these groups.

ID: 4864

An influenza care bundle approach to patient management, surveillance and documentation

Stella Barnass[1], Josephine Elfick[2], Colin Barnes[2], Farhana Butt[2], Nupur Goel[2], Yolanda Hedges[2], Linda Woodward-Stammers[2]. *[1]West Middlesex University Hospital, Chelsea and Westminster NHS Foundation Trust, [2]West Middlesex University Hospital, Chelsea and Westminster NHS Foundation Trust*

Aim(s)/Objective(s): An influenza care bundle was developed to facilitate consistent management and documentation of influenza cases. The care bundle covers:

- patient demographic information
- laboratory results
- informing ward staff
- patient treatment
- isolation with respiratory precautions
- contact tracing for adult patients on general wards, pregnant patients and children
- contact tracing for staff contacts
- antiviral prophylaxis for contacts
- incident reporting
- consideration of whether an incident meeting is required
- patient outcome

There is guidance on which sections should be completed by one of the medical microbiologists and/or one of the infection prevention and control nurses. The name of the person(s) completing the form and the date are included.
Method(s): On completion the form is scanned into the department shared drive and the data is readily to hand for analysis and to compile reports.
Discussion and/or Conclusion(s): Copies of the care bundle will be available at the conference, and an electronic version can be e-mailed on request for local adaptation.

ID: 4879

How much do we Trust epidemiological definitions of healthcare-associated *C. difficile* infection?

Jon Otter, Jonathan Sullivan, Eleonora Dyakova, Siddharth Mookerjee, Tracey Galletly, Eimear Brannigan, Mark Gilchrist, Frances Davies, Alison Holmes. *Imperial College NHS Healthcare Trust*

Background: Epidemiological definitions from PHE do not include previous hospitalisation in defining healthcare-associated (Trust-apportioned) *C. difficile*, in contrast to other definitions such as from the CDC and ECDC.
Aim(s)/Objective(s): To investigate previous hospitalization in patients presenting with *C. difficile* infection within the first 72 hours of hospital admission.
Method(s): We evaluated all cases of *C. difficile* PCR and toxin EIA positive cases identified in the 14/15 Financial Year to determine attribution of cases, comparing surveillance definitions from PHE (which do not include previous hospitalization) and CDC (which include previous hospitalization). For each case of *C. difficile* identified in the first 72 hours of admission, previous hospitalization in our hospitals was determined through medical note review.

Results: When applying the CDC definitions to the cases defined as non-Trust-apportioned using PHE definitions, there was an increase of 22% in reportable cases from 168 to 205 cases. 31/37 additional Trust-apportioned cases according to CDC surveillance definitions were due to previous hospitalisation in the 4 weeks prior to the positive specimen. Of the 84 cases defined as non-Trust-apportioned, 40 (48%) had a previous overnight hospital stay in the 4 weeks prior to the positive specimen, and 24 (29%) within 1 week prior to the positive specimen.
Discussion and/or Conclusion(s): A high proportion of *C. difficile* cases defined as 'non-Trust' have recent overnight hospitalization in our hospitals, suggesting that these cases may be attributable to the previous episode of care. PHE should consider including previous hospitalisation in their epidemiological definitions.

ID: 4888
Health care-associated infections in a neurologic department: epidemiology, antibiotic resistance and risk factors. Two years study, Mansoura University, Egypt

Rawia Badr[1], Rasha Hassan[2], Enas Hammad[2], Hassan Salama[2]. [1]*Faculty of Medicine, Mansoura University,* [2]*faculty of medicine*

Background: Health care-associated infections (HAIs) are representing a major problem in neurology department with a considerable impact on mortality and morbidity rates.
Aim(s)/Objective(s): This is a prospective study conducted to detect HAIs according to CDC definition, main infection sites, common microorganisms, mortality rate and risk factors such as age and length of stay.
Method(s): This study was carried out in a neurology department, faculty of medicine, Mansoura University, Egypt, from January 2014 to December 2015. Isolation, identification and antimicrobial susceptibility were carried out. An outbreak of UTI due to Candida species was detected and RFLP was done for typing and tracing source of infection.
Results: Elderly patients and those having prolonged length of hospital stay were at higher risk of acquiring HAIs. Higher mortality rate was associated with patients having HAIs, blood stream infection, mechanical ventilation and low Glasgow Coma Scale. HAIs were detected in 413 samples. The three most commonly reported organisms were *Klebsiella pneumoniae* 107 (26%), followed by *Candida spp* 67 (16%) and *MRSA* 65 (15.7%). Regarding site of infection, urinary tract infection was the commonest site 185 (44.8%) followed by respiratory tract infection 90 (21.8%), blood stream infection 73 (17.7%) and wound infection 65 (15.7%). Imipenem was the most effective antibiotic against Gram negative bacteria. Vancomycin and imipenem were found to be the most effective against Gram positive bacteria.
Discussion and/or Conclusion(s): HAIs prevention represents a real challenge to minimize HAIs limiting mortality, antibiotic resistance and outbreak emergence.

ID: 4890
The epidemiology of glycopeptide resistance in coagulase negative staphylococci in the East Midlands

Sharon Koo, Nelun Perera. *University Hospitals of Leicester NHS Trust*

Background: Coagulase negative staphylococcus (CoNS) is one of the most frequently isolated nosocomial pathogen in clinical microbiology laboratories. There is increasing evidence that glycopeptide resistance, particularly to teicoplanin is increasing in CoNS.
Aim(s)/Objective(s): This is a retrospective analysis to evaluate teicoplanin and vancomycin susceptibilities in CoNS isolates from sterile site samples.
Method(s): All CoNS isolates from sterile site samples submitted to our laboratory between January 2013 and April 2015 were evaluated. A total of 846 CoNS were isolated during that period. The majority of the isolates were from blood cultures (49.5%), orthopaedic (bone, joint and wound) samples (27.7%), peritoneal dialysis fluid (6.6%) and sternum (5%).
Etest strips were used to determine teicoplanin MICs. Vancomycin susceptibilities were initially performed using Etest strips. This was changed to a commercial MIC testing system (Vitek 2) in October 2013. The MIC values were interpreted according to the 2015 recommendations of the British Society for Antimicrobial Chemotherapy. Isolates with MIC >4.0 mg/L were considered to be resistant.
Results: 799 samples were tested for vancomycin susceptibility. 2 samples were resistant (MIC 8.0mg/L) (0.25%). Both were isolated from blood cultures. One of the samples was tested against teicoplanin and was deemed susceptible (MIC 2.0mg/L).
Of the 247 samples that were tested for teicoplanin susceptibility, 9 CoNS isolates were resistant (3.6%). 2 had an MIC of 6.0mg/L and 7 samples had MIC of 8.0mg/L. 8 of the samples were vancomycin susceptible.
Discussion and/or Conclusion(s): The glycopeptide resistance in CoNS isolates from our population reflected the pattern of that seen by investigators in other countries.

ID: 4924
Carbapenemase screening programme at a London Teaching Hospital with low rates of detection

Kerry Roulston[1], Yvonne Carter[1], Vicky Pang[1], Gemma Vanstone[2], Indran Balakrishnan[1], Robin Smith[1], Damien Mack[1]. [1]*Royal Free London NHS Foundation Trust,* [2]*HSL Analytics*

Background: Public Health England advises carbapenemase screening (CS) in high-risk patients. At the Royal Free Hospital, universal CS is performed for Intensive Care Unit (ICU) patients and risk-based CS is performed for private, renal, liver, haematology, infectious diseases (ID), stroke and oncology patients.
Aim(s)/Objective(s): To review the number of patients screened for carbapenemase-producing organisms (CPO) and cases detected.
Method(s): The laboratory information system was searched for all CS samples between July 2013 and December 2015. CS was performed using broth enrichment cultures containing imipenem discs until December 2013 and chromID CARBA (Biomerieux) from January 2014 onwards. Suspected CPOs were confirmed by the reference laboratory.
Results: CS was performed for 25,787 samples from 7,520 patients, with an average of three samples per patient (median = 2, IQR = 1–4). The majority of samples were from ICU (52%), private (15%) and renal (12%) patients. From the 7,520 patients screened, 44 (0.59%) new cases of CPO were identified. Detection rates per patient screened were: 0.49% (ICU); 1.16% (private); 0.12% (renal); 2.17% (haematology); 0.55% liver; 0% (stroke, oncology and ID); 0.82% (other specialties). Detection rates per patient screened increased significantly from 12/3145 (0.38%) in 2014 to 29/3685 (0.8%) in 2015 (OR = 2.07, 95%CI = 1.02–4.46, p = 0.031).
Discussion and/or Conclusion(s): The cost-effectiveness of implementing CS is unknown. The yield from CS of high-risk patients in our hospital is currently low, however detection rates have increased significantly over the last two years. CS of high-risk patients is important due to the increased risk of infection associated with high mortality.

ID: 4939
Light surveillance of cranial surgery procedures in a tertiary referral hospital using an integrated electronic approach

Teresa Inkster[1], Ann Kerr[2], Irene Aitken[3], Susan Little[3], Helen O'Neill[4]. [1]*Queen Elizabeth University Hospital, Glasgow,* [2]*NHSGGC infection control team,* [3]*NHSGGC Infection control,* [4]*NHSGGC infection control*

Background: NHS GGC IPCT have revisited SSI surveillance within cranial surgery procedures using a real-time web application designed to assist infection surveillance.
Neurosurgical SSI surveillance is not a mandatory component of the HPS SSI surveillance programme.

SSI surveillance was previously undertaken for neurosurgical procedures in our hospital from 2003–2006. This involved a manual paper based system for data collection.
Aim(s)/Objective(s): We discuss the use of an integrated electronic approach to initial data capture, post surgery patient surveillance, readmission and microbiology alerts.
Method(s): The IPC team use ICNet and the addition of a SSI surveillance package has enabled robust light surveillance.
The system provides real time data import, alerts and customisable reports via intranet PCs and tablets allows increased accessibility throughout multiple hospital sites. This also reduces the burden of requiring staff to complete paper forms.
Once the patient surgery case is identified for surveillance inclusion this is automatically displayed on the surveillance nurses ICNet 'dashboard' allowing monitoring of each case for 30 days post surgery.
Results: This method relies on accurate surgical procedure coding data as the unique identifier for surveillance inclusion. It was noted that some procedures were not captured due to coding anomalies; however this was identified and remedied locally.
Discussion and/or Conclusion(s): Using a real-time web application to undertake SSI Surveillance within cranial surgery has reduced the burden of a paper based process. SSI monitoring provides a single data repository for surveillance data and provides a straightforward approach to monitoring SSI outcome following surgery.

ID: 4940
A review of the analytical methodology used to estimate excess length of stay due to health care associated infections

Sarkis Manoukian[1], Sally Stewart[1], Agi McFarland[1], Jacqui Reilly[2], Nick Graves[3]. *[1]Glasgow Caledonian University, [2]GCU/NHS, [3]Queensland University of Technology*

Background: Accurately quantifying the additional costs of healthcare associated infections (HAIs) is essential for developing cost-effective infection prevention and control measures. A major component of the economic cost due to health care associated infections can be captured my measuring the additional length of stay (LOS) due to these infections.
Aim(s)/Objective(s): The preference for modelling LOS instead of monetary valuation of hospital cost stems from a belief that many decisions about healthcare investments are made in the short term where most financial expenditures are made for costs which are fixed. However, estimating excess LOS due to HAI is complicated due to the fact an infection increases duration of hospital stay but at the same time risk of infection increases with duration of stay. This problem of endogenous variables can potentially be addressed by using appropriate statistical methods.
Method(s): This systematic review examined papers in PubMed published between 1997 and 2016 and identified English language studies that estimated increased LOS due to HAIs.
Results: The methodological approaches used in the literature to estimate excess LOS due to HAIs include case reviews, matched comparisons and regression analyses. The choice of estimation methodologies can affect the accuracy of the resulting estimates and due to that estimates of LOS varied widely between studies reviewed. Studies examining LOS attributed to HAI varied considerably in design and data collected.
Discussion and/or Conclusion(s): This review summarises the most recent statistical methodologies and the message is that a robust application of these can address key gaps in our understanding of HAIs and their effects on healthcare.

ID: 4943
Infection after trans rectal ultrasound (TRUS) prostate biopsy – findings of a two year surveillance programme

Mairead Skally[1], Sara White[2], Sheila Donlon[3], Caoimhe Finn[3], Richard Power[4], Gordon Smyth[5], Ijaz Cheema[6], Frank Keeling[7], Martina Morrin[7], Yvonne Williams[8], Caitriona Higgins[8], Edmond Smyth[9], Hilary Humphreys[10], Eimear Dunne[2], Karen Burns[11], Fidelma Fitzpatrick[10]. *[1]Department of Microbiology, Beaumont hospital, [2]Clinical Nurse Specialist - Prostate Cancer, Beaumont Hospital, [3]Infection Control Department, Beaumont Hospital, [4]Consultant Urologist & Renal Transplant Surgeon, [5]Consultant Urologist, [6]Consultant Urologist Surgeon, [7]Consultant Radiologist, Beaumont Hospital, [8]Cancer Data Manager, Beaumont Hospital, [9]Consultant Microbiologist, Beaumont Hospital, [10]Consultant Microbiologist, Beaumont Hospital and Royal College of Surgeons Ireland, [11]Consultant Microbiologist, Beaumont Hospital and Health Protection Surveillance Centre*

Background: Antimicrobial resistant (AMR) infectious complications following transrectal ultrasound (TRUS)-guided prostate biopsy are increasing, and include urinary tract infection (UTI) and bloodstream infection (BSI).
Aim(s)/Objective(s): A prospective multi-disciplinary local infection surveillance programme was established for men undergoing prostate biopsy and results of the first two years (2014–2015) are described.
Method(s): Ciprofloxacin is standard prophylaxis. Intravenous gentamicin is added if risk factors are identified from pre-procedure AMR assessment. A man representing with suspected infection is investigated and managed according to the local guideline. UTI and BSI surveillance within 15 days of biopsy, using European (ECDC) definitions is performed. Rates are expressed per 100 biopsies. Root cause analysis (RCA) is completed for confirmed UTI or BSI. Results and interventions are discussed at biannual team meetings.
Results: The rate of microbiologically-confirmed infections per 100 biopsies decreased by 26% from 1.534 (2014) to 1.133 (2015), with *E. coli* the causative pathogen in 100% and 78% non-susceptible to ciprofloxacin. There was a contemporaneous 62% increase in the rate of microbiologically-unconfirmed infections from 1.227 to 1.983, despite 100% compliance with sending blood cultures and urine. No man who represented with suspected infection had gentamicin added to ciprofloxacin prophylaxis, as AMR risks were not evident pre-procedure.
Discussion and/or Conclusion(s): Implementation of an AMR risk assessment, robust infection surveillance and management processes and RCA led to a 26% reduction in infection. The contemporaneous increase in non-microbiologically confirmed infections, despite full compliance with testing, warrants further investigation.

ID: 4945
Invasive *Candida* infections in an Irish tertiary referral hospital: a descriptive review

Mairead Skally[1], Leah Gaughan[2], Elaine McFadden[3], Sinead O'Donnell[3], Zainab Barker[3], Denise McGowan[3], Karen Burns[4], Fidelma Fitzpatrick[5], Lillian Rajan[3], Binu Dinesh[3], Edmon Smyth[3], Hilary Humphreys[6], Anna Rose Prior[6]. *[1]Department of Microbiology, Beaumont hospital, [2]Pharmacy Department, Beaumont Hospital, [3]Department of Microbiology, Beaumont Hospital, [4]Department of Microbiology, Beaumont Hospital and Health Protection Surveillance Centre, [5]Department of Microbiology, Beaumont Hospital and Royal College of Surgeons Irealn, [6]Department of Microbiology, Beaumont Hospital and Royal College of Surgeons Ireland*

Background: Invasive *Candida* infection is associated with increased morbidity and mortality. Standardised surveillance programmes for such infections are limited.
Aim(s)/Objective(s): To investigate incidence of *Candida* species isolated from blood and cerebral spinal fluid (CSF) over a five year period.
Method(s): A retrospective review was conducted between January 2011 – December 2015 of blood and CSF resullts where *Candida* species was isolated, antifungal susceptibility and patient outcomes.
Results: *Candida* was cultured from blood (n = 75) and CSF (n = 4) of 79 patients. Nine patients had documented recurrent infections. The average time of positive culture was day 28 of admission. Male and females were equally affected. The average age was 55 years (range 16 to 91 years). Ten patients (13%) were in critical care at time of culture.

Annual number of cases varied from nine in 2012 to 24 in 2014. *C. albicans* was the predominant species (51%) followed by *C. glabrata* (21%) and *C. parapsilosis* (16%). The proportion of non-*albicans* species did not vary over time. Caspofungin or 5-flucytosine resistance was not detected. Fluconazole non-susceptibility was uncommon among non-*glabrata* species (n = 5) and not associated with length of stay. Azole consumption, but not other antifungals, increased over the 5-year period. Crude mortality rate was 28%.

Discussion and/or Conclusion(s): Local surveillance of invasive candidiasis is crucial to monitor changes in trends in antifungal resistance. Fluconazole resistance remains at a low level, however as a significant proportion of our isolates are *C. glabrata* empiric echinocandin therapy should be considered particularly in critically unwell patients pending susceptibility data.

ID: 4953

The changing epidemiology of methicillin-resistant Staphyloccocus aureus (SARM) over a 15 years period

Ana Hornero, Sara Grillo, Juan Manuel Verge, Purificación Martos, Jordi Camara, Mª Angeles Dominguez, Jordi Carratala, Miquel Pujol. *Bellvitge University Hospital*

Background: The first cases of MRSA at Bellvitge University Hospital were detected in the early nineties. Cases were of nosocomial origin, caused by a dominant clone (Iberian clone), which produced outbreaks, especially in intensive care units, and serious infections associated with invasive devices. The implementation of an intensive control program resulted initially in a significant decrease in new MRSA cases, but an upward trend was observed during last years explained partially by clone replacement and changes in the clinical epidemiology of MRSA.

Aim(s)/Objective(s): To determine the current clinical epidemiology of MRSA cases over a period of 15 years in a tertiary care hospital.

Method(s): Prospective surveillance of MRSA cases reported daily by the Microbiology Service: Collection of systematic information, regarding acquisition and sample source. Implementation of a control program based in active surveillance, contact precautions and decolonisation.

Results: From 2000 to 2015, 6.714 MRSA cases were identified. Most significant changes regarding clinical epidemiology between periods were as follows: Rate of cases detected by active surveillance cultures (35% vs 63%); nosocomial acquisition (69% vs 13% of cases), incidence rate of nosocomial MRSA clinical samples (0.42 vs 0.16/1,000 patients-day), and incidence rate of nosocomial bacteraemia (0.12 vs 0.02 /1,000 patients-day).

Discussion and/or Conclusion(s): A significant reduction of nosocomial MRSA transmission and nosocomial MRSA bacteraemia cases were observed throughout the study period. A surveillance program of MRSA including implementation of a multifaceted infection control program was essential to reduce nosocomial rates in our center.

ID: 4957

E. coli blood stream infections: differences in epidemiology across different sites within a large teaching hospital Trust

Damien Mack, Husam El-Mugamar, Judy Jaques, Yvonne Carter, Diane Rogers, Sunil Jose, Robin Smith. *Royal Free London NHS Foundation Trust*

Background: The incidence of *E. coli* blood stream infection (BSI) in England increased by 15.6% from 2010 to 2014. 30-day all-cause mortality was 15.9% in 2014/15. In May 2016 the Government announced plans to halve the number of healthcare associated BSI such as *E. coli* in England by 2020.

Aim(s)/Objective(s): Here we show differences in the epidemiology of *E. coli* BSI over four years across a large hospital Trust consisting of the Royal Free Hospital (RFH) tertiary referral site, and Barnet and Chase Farm Hospitals (BCF) district general hospital sites.

Method(s): Trust infection control data was analysed using Stata 13.

Results: We found that from 2012/13 to 2015/16 cases of *E. coli* BSI fell by 0.21% from 481 to 469 per year however the case rate rose from 118 to 145 per 100,000 occupied bed days. The average age of cases was lower at RFH than at BCF: 67 versus 70 years for pre-48 hour cases and 61 versus 75 years for post-48 hours cases (both $p < 0.001$). There was a decreasing trend in the proportion of post-48 hour cases at BCF (9.8% to 5.1%, $p = 0.004$) and a non-significant increasing trend at RFH (12.1% to 16.6%, $p = 0.088$). On multi-variate analysis, compared to BCF, cases at RFH were more often associated with augmented care (OR = 5.25,95%CI:3.53–7.80,$p < 0.001$), non-A&E/medical/geriatric specialties (OR = 2.47,95%CI:1.96–3.11,$p < 0.001$), non-emergency admission (OR = 1.78,95%CI:1.78–2.69,$p = 0.006$), and post-48 hour onset (OR = 1.54,95%CI:1.07–2.24,$p = 0.021$).

Discussion and/or Conclusion(s): Analysis of *E. coli* BSI by Trust site revealed differences in epidemiology that will be important considerations in planning measures to reduce cases.

ID: 4966

E. coli blood stream infections: changes in healthcare associations over five years at a large teaching hospital

Damien Mack, Yvonne Carter, Sunil Jose, Robin Smith. *Royal Free London NHS Foundation Trust*

Background: The incidence of *E. coli* blood stream infection (BSI) in England increased by 15.6% from 2010 to 2014; 30-day all-cause mortality was 15.9% in 2014/15. In May 2016 the Government announced plans to halve the number of healthcare associated BSI such as *E. coli* in England by 2020.

Aim(s)/Objective(s): Here we show changes in the healthcare associations of *E. coli* BSI over five years at the Royal Free Hospital, a large teaching hospital in London.

Method(s): Analysis of Trust data using Stata 13.

Results: From 2011/12–2015/16 *E. coli* BSI cases varied between 214 and 246 per year, however the proportion that were likely to be or possibly healthcare associated infections (HCAI) fell 30% from 53% to 37% (chi-squared test for trend: $p < 0.001$). On multivariate analysis, compared to "community" cases with no contact with the hospital in the previous three months, the proportion of HCAI cases was significantly higher in cases diagnosed on day 0-1 of admission but with previous contact with the hospital within three months (OR = 10.38, 95%CI:6.86–15.71), and in cases diagnosed on day 2 of admission onwards (OR = 15.94, 95%CI:7.42–34.24). For the 488 (43%) HCAI cases, the following year-on-year trends were seen: decreasing association with vascular access device use ($p = 0.02$), and increasing associations with other invasive device use ($p < 0.002$), catheter use ($p = 0.006$), surgery or other invasive procedures ($p < 0.001$).

Discussion and/or Conclusion(s): Factors associated with *E. coli* BSI HCAI are changing. Further investigation by root cause analysis will be required to determine what proportion of *E. coli* BSI HCAI may be preventable.

ID: 4973

Performance of the Research-Use-Only Xpert MRSA NxG on a nasal swab collection

Martin Rottman[1], Christine Lawrence[2], Hayfa Mansour[2], Faten El Sayed[3], Anne-Laure Roux[3], Jean-Louis Herrmann[3], Jean-Louis Gaillard[3]. [1]*Groupe Hospitalier Universitaire Paris Ile de France Ouest (AP-HP) UMR Université de Versailles St Quentin – INSERM U1173,* [2]*Groupe Hospitalier Universitaire Paris Ile de France Ouest (AP-HP),* [3]*Groupe Hospitalier Universitaire Paris Ile de France Ouest (AP-HP) UMR Université de Versailles St Quentin – INSERM U1173*

Background: The shifting genetic background of methicillin resistant *Staphylococcus aureus* (MRSA) requires the regular update of the PCR based rapid detection assays. The Research-Use-Only Xpert MRSA NxG is a new Cepheid assay designed to be highly effective at detecting current MRSA isolates in nasal swabs without requiring cold room storage and with a long shelf life.

Aim(s)/Objective(s): We aim to determine the analytical performance of the Research-Use-Only (RUO) Xpert MRSA NxG using a frozen samples biobank previously assayed by culture, Xpert MRSA Gen3 RUO and BD-MAX MRSA XT.
Method(s): A frozen library obtained in a previous study made of 155 nasal swabs discharged in saline (119 prospective and 36 swabs from known MRSA culture positive patients) was screened with the new RUO Cepheid Xpert MRSA NxG. 100µl of the suspension was assayed on a GeneXpert IV platform. The same starting material had been previously used for culture and molecular assays.
Results: 141 samples contained the required volume of 100µl. The sensitivity and specificity of the Xpert MRSA NxG were 93.3% and 100%, respectively, while the positive and negative predictive values were 100% and 96.9%, respectively. Three out of the 45 positive samples tested were falsely negative and two unresolved. Suspensions from four of these five isolates were appropriately detected by the Xpert MRSA NxG assay.
Discussion and/or Conclusion(s): The Xpert MRSA NxG proved to be as effective as the previously released Xpert MRSA Gen3 while further expanding the subtypes coverage, decreasing runtime from 77 to 70 minutes and providing room temperature storage and extended shelf life.

ID: 4976
Why and how merge data by approximate string matching from a prospective study and the DRG-based system to study the impact of nosocomial infection

Joris Muller[1], Pierre Tran Ba Loc[2], Stéphanie Deboscker[1], Francis Schneider[3], Thierry Lavigne[1]. *[1]Strasbourg University Hospital; Infection control and prevention unit, [2]Strasbourg University Hospital; Public health service, [3]Strasbourg University Hospital; Medical intensive care unit*

Background: Valuable data that could be used to perform original studies are often split between multiple databases. However, linking a manually fulfilled database with potential typing mistake with another one is challenging.
Aim(s)/Objective(s): Our objective was to develop an algorithm to link two databases when no explicit linkage key exists.
Method(s): Our algorithm calculates a 'link likelihood score' (LLS) between each pair of possible record in each database. The lower this LLS is, the more probable the matching between the two records. To take account of possible mistyping, this score was based on Levensthein distances for non-numerical data and various calculations for numerical data. We checked the accuracy by manually review 10% of the non-perfect matching pairs and systematically when the score was over a threshold. The algorithm was implemented in the open-source R software.
We applied this method by linking data from a prospective study's database about nosocomial infection in the intensive care unit (REA-RAISIN) with our local DRG system.
Results: Among the 7479 records of our database, almost all observations (99.8%) were linked with related records in the DRG-based database. Without our algorithm only 5448 (72.8%) with a perfect matching would be linked. No linking error was found when the LLS was under the threshold. Among the 134 record manually reviewed with a LLS above the threshold, only 14 (0.2%) were excluded due to the lack of matching record between the databases.
Discussion and/or Conclusion(s): This original algorithm implemented in a free software could be adapted to link potentially any other database.

ID: 4996
Extra-pulmonary tuberculosis: an epidemiological review of 90 cases at a London teaching hospital

Mary Peirse, Daniela Kirwan, Angela Houston. *St George's University Hospital NHS Foundation Trust*

Background: TB remains a major global health problem: an estimated 9.6 million new cases were reported worldwide in 2014. In England 47.1% of new cases reported in 2014 were extra-pulmonary (EPTB); this proportion has increased since 2005. EPTB symptoms are often non-specific, making diagnosis challenging.
Aim(s)/Objective(s): This study aimed to retrospectively review clinical and microbiological characteristics of all cases of EPTB managed over a two-year period at a tertiary referral centre in London, and compare with national data.
Method(s): Since 2013, data from all inpatients attending the Clinical Infection Unit at St. George's Hospital have been entered into a database. This was searched for patients treated for EPTB between 2013 and 2015. Parameters including site of disease, microbiological confirmation, resistance pattern, and HIV status were collected.
Results: A total of ninety cases were identified. Median age was 38 years (IQR 27–57 years) and 58 (64%) were male. The commonest site was the lymph node (25%) followed by CNS disease (23%): national figures are 42.2% and 4.5% respectively. A confirmed microbiological diagnosis (positivity by automated liquid culture and/or Xpert® MTB/RIF) was obtained in 69%. Five (8%) of these patients had MDR-TB. 88 (98%) of patients had their HIV status checked at diagnosis; 6 patients (7%) were HIV-positive, including 3 new diagnoses.
Discussion and/or Conclusion(s): Inpatients treated for EPTB at St George's Hospital during the study period were mainly men of working age, in keeping with national data. Almost a quarter had CNS disease. The majority of patients were HIV-negative and MDR-TB rates were low.

ID: 4999
Estimating the burden of group B streptococcal (GBS) maternal sepsis in England

Theresa Lamagni, Rebecca Guy, Catherine Wloch, Nandini Shetty, Vicki Chalker, Alan Johnson. *Public Health England*

Background: With encouraging progress in GBS vaccine development, attention is increasingly focusing on identifying the breadth of potential target groups for immunisation.
Aim(s)/Objective(s): Our study aimed to quantify the incidence of GBS sepsis associated with pregnancy and childbirth.
Method(s): Laboratory confirmed GBS infections diagnosed from normally sterile sites (invasive GBS disease, iGBS) in England in 2014 were extracted from national surveillance data (SGSS). Records were linked to HSCIC Hospital Episode Statistics using NHS number and analysed to identify pregnancy or childbirth within 6 weeks of GBS diagnosis. Cases were compared to normative data on maternities from ONS and HSCIC.
Results: Of 1601 patients diagnosed with iGBS infection in England in 2014, 1546 (97%) were successfully linked to a hospital admission record. Of these, 185 (12%) were identified as maternal infections, 0.28/1000 maternities. The median age of maternal cases was 30y (18–44y). Seven cases were associated with miscarriage. Of 168 cases with information on the interval between diagnosis and delivery, 74% (124) were diagnosed on the day of delivery, 10% (16) antepartum and 17% (28) postpartum. Of the 140 intra/antepartum infections, 41% were emergency C-section deliveries. Although the proportion of preterm (<37 week) deliveries was similar between cases and national data (7% *vs* 8%), a higher proportion of stillbirths were associated with maternal GBS infection, 3% *vs* 0.47% ($p < 0.001$).
Discussion and/or Conclusion(s): Our study identified a substantial burden of maternal GBS infection with an associated higher risk of stillbirth. Prevention of maternal infection should be a priority for future public health strategy.

ID: 5013

Urinary catheter and CAUTI prevalence in hospitalized patients in a large tertiary-care Italian hospital: results from a repeated data point prevalence survey

Elisabetta Mantengoli[1], Christopher Petrilli[2], Lea Magistri[3], Maria Beatrice Pulci[3], Alessandro Bartoloni[1], Fabrizio Niccolini[3], Professional Unit "Healthcare Infection Prevention"[3]. *[1]Department of Experimental and Clinical Medicine, University of Florence, Florence, Italy; [2]Department of Medicine, Division of General Internal Medicine, University of Michigan, Ann Arbor, MI, USA; [3]Medical Direction, Careggi University Hospital, Florence, Italy*

Background: Indwelling urinary catheters are often placed in the hospital setting without an appropriate indication. Inappropriate use of catheters may lead to complications including catheter-associated urinary tract infection (CAUTI) and other non-infectious consequences of urinary catheters.
Aim(s)/Objective(s): In this study, we examined the appropriateness of indwelling urinary catheters and the association with CAUTI among hospitalized patients.
Method(s): Six point prevalence surveys were conducted from a random sampling of 1297 beds unit, semi-annually, beginning May 2012. Data on urinary catheter utilization and CAUTI were collected from participating units. Since November 2014, we captured urinary catheter appropriateness as defined by the international HICPAC Guidelines 2014.
Results: A mean of 599 patients (range 518–637) were analyzed in each chart review. Overall catheter utilization was 38.3% (range 34.0–42.9%). Urinary catheters placed without an appropriate indication represented 19.7–21.5% of all catheters inserted. The CAUTI rate since 2012, ranged from 1.1% to 5.4% with a higher CAUTI rate found in patients with an inappropriate indication for a urinary catheter compared with those with an appropriate indication (8.0% versus 4.2%). Microorganisms most commonly isolated were Gram negative bacteria, such as *Escherichia coli* and *Klebsiella pneumoniae*.
Discussion and/or Conclusion(s): The prevalence of CAUTI was lower than that reported in literature. However, given the significantly higher CAUTI rate seen in patients with an inappropriate indication, further research to reduce the inappropriate use of urinary catheters appears necessary.

ID: 5015

Epidemiology of carbapenemase-producing Enterobacteriaceae from screening samples

Rob Shorten[1], Philip Ascroft[2], Andy Dodgson[3]. *[1]Public Health England, [2]Central Manchester NHS Foundation Trust, [3]Public Health Laboratory Manchester, Manchester Royal Infirmary*

Background: Carbapenemase-producing Enterobacteriaceae (CPE) are a significant healthcare threat. Infections caused by them are more problematic to manage due to reduced antimicrobial choice and are associated with poorer outcomes. As they as transmissible between individuals, their rapid detection in colonised patients is vital in containing their spread and starting appropriate empirical antimicrobials when required. Based on national guidelines and local risk assessment, patients at Central Manchester Foundation Trust are screened for colonisation with CPE using one of two molecular methods; CARBA-R (Cepheid, Sunnydale, California) or an in-house nucleic acid amplification test (NAAT). Samples with a positive NAAT are subsequently cultured to attempt to isolate the CPE.
Aim(s)/Objective(s): To establish the epidemiology of CPE in screening samples in this high incidence setting.
Method(s): We retrospectively analysed the results of more than 68,000 rectal swabs submitted to the laboratory for the purpose of screening for the carriage of CPE.
Results: We present the epidemiology of KPC, OXA-48 and NDM, including organism identification and susceptibility data in this large cohort of patients.

ID: 5020

A comparison of the 2014–15 and 2015–16 Influenza seasons at Royal Free London NHS Foundation Trust

Jennifer Hart[1], Tehmina Bharucha[2], Ons El Hayet Ben Ismail[2], Beatrice Cockbain[2], Joanna Ellis[3], Angie Lackenby[3], Dianne Irish[2], Tabitha Mahungu[2], Tanzina Haque[2], Paul Griffiths[2]. *[1]Royal Free Hospital London NHS Foundation Trust, [2]Royal Free London NHS Foundation Trust, [3]Public Health England, Colindale*

Background: Influenza is a significant cause of morbidity and mortality, with an estimated cost to the NHS of £286 million per year. Viral and host factors are both known to influence patient outcome.
Aim(s)/Objective(s): To compare the 2014–15 and 2015–16 Influenza seasons.
Method(s): Information was obtained from patient records, internal and referral laboratory reports.
Results: During the 2014–15 Influenza season there were 247 cases in total, with 177 (71.7%) Influenza A and 70 (28.3%) Influenza B. In 2015–16 there were 208 cases with 160 Influenza A (76.9%) and 48 Influenza B (23.1%). Of the Influenza A cases in 2014–15, 5 (2.0%) were H1, 152 (61.5%) H3 and 20 (8.1%) untypeable. In 2015–16, 117 (56.3%) were H1, 23 (11.1%) H3 and 20 (9.6%) untypeable.
In 2014–15, 203 (82.2%) patients received treatment for Influenza, with 190 (76.9%) receiving Oseltamivir and 13 (5.3%) Zanamivir. In 2015–16, 122 (58.7%) patients received Oseltamivir and 2 (1.0%) Zanamivir. Antiviral resistance to Oseltamivir affected 3 patients in 2014–15 with one of these isolates also low level resistant to Zanamivir. No resistance was observed in 2015–16.
82 patients (33.2%) who contracted Influenza in 2014–15 were immunosuppressed/pregnant, compared to 53 (25.5%) in 2015–16. Mortality rate was 1.2% in 2014–15 and 1.0% in 2015–16.
Discussion and/or Conclusion(s): There was a higher total number of cases in 2014–15, with Influenza A H3 predominating, compared to Influenza A H1 in 2015–16.
Vaccine mismatch may explain higher treatment rates in 2014–15 as well as higher infection rates amongst immunosuppressed/pregnant patients. Higher antiviral resistance rates in 2014–15 may also reflect this.

ID: 5025

Evaluation of in-house prepared selective media for screening gut colonization with carbapenemase producing enterobacteriaceae (CPE)

Rajni Gaind[1], Gajanand Mittal[1], Monorama Deb[2], P.k Verma[3]. *[1]VMMC and Safdarjung Hospital, [2]VMMC and Sfadrjung Hospital, [3]VMMC and Safdarrjung Hospital*

Background: Most commercial media have been used to study colonization with KPC Enterobacteriaceae. Detection of Enterobacteriaceae with NDM and OXA genes and with susceptibility to carbapenems is a challenge
Aim(s)/Objective(s): Performance of selective media for detection gut colonization with CPE.
Method(s): A total of 322 fecal samples were screened for CPE using four in house prepared selective media: (i) overnight selective enrichment in tryptic soy broth with a 10μg ertapenem disk. (CDC protocol) (ii) MacConkey agar supplemented with imipenem at 1mg/L (MacI), (iii) MacConkey agar supplemented with cefotaxime at 1mg/L (MacC ESBL), (iv) MacConkey agar with standard Imipenem, Meropenem and Ertapenem Disk (10μg Disk), (MacD). Isolates were screened for KPC1 and 2, NDM-1, IMP, VIM, OXA- 48 and OXA-181.
Results: A total of 444 morphologically distinct *Enterobacteriaceae* were isolated. 91 (20.5%) *Enterobacteriaceae* were CRE (Ertapenem MIC >0.5 mg/L). Carbapenemase genes were detected in 50/91 CRE and defined as CPE, 41/91 isolates were non CPE.
Among CPE, 38/50 were resistant to both imipenem and meropenem and 12 showed varied susceptibility. 38 CPE (76%) were

detected by all media. A total of 40, 48, 47 and 43 CPE were detected on MacI, MacD, MacC ESBL and TSB broth respectively. Sensitivity was highest for MacD (96%) (94%). Specificity was maximum for MacI (97%).
The performance of media varied with carbapenem MIC and carbapenemase gene associated with CPE isolate.
Discussion and/or Conclusion(s): No single method is 100% sensitive and specific for CPE detection. The choice depends on type of carbapenemase gene prevalent locally. Combination of media increases the sensitivity and specificity.

ID: 5033
Spread of hospital-acquired infections: a comparison of patient transfer networks

Narimane Nekkab[1], Pascal Astagneau[2], Pascal Crépey[3]. [1]*Conservatoire National des Arts et Metiers, Ecole des Hautes Etudes en Sante Publique,* [2]*Centre de Coordination pour la Lutte Contre les Infections Associées aux Soins,* [3]*Ecole des Hautes Etudes en Santé Publique*

Background: Hospital-acquired infections (HAIs), including emerging multi-drug resistance organisms, continue to threaten all healthcare systems.
Aim(s)/Objective(s): To better understand how to reduce the scale of HAI epidemic spread we compared and explored the characteristics of patient transfer patterns in the French healthcare network to identify their potential role in epidemic spread of HAIs within the network.
Method(s): Three patient transfer networks were compared: two with only HAI related patients (a specific and a more sensitive definition), and all transferred patients. We assessed network characteristics, computed centrality, community measures, and compared these networks to Erdos-Renyi random models and to networks with randomly selected patients.
Results: More than 10 million patient transfers were recorded in France in 2014 for 2.3 million patients, building a network of 2063 hospitals and 50026 connections. The network of specific-HAI patients was composed of 1266 hospitals and 3722 connections for 13627 patient transfers, while the suspected-HAI network was composed of 1975 hospitals and 18812 connections for 128681 patient transfers. These networks displayed a scale-free structure for hospital's number of connections (in and out), and transfers. They also feature a small-world characteristic. Communities within the networks had small average inner distances between 22km to 88km, depending on the modularity of the community detection algorithms.
Discussion and/or Conclusion(s): These characteristics may have a tremendous effect on the diffusion of nosocomial pathogens. In addition, different patient inclusion criteria could impact network characteristics and the identification of key hospital centres, patient flow trajectories, and regional clustering that may serve as a basis for novel wide-scale HAI control strategies.

ID: 5035
Use of ICD-10 coding in the hospital setting for infectious disease and antimicrobial resistance surveillance

Meghan Perry[1], Catriona Parker[2], Oliver Koch[2], Mark Woolhouse[3]. [1]*NHS Lothian and University of Edinburgh,* [2]*NHS Lothian,* [3]*University of Edinburgh*

Background: Databases of hospital admissions using the International Classification of Disease codes could be a valuable source of infectious diseases surveillance.
Aim(s)/Objective(s): This study's aim was to assess the accuracy of ICD-10 codes for infectious diseases diagnoses and recording of antimicrobial resistance.
Method(s): The ICD-10 codes from 100 discharges in the Regional Infectious Diseases Unit, Western General Hospital, Edinburgh starting on June 1st 2015 were recorded. Corresponding discharge letters were reviewed to verify the accuracy of the codes. Microbiological records of the admission were checked to confirm that all relevant information had been recorded on the discharge letter.
Results: Sixty-eight discharges had appropriate ICD-10 codes relating to the discharge letter. Of the 32 inappropriate codes 21 were incomplete, 8 were inaccurate, 2 were unconfirmed diagnosis and one diagnosis had not been coded. On reviewing the microbiology 16 results were unrecorded in discharge letters that would impacted the ICD-10 codes. Sixteen of the pathogens identified were resistant to one or more antibiotics. However, only 2 of the discharge diagnoses mentioned antimicrobial resistance and no ICD-10 resistance codes were used.
Discussion and/or Conclusion(s): Although a small sample size, this audit highlights that the use of hospital ICD-10 databases for epidemiological surveillance of infectious diseases diagnoses and antimicrobial resistance would not currently give an accurate picture. There are areas where the ICD code format could be improved to allow for adequate representations of infectious diseases diagnoses including recording of the clinical impact of antimicrobial resistance. Increased awareness in doctors of the coding process and education of the coders is recommended.

ID: 5036
Computer-assisted risk assessment of hospital infections: a preliminary implementation in Polish hospitals

Andrzej Jarynowski[1], Damian Marchewka[2], Andrzej Grabowski[3]. [1]*Jagiellonian University,* [2]*Interdisciplinary Research Institute in Wroclaw,* [3]*CIOP – National Research Institute in Warsaw*

Background: We create an intuitive and functional desktop application (free of charge, open licensed) to support the work of the hospital epidemiologists in preventing and containing hospital infections.
Aim(s)/Objective(s): The goal of the application is reconstructing the most likely paths of infection and classifying places and individuals into different risk groups. We study the time-varying structure of contacts reconstructed from the data sets collected in Polish and Swedish hospitals. We will apply theory of temporal networks to improve computer-assisted hospital infection analyses.
Method(s): The algorithm processes data from the register of patient admissions and discharges from each hospital unit (wards, clinics, etc.), microbiological laboratory test results and medical staff register. The patients' structure of contacts (persons who had visited the same care facility) and functional paths are reconstructed. Epidemiological models are implemented on a temporary network of contacts (where each link can provide a path for the pathogen transmission).
Results: In a preliminary setup, we analysed only one alarm pathogen: MRSA. With simulated infection paths, we were able to compute network measures for patients. We obtained the risk of getting infected, based on the patient's incoming connections, and the risk of spreading infections resulting from outgoing connections (both analogous to Google algorithm).
Discussion and/or Conclusion(s): We provide a costless preventive computer-assisted tool against HAI. The biggest effort from hospital administration is mapping hospital topology, entered manually by a hospital employee. Later on, data is imported from hospital information system. The results of the algorithms are presented 'real-time' to an hospital epidemiologist for interpretation and applying preventive control.

ID: 5058
Invasive pneumococcal disease in the North East of England: Rising incidence in 2014/2015 and 2015/2016

Kate Houseman, Gareth J Hughes, Kaye Chapman, Russell Gorton, Deb Wilson. *Public Health England*

Background: A substantial and sustained increased incidence of invasive pneumococcal disease (IPD) has been observed across the North East of England (NEE) from April 2014, reversing the decline that

followed introduction of pneumococcal conjugate vaccines (PCV) into the UK childhood immunisation program in 2006.
Aim(s)/Objective(s): To examine the rising incidence of IPD in NEE.
Method(s): NEE residents with laboratory-confirmed IPD were reported to the NEE IPD enhanced surveillance system between 1 April 2006 and 31 March 2016. Clinical and demographic data were obtained from clinicians and primary care; serotypes were obtained from the Public Health England Respiratory and Vaccine Preventable Bacteria Reference Unit. Incidence rate ratios (IRR) were estimated using negative binomial regression.
Results: Between 1 April 2015 and 31 March 2016, 298 cases of IPD (11.4/100,000 population) were reported. This was significantly greater than the previous epidemiological year 2014/2015 (230 cases; 8.8/100,000 population; $p = 0.003$), significantly greater than the average during the three epidemiological years covering 2011/2014 (211 cases; 8.1/100,000 population; $p < 0.001$) and similar to 2006/2007 (11.91/100,000 population; $p = 0.577$).While IPD caused by 13-valent PCV serotypes has remained low, cases due to serotypes exclusive to 23-valent polysaccharide vaccine (in particular 8, 9N, 12F) have increased significantly, as have cases caused by non-vaccine type serotypes 15A, 23A, 35F. Increases are particularly notable in individuals 5–64 years and ≥65 years.
Discussion and/or Conclusion(s): This reversal of the declining trend of IPD is unexpected and merits further study and comparison to trends observed elsewhere. Investigation of possible underlying causes may inform public health responses to address the persistent burden of IPD.

ID: 5100
HIV, hepatitis B and syphilis testing in antenatal clinic attendees at Bairo Pite Clinic, Timor-Leste

Marc Heymann[1], Charlotte Hall[2]. *[1]Warwick Medical SChool, [2]Bairo Pite Clinic, Dili, Timor-Leste*

Background: Routine antenatal clinic (ANC) screening in Dili, Timor-Leste includes hepatitis B (HBV), HIV, and- from late 2014- syphilis screening. Limited prevalence data suggest antenatal prevalence rates of 0.52% (syphilis), 0.04% (HIV) and 2.8% (HBV). Bairo Pite Clinic is a non-governmental health facility in Dili with approximately 100 new ANC attendees monthly.
Aim(s)/Objective(s):
1. Service evaluation of syphilis screening programme
2. Assessment of HIV and HBV prevalence

Method(s):
1. Evaluation of syphilis screening programme and of ANC consultations/testing procedures
2. Prospective evaluation of HIV/HBV/syphilis results of ANC attendees over one week
3. Retrospective evaluation of results for ANC attendees in the preceding month.

Results:
Prevalence data:
1. prospective cohort: 0/65(0%) HIV, 0/65(0%) syphilis, 1/65(1.5%) HBV
2. retrospective cohort: 0/493(0%) HIV, 11/493(2.2%) HBV; syphilis prevalence unknown (not in midwifery records).

Service evaluation: Syphilis testing was not requested by midwives (unlike HIV, HBV) but was observed to be performed by laboratory staff. Other syphilis screening issues: no consistency in screening test used, no pathway for management of a positive result and no clear reporting structure.
Discussion and/or Conclusion(s): This study supports the existing estimates of HIV and antenatal hepatitis B prevalence. HIV and HBV testing are well established with clear referral pathways and excellent coverage. It is encouraging that syphilis testing is occurring given its recent introduction, but work needs to be done to increase midwives' awareness and create a formal consistent testing pathway. Further prevalence studies for syphilis are needed.

ID: 5112
Genomic surveillance of vaccine antigens in invasive meningococcal disease in Great Britain and Ireland using Bexsero® Antigen Sequence Type (BAST)

Charlene Rodrigues[1], Carina Brehony[2], Ray Borrow[3], Andrew Smith[4], Robert Cunney[5], E Richard Moxon[6], Martin Maiden[2]. *[1]University of Oxford, [2]Department of Zoology, University of Oxford, South Parks Road, Oxford, United Kingdom; [3]Public Health England, Meningococcal Reference Unit, Manchester Royal Infirmary, Manchester, United Kingdom; [4]Scottish Haemophilus, Legionella, Meningococcus and Pneumococcus Reference Laboratory, Glasgow Royal Infirmary, Glasgow, United Kingdom and College of Medical, Veterinary & Life Sciences, University of Glasgow, Glasgow, United Kingdom; [5]Irish Meningitis and Meningococcal Reference Laboratory, Temple Street Children's University Hospital, Dublin, Ireland; [6]Department of Paediatrics, University of Oxford, John Radcliffe Hospital, Oxford, United Kingdom*

Background: Invasive meningococcal disease (IMD) in the UK is predominantly due to serogroup B, with the burden of disease among children under 5 years. In September 2015, the UK implemented a targeted serogroup B vaccine, Bexsero®, into the national childhood immunisation schedule at 2, 4 and 12 months.
Aim(s)/Objective(s): To design and implement a genomic scheme for rapid and scalable surveillance of vaccine antigens in response to this selection pressure.
Method(s): All culture-confirmed IMD isolates ($n = 2016$) from 2010–11 to 2013–14 from UK (Meningitis Research Foundation Meningococcus Genome Library) and Republic of Ireland were included. Whole genome sequences were hosted on PubMLST Neisseria public database (http://pubmlst.org/neisseria/). A novel Bexsero® Antigen Sequence Type (BAST) scheme was implemented and used to analyse the presence of vaccine antigens (fHbp, NadA, NHBA and PorA).
Results: There were 1966 isolates for which BAST was determined, with 647 unique BASTs. The nine most frequently occurring BASTs accounted for 39.4% of all isolates ($n = 775$). BAST was strongly associated with clonal complex (Cramer's V 0.946). BASTs were largely stable over time, except for the increase in clonal complex 11 associated BAST-2. The 14 most frequent BASTs were present in all areas, but there was variation in the prevalence of BASTs between the four geographic regions.
Discussion and/or Conclusion(s): The Meningitis Research Foundation Meningococcus Genome Library is a publicly available, online repository of IMD isolates, facilitating high resolution analysis of bacterial genomes. The presence of a few predominant BASTs with temporal and geographical stability, suggests that use of the associated vaccine antigens could provide high vaccine coverage.

ID: 5114
Bexsero® vaccine coverage estimates in Great Britain and Ireland using genomic surveillance using Bexsero® Antigen Sequence Type (BAST)

Charlene Rodrigues[1], Carina Brehony[2], Ray Borrow[3], Andrew Smith[4], Robert Cunney[5], E Richard Moxon[6], Martin Maiden[2]. *[1]University of Oxford, [2]Department of Zoology, University of Oxford, South Parks Road, Oxford, United Kingdom; [3]Public Health England, Meningococcal Reference Unit, Manchester Royal Infirmary, Manchester, United Kingdom; [4]Scottish Haemophilus, Legionella, Meningococcus and Pneumococcus Reference Laboratory, Glasgow Royal Infirmary, Glasgow, United Kingdom and College of Medical, Veterinary & Life Sciences, University of Glasgow, Glasgow, United Kingdom; [5]Irish Meningitis and Meningococcal Reference Laboratory, Temple Street Children's University Hospital, Dublin, Ireland; [6]Department of Paediatrics, University of Oxford, John Radcliffe Hospital, Oxford, United Kingdom*

Background: In September 2015, Bexsero®, targeted to serogroup B meningococcus, was introduced into the UK childhood immunisation

schedule. The Meningococcal Antigen Typing System (MATS) established coverage estimates for Bexsero® of 73% in England and Wales, assessing phenotypic and functional properties of circulating meningococci from 2007–08. The increasing availability of whole genome sequencing (WGS) allows rapid, scalable and real-time genomic analysis.

Aim(s)/Objective(s): To estimate Bexsero® coverage of UK isolates using genomic and genotype-phenotype modelling approaches.

Method(s): All culture-confirmed IMD isolates (n = 2016) from 2010–11 to 2013–14 from UK (Meningitis Research Foundation Meningococcus Genome Library) and Republic of Ireland were included. WGS were hosted on PubMLST database (http://pubmlst.org/neisseria/). The Bexsero® Antigen Sequence Type (BAST) scheme identified antigenic variants (fHbp, NadA, NHBA and PorA). Projection Pursuit Regression modelling predicted phenotype (MATS outcome) from genotype (sequence type) calibrated on 508 serogroup B isolates from 2007–08.

Results: Exact genotypic matches to vaccine BAST-1 (≥1 matching antigen) reduced over time, from 179/582 (30.8%) in 2010–11 with to 100/439 (22.8%) in 2013–14. Considering cross-reactive antigens, coverage ranged from 58.3–60.3%. Using genotype-phenotype modelling, MATS outcome was predicted for 887/1393 (63.7%) serogroup B isolates, mean coverage estimate across four years was 66.1% (95% CI 61.5–70.7%).

Discussion and/or Conclusion(s): The variation in genotypic analysis of vaccine antigens and that described by MATS, may be due to secular changes in the bacterial population or different experimental approach. WGS allows detailed analysis of vaccine antigens, but does not take into account cross-reactivity or protein expression. We further demonstrate an example of combining a stable genomic BAST nomenclature with phenotypic data.

ID: 5127

Financial analysis of carbapenemase producing Enterobacteriaceae acquisitions post infection control cohort ward introduction in an Irish tertiary hospital

Nuala O'Connell[1], Patricia Treacy[2], Eimear O'Donovan[2], Alan O'Gorman[3], Marion Commane[2], Lorraine Power[2], Maureen O'Hara[4], Siobhan Barrett[3], James Powell[5], Ruth Martin[3], Barbara Slevin[6]. *[1]UL Hospital Group Limerick, [2]Ul Hospitals Group, [3]UL Hospitals Group, [4]Ul Hospitals group, [5]Ul Hospitals Limerick, [6]UL Hospitals Limerick*

Background: The emergence and spread of carbapenemase producing Enterobacteriaceae (CPE) is a clinical and public health concern both nationally and internationally. In this hospital, the first documented case of CPE was described in 2009 and since then the number of new cases has risen exponentially year on year since 2013 accounting for 53% of the total national burden in 2015.

Aim(s)/Objective(s): The aim of a quality improvement project (QI) was to reduce newly identified CPE cases from 27 (the total for the first 6 months in 2015) to 13 for the first 6 months 2016. It was opportune to review all aspects of the management of CPE from a QI perspective including financial costs and the impact of an infection cohort ward.

Method(s): A series of PDSA cycles were undertaken, as a consequence of baseline audits, to enhance compliance with CPE infection prevention and control processes around screening and diagnostics, hand hygiene, care bundles for devices and contact precautions. The daily cost of each of the patients in the project group and an average cost per night identified for each bed night attributable to the CPE care element of the patient stay was calculated.

Results: Sixteen new CPE cases were identified for the first 6 months of 2016 with a cost saving of €682,086 for this time frame.

Discussion and/or Conclusion(s): The impact of the QI measures utilised have evidenced a safer, more efficient and higher quality of care provided to the patient population on the cohort ward.

ID: 5145

Disappearing dysgalacticae? Group C&G streptococcus epidemiology in North West London

William Nevin[1], Luke Moore[2], Shiranee Sriskandan[3], Lionel Tan[3]. *[1]Chelsea and Westminster Hospital NHS Foundation Trust, [2]Imperial College Healthcare NHS Trust, [3]Imperial College London*

Background: Group C and G streptococci (GCS, GGS) are associated with pharyngitis and skin/soft tissue infections, and bear genetic similarities to Group A Streptococcus (GAS). Increased incidence of invasive GAS in the UK suggests analysis of the epidemiology of GCS/GGS is warranted.

Aim(s)/Objective(s): To identify epidemiological trends in GCS/GGS isolates among beta haemolytic streptococci (BHS) in community and inpatient settings across a population of 2.5 million in North West London, over six years.

Method(s): All BHS isolates were retrospectively identified from clinical samples submitted to a centralised laboratory serving the study population from March 2009-February 2015.

Results: Community: 9069 BHS isolates were identified. There was a negative temporal correlation in the proportion of GCS/GGS among BHS from 27% in 2009 to 12% in February 2015 (rs −0.66, $p < 0.001$), concomitant with a fall in GAS from 38% to 22% (rs −0.44, $p < 0.001$). Hospital: 2670 BHS isolates were identified. For GCS/GGS as a proportion of BHS there was again a negative temporal correlation from 18% in 2012 to 12% in 2015 (rs −0.52, $p = 0.002$), yet GAS rose from 10% to 19% (rs + 0.40, $p = 0.02$).

Discussion and/or Conclusion(s): Among BHS, GCS/GGS from community and hospital samples fell between 2009 and 2015. A less significant fall was seen in GAS in the community, yet GAS in a hospital setting increased. This is in keeping with increased invasive GAS incidence under investigation by Public Health England. The concomitant fall in GCS/GGS warrants further investigation of transmission patterns, including network analysis and molecular virulence and fitness.

ID: 5150

Impact of an online web module with real time feedback on data entry and compliance to hand hygiene, the case of the Belgian hand hygiene campaigns

Sylvanus Fonguh[1], Boudewijn Catry[1], Anne Simon[2]. *[1]Scientific Institute Of Public Health Belgium, [2]Université Catholique Louvain (UCL)*

Background: Nation-wide campaigns to promote hand hygiene in Belgian hospitals have been ongoing since 2005. The campaigns combined educational sessions for healthcare workers, promotion of alcohol-based hand rubs and patient awareness. Hand hygiene compliance of healthcare workers was measured by direct observation and data transferred by email to the Scientific Institute of Public Health (WIV-ISP), between 2005 and 2011. A new web tool compatible with wireless tablets was developed in 2013 for both direct data entry and real time feedback to hospitals.

Aim(s)/Objective(s): The objective of the web tool was to provide hospitals with a user friendly password protected system for easy/direct data entry and real time performance feedback.

Method(s): Using SharePoint technology, an observation roster standardised according to World Health Organisation specifications was designed and built for data entry. The data entered are stored directly into tables in an SQL database. Data integrity and validity are automatically done upon entry. SAS Enterprise Guide is then used to analyse data using SAS stored processes and results are then reported back to hospitals depending on the selection made from the prompts.

Results: The number of opportunities (compliance rates) before intervention increased from 73,663 (49.6%) during the first campaign to 123,204 (64.1%) during the fifth campaign when the tool was introduced.

Discussion and/or Conclusion(s): Though the key factors for success include among others the multimodal nature of the campaigns, the political and financial support from the government, the highest number of observed opportunities and compliance rates recorded in 2013 can also be attributed to the new online tool.

ID: 5182

Identifying preventable Gram-negative bloodstream infections

Conor Bowman, Damien Mack, Robin Smith, Susan Hopkins. *Royal Free London NHS Foundation Trust*

Background: In England, from 2010 to 2014, *Klebsiella* and *E. coli* bloodstream infections (BSI) rose 21% and 16% across England. The UK government ambition is to half preventable Gram-negative BSI by 2020.
Aim(s)/Objective(s): To identify the differences between these two pathogen BSIs to allow focused interventions to be developed.
Method(s): All *Klebsiella* or *E. coli* BSI at a university teaching hospital between 1/1/2014 and 31/12/2016 were extracted from the laboratory information management system. Clinical data was extracted from the patient clinical records and hospital administration system. A hospital-acquired BSI (HABSI) was defined as onset ≥ day 3 of the hospital admission.
Results: In 2014–2015, 458 *E. coli* and 172 *Klebsiella* BSI were detected. Patients with E. coli were less likely to be male (50% v 61%) and were older (median age 72y V 64y) than those with Klebsiella BSI. The greatest burden of HAI occurred in *E. coli* compared to *Klebsiella* (126 V 84 patients); though 48% of all *Klebsiella* were HABSI compared to 28% of *E. coli*. The top two commonest sources of BSI were urinary tract (*E. coli* 46% V *Klebsiella* 28%) and hepatobiliary (21% for both bacteria) infections. Preventable infections were assessed as very likely or possibly for 36% of *E. coli* and 47% of *Klebsiella* BSI, predominantly related to devices, procedures or inappropriate initial antibiotic therapy.
Discussion and/or Conclusion(s): There are significant demographic and clinical differences between *E. coli* and *Klebsiella* BSI. However targeting device insertion and care, surgical prophylaxis and empiric treatment guidelines could reduce these HABSI.

Topic: Tropical infections

ID: 4421

Transmission study of *Mycobactrium leprae* in household contact using polymerase chain reaction method in leprosy endemic area of Papua Indonesia

Hana Krismawati[1], Antonius Oktavian[1], Yustinus Maladan[1], Tri Nury Kridaningsih[1]. *[1]National Institute of Health Research and Development- Institute of Research and Development for Biomedicine Papua*

Background: The new case number in Papua, easternmost part of Indonesia Archipelago is remained stable although so many efforts of leprosy elimination programs were carried out. It shows that the transmission of *Mycobacterium leprae* is actively happen.
Aim(s)/Objective(s): Aims of this study are to detect *Mycobacterium leprae* using Polymerase Chain Reaction (PCR) in asymptomatic household contact in order to observe the transmission of *Mycobacterium leprae* in early stage before the clinical manifestation and to observe the risk factors of transmission.
Method(s): This is cross sectional with descriptive design study. Sample population were 35 symtomatic leprosy patients and 4 asymptomatic household contacts for each patient. Environment factors that observed are periode of living with the patient, intencity and number of person in a house. The nasal swab, skin silt and blood samples was collected from all subjects. The DNA was extracted from nasal and skin silt.
Results: Thirty five leprosy patients and 107 asymptomatic household contacts were recruited as subjects in this study. The result show that *Mycobacterium leprae* can be detect on 100% leprosy patients and 19,62% of household contact using PCR. Risk factors that statistically significant associated with transmission of *Mycobacterium leprae* is the period of living together with leprosy patients (P: 0,002).
Discussion and/or Conclusion(s): The conclusion of this study is PCR can be used to detect *Mycobacterium leprae* in household contact without clinical cardinal sign as well as in leprosy patients with cardinal sign. The risk factors that influence the transmission of *Mycobacterium leprae* is the period of living together.

ID: 4828

Outpatient management of uncomplicated *P. falciparum* infection in returning travellers: benefits & barriers of implementation in a South-East London DGH setting

Edward Monk, Juliet Uwagwu. *Greenwich and Lewisham NHS Trust*

Background: Admission is recommended for all imported *Plasmodium falciparum* infections, despite studies in UK specialist and district settings claiming safe selective-outpatient management. We established admission criteria at Queen Elizabeth Hospital, Woolwich for *P. falciparum* and present potential benefits to outpatient management in a UK district general hospital and barriers to implementation.
Aim(s)/Objective(s): We aim to determine whether it is possible to implement an ED risk-assessment protocol for outpatient management of adult, uncomplicated *P. falciparum* infection safely. Objectives are to determine appropriate referral, audit documentation of outpatient/admission criteria and ascertain whether outpatient *P. falciparum* management is a rational pursuit.
Method(s): Patient notes were gathered for adults with *P. falciparum*-positive blood films between 01/08/2014 and 31/11/15 (protocol implementation from 01/03/2015) and searched retrospectively for documentation of criteria used to determine uncomplicated infection and suitability for outpatient management.
Results: During the study period, 52 adults were diagnosed with *P. falciparum* with 42.3%(22/54) eligible for outpatient management. 25.0%(13/52) had a heart rate >120 on admission, 17.3%(9/52) a parasitaemia of >2% and 13.5%(7/52) associated AKI. Of the 13 patients suitable for outpatient management after pathway implementation, 0 were referred to outpatient services. All had uneventful admissions. Average admission was 2.05 days; 29 hospital-bed-days could have been saved with appropriate outpatient referral-pathway use.
Discussion and/or Conclusion(s): Improved staff education and referral-pathway awareness is required to assess the true feasibility of outpatient *P. falciparum* management; in theory it could save QEH 32 hospital-bed-days/year (approximately £12,800). Eligibility criteria were well-documented and suitable patients made quick recovery. High-powered, multi-centre studies are necessary to establish statistical safety.

ID: 5019

Diarrhoea in a returning traveller from Mexico

Marco Lee, Fauzia Rizwan*Leeds Teaching Hospitals NHS Trust.*

Background: A 72 year old female, normally fit and well, returned from a one month visit to Mexico City. She ate at local restaurants on many occasions and developed acute onset diarrhoea. She attended private clinics twice and was given courses of ciprofloxacin and cephalexin. Symptoms did not improve. On arrival to UK, she had symptoms of abdominal bloating, vomiting, and type 7 stools.
Results: A bloodborne virus screen (HIV, HBV, HCV) was negative. Stools were negative for Campylobacter, Salmonella, Shigella, *E. coli* 0157, rotavirus, adenovirus, and *C. difficile* toxin. A stool OCP revealed Cyclospora cayetanensis oocysts. Diarrhoea improved within 3 days of starting oral co-trimoxazole. She was discharged to complete a 7 day course with routine follow-up in the infectious diseases outpatient clinic.

Discussion and/or Conclusion(s): *C. cayetanensis* is a coccidian protozoan parasite. The diarrhoea is usually self-limiting, but can be prolonged (lasting weeks to months if untreated), copious, and explosive. Transmission occurs by ingestion of contaminated food and water. It is endemic in many countries including Mexico. Outbreaks occur because the oocysts are resistant to standard water chlorination treatments.
Standard laboratory procedures for OCPs do not detect Cyclospora. The laboratory should be notified that Cyclospora is considered. Special techniques to identify Cyclospora include acid-fast stains, safranin stains, and lactophenol cotton blue stains.
Public Health England[3] recommends that returning travelers from Mexico with diarrhoea are tested for Cyclospora. Positive cases should be reported to PHE and samples referred to the Cryptosporidium Reference Unit in Swansea for confirmation and typing.

ID: 5144
Novel porcine model of cutaneous myiasis for training of removal

Daniel Burns[1], Mark Bailey[2], Major Kieran Campbell[3]. *[1]Army Medical Directorate Birmingham Heartlands Hospital, [2]Birmingham Heartlands Hospital and the Royal Centre for Defence Medicine, [3]British Army*

Background: Cutaneous myiasis caused by the tumbu fly Cordylobia anthropophagia in the African tropics and the bot fly *Dermatobia hominis* in Latin America is a common well reported skin complaint both of travellers and residents of endemic areas. The British Army frequently exercises overseas, and in particular soldiers exercising in the Belize jungle are at risk of developing bot fly infestation. While the larvae can be easy to remove in the early stages, late instars, particularly of *Dermatobia hominis* often require surgical removal.
We developed a novel porcine model of botfly removal to aid in the training of medical staff deploying on exercises in areas with endemic cutaneous myiasis. Commercially obtained maggots were inserted under the skin of a pig's trotter which had been prepared to replicate a typical lesion. Students received a lecture on cutaneous myiasis, including a video and photos of removal, before having multiple attempts at the practical, safe removal of larvae from the botfly model using a cruciform incision and simple surgical tools under supervision. They received feedback on their performance. Students reported an increase in confidence in their ability to safely remove larvae after their training. Usefully, training materials are easily obtained from a butcher's and tackle shop making this model cheap and easy to replicate.

ID: 5173
Beyond the pail: two cases of brucellosis in travellers returning from India

Kathryn French, Helen Jones. *The Royal Wolverhampton NHS Trust*

Background: A 70-year-old woman, Mrs X, presented with fever and loin pain. Imaging revealed a psoas abscess at the level of L4. In the meantime, the patient's husband, Mr X, was admitted to the hospital with fever and loss of appetite. On review of the clinical history, it was revealed that both patients had recently travelled to the Punjab area of India and to Spain. After four days of incubation, an organism was isolated from Mrs X's blood culture. Although not identified on routine MALDI-ToF mass spectrometry, the organism was confirmed as *Brucella melitensis*. A few days later the same organism was isolated from her husband's blood culture.
Discussion: Mr and Mrs X had non-focal and focal brucellosis respectively. The couple had mostly likely acquired the disease during their recent trip to the Punjab where they reported drinking unpasteurised milk supplied by a local farmer. The incidence of brucellosis in many parts of the world, particularly Asia, remains largely unknown. The WHO recognises the disease may be endemic in India and is likely to be under diagnosed and under reported.
Learning Points
- *Brucella melitensis* is not reliably identified by MALDI-ToF mass spectrometry in a clinical laboratory. This has the potential to complicate the diagnostic process and delay appropriate patient management.
- Despite understanding the need to boil milk prior to consumption, Mr and Mrs X did not always adhere to this advice. This highlights the significant role of human behaviour in the acquisition and transmission of infectious diseases.

Topic: Viral infections

ID: 4768
"Hear hooves, think zebras, not horses" – Case series: Atypical presentations of Hepatitis E

Charlotte Brookfield, Dimitrios Mermerelis, Joel Paul. *Pennine Acute Hospitals Trust*

Background: Hepatitis E (HEV) is generally a mild infection but can be associated with severe disease and atypical manifestations. G3, the commonest genotype seen indigenously in the UK, is spread mainly by consumption of pork products and is increasing in incidence. HEV is not commonly considered in the initial differential diagnosis or investigations for patients with abnormal liver function tests.
Aim(s)/Objective(s): Here we present four recent cases of confirmed HEV infection where this was not considered likely from the initial clinical presentations.
Method(s): Patient case records were reviewed.
Results: Case one was a twenty-three year old man with a background of diabetes and substance abuse. Initial management was based on a presumed paracetamol overdose. Case two was a middle aged woman who presented with weakness, dry cough, and back pain. This patient required intensive care support for Guillian-Barré Syndrome. The third case was a seventy-seven year old gentleman who presented with bronchopneumonia requiring ITU support where he was noted to be jaundiced. The fourth case was an eighty year old man who enjoyed good health until presenting with weight loss and jaundice. He was investigated for pancreatic malignancy and gall bladder pathology.
Discussion and/or Conclusion(s): In common, all these patients had deranged ALT and bilirubin but a normal INR. None of these patients had HEV considered early in their presentation although they were screened for the other hepatitis viruses. We present these cases to remind people to consider HEV as an increasing cause of typical and atypical presentations of hepatitis.

ID: 4785
The prevalence of human herpesvirus-6 central nervous system infection in the paediatric population in Lothian

Fiona Hamilton[1], Fraser Barbour[2], Kate Templeton[3]. *[1]Specialist Virology Centre, [2]University of Edinburgh, [3]Royal Infirmary of Edinburgh*

Background: Encephalitis is a severe neurological disease associated with multiple sequelae, high healthcare costs and mortality. Causes of encephalitis include a range of infectious and non-infectious disease processes. The majority of cases result from viral infection. The aetiology of encephalitis remains unknown in up to 58% of cases in the UK (Granerod *et al*., 2010).
Aim(s)/Objective(s): Real-time polymerase chain reaction (PCR) is central to the diagnosis of viral encephalitis and identification of the causative pathogen. However Human Herpesvirus-6 (HHV-6), which is known to be a cause of encephalitis, is not routinely screened for in the UK. This study aims to determine the prevalence of neurological infection of HHV-6 in the paediatric population in Lothian throughout 2015.
Results: Using real-time PCR, 427 cerebrospinal fluid (CSF) samples were tested for HHV-6. HHV-6 was identified in 25 samples. As HHV-6 DNA can be congenitally integrated into the host genome corresponding blood samples were also tested. 10 of the patients had corresponding blood samples tested. 2 of these samples were negative

in the blood and positive in the CSF indicating a likelihood of active infection.
Discussion and/or Conclusion(s): Identification of the aetiology of encephalitis is crucial to the management of the condition and this study provides evidence that suggests the inclusion of HHV-6 in routine diagnostic screening of CSF may be beneficial in management.

ID: 4791
Use of genome sequencing to identify hepatitis C virus transmission in a renal healthcare setting

Mark Garvey, Kerry Holden, Craig Bradley, Erasmus Smit, Peter Hewins, Pauline Jumaa. *University Hospitals Birmingham NHS Foundation Trust*

Background: Hepatitis C virus (HCV) is a significant human pathogen affecting nearly 3% of the world's population and is a leading cause of chronic liver disease including cirrhosis and hepatocellular carcinoma. There are several risk factors for haemodialysis patients acquiring HCV infection including: lifestyle risk factors; treatment-related infections; haemodialysis procedures; noncompliance by health care workers with standard infection control precautions.
Aim(s)/Objective(s): We describe the investigation and management of a case of transmission of HCV in a Renal unit.
Method(s): NS5B sequencing identified a healthcare associated HCV transmission and was used to guide our investigations. An outbreak team was convened and infection control audits were undertaken on the affected areas.
Results: Based on infection control inspections we identified multiple routes of potential transmission from poor hand hygiene, inappropriate PPE usage, environmental cleanliness issues and issues around phlebotomy practice using reusable Asceptic Non Touch Technique (ANTT) trays. We found multiply phlebotomy procedures reusing ANTT trays which were often inadequately cleaned in some instances being soiled with blood. Disposable ANTT trays are now used for separate phlebotomy procedures. Despite the fact that the exact route or routes of infection were not identified, inappropriate hygiene standards in parenteral treatment leading to viral hepatitis transmission was the likely source of transmission.
Discussion and/or Conclusion(s): The report highlights that transmission of healthcare-associated HCV infection continues to occur. The results suggest that use of NS5B sequencing can reduce ambiguity about potential transmission events in healthcare and inform infection prevention control about the routes of transmission.

ID: 4812
Post-exposure prophylaxis of seasonal influenza in hospitalized patients

Ons El Hayet Ben Ismail, Jennifer Hart, Tehmina Bharucha, Beatrice Cockbain, Neal Marshall, Paul Griffiths, Tanzina Haque, Dianne Irish, Tabitha Mahungu. *Royal Free NHS Trust*

Background: Neuraminidase inhibitors (oseltamivir or zanamivir), are licensed for the antiviral treatment and prophylaxis of seasonal influenza. The National Institute for Health and Care Excellence (NICE) has provided guidance stating that they can be used for chemoprophylaxis in persons in specified at-risk groups following exposure to virologically confirmed influenza infection if they are not adequately protected by vaccination.
Aim(s)/Objective(s): To characterize the use of neuraminidase inhibitors for influenza post-exposure prophylaxis.
Method(s): We performed a retrospective review of all hospitalised patients who received antiviral prophylaxis after influenza exposure during the 2015–2016 influenza season.
Results: 150 patients had confirmed exposure to an influenza infection. Of these, 110 (73%) were over 65 years, 7 (5%) were pregnant, 2 (1%) were children under six months of age, 39 (26%) were diabetic, 94 (63%) had one or more chronic conditions (cardiovascular/liver/neurological/renal/respiratory), 21 (14%) had severe immunosuppression, 4 (3%) were obese and 3 (2%) did not have any risk factors. Influenza vaccination status was not recorded for any of the patients. The median length of stay was 20 days (range 2–165 days).
149/150 patients received oseltamivir prophylaxis and one patient received zanamivir prophylaxis. 2/150 of our patients developed influenza A in hospital while on prophylaxis. One of them was a stroke patient on inhaled Zanamivir and the other had only 7 days of oseltamivir prophylaxis.
Discussion and/or Conclusion(s): Antiviral drugs should not be used as a substitute for influenza vaccination. It is more cost-effective to vaccinate individuals as opposed to offer chemoprophylaxis. Opportunities to vaccinate long stay patients in hospitals should be explored.

ID: 4967
The use of a point of care test for influenza on the medical assessment suite: Experience of a tertiary referral centre 2015/2016

Shirelle Burton-Fanning, Sheila Waugh, Brendan Payne, Jayne Harwood, Chris Gibbins, Manoj Valappil, Ashley Price. *Newcastle upon Tyne Hospitals NHS Foundation Trust*

Background: Influenza infections can pose significant health care burden during winter months. UK guidance advises that patients with suspected influenza are isolated to reduce transmission, and where indicated, antiviral treatment should be started within 48 hours of presentation. An audit of isolation of patients with influenza during the previous year had shown that only 41% of patients admitted via the medical assessment suite (AS) were empirically isolated due to limited isolation facilities.
Aim(s)/Objective(s): We describe our experience with introduction of a commercial molecular assay as a point of care test (POCT) in the AS during the 2015/16 season for rapid diagnosis of Influenza to improve of the management of patients and reduce exposure to susceptible contacts.
Method(s): A Cepheid GeneExpert™ analyser was placed in a designated testing area in the AS. Junior medical staff in the unit were trained to perform the test. Standard operating procedures for the collection and analysis of the samples and written guidance on management of patients and their contacts were provided. Electronic records were interrogated to obtain data on time of admission, result availability, isolation and antiviral prescription for 2014/15 and 2015/16.
Results: Interim data analysis showed significant reductions in:
- Median time from admission to result availability (38 hours to 4 hours)
- Median time to isolation/discharge (16 hours to 7 hours)
- Median time to initiation of antiviral treatment (37 hours to 15 hours).

Discussion and/or Conclusion(s): Interim data indicates POCT for influenza on the assessment suite aids the management of patients with influenza and reduces exposure to susceptible contacts.

ID: 4972
Norovirus disease leads to higher hospitalization rates in older adults with chronic medical conditions

Thomas Verstraeten[1], Baoguo Jiang[2], John Weil[3]. *[1]P95 Pharmacovigilance and Epidemiology Services, [2]Takeda Development Center Americas, [3]Takeda Pharmaceuticals International*

Background: Norovirus is the main cause of acute gastroenteritis across all age groups. Older adults are particularly at risk of severe disease potentially leading to hospitalization. An estimated 86% of US adults over 65 have at least one, and 61% more than one chronic medical condition.
Aim(s)/Objective(s): We assessed the impact of norovirus acute gastroenteritis (NGE) on hospitalizations among older US adults with various chronic underlying conditions.
Method(s): Retrospective cohort study using MarketScan data 2002 to 2013, comparing rates of hospitalizations for NGE in patients with one or more chronic conditions (renal, cardiovascular, respiratory,

immunocompromising, gastrointestinal, hepatic/pancreatic and neurological conditions and diabetes) as compared with a healthy age-matched population. We estimated rates of hospitalizations for NGE using an indirect modeling approach, stratified into 65–74, 75–84 and 85+ year-old age groups.
Results: In our study, 82.2% and 57.2% of elderly adults had one or more than one chronic condition, respectively. Hospitalization rates for NGE were higher in all risk groups compared with otherwise healthy subjects. Highest rates were among those with renal conditions (23.9–40.3 episodes per 10,000 person-years across the increasing age groups), compared with 2.9–11.5 episodes per 10,000 person-years among those without chronic conditions. Among those with more than one chronic condition, hospitalization rates were mostly increased in the 65–74 year-olds (5.5 compared with 2.9 episodes per 10,000 person-years).
Discussion and/or Conclusion(s): Norovirus gastroenteritis leads to significantly higher hospitalization rates in older adults with a chronic medical condition compared with otherwise healthy older adults. Chronic renal patients are at particularly high risk.

ID: 4978
Norovirus gastroenteritis as a cause of nosocomial infections among hospitalized patients in Germany

Frank Kowalzik[1], Daniela Zöller[2], Harald Binder[2], Thomas Verstraeten[3], Ralf Clemens[4], Fred Zepp[1]. *[1]Paediatric Department, University Medical Center of the Johannes Gutenberg University, [2]Institute of Medical Biostatistics, Epidemiology and Informatics, University Medical Center of the Johannes Gutenberg University, [3]P95 Pharmacovigilance and Epidemiology Services, [4]GRID Europe Consult, Mainz*

Background: Noroviruses are the most important global cause of acute gastroenteritis (AGE) across all age groups. Testing for norovirus in patients hospitalized with AGE is incentivized in Germany because a positive diagnosis impacts reimbursement.
Aim(s)/Objective(s): We estimated the number of nosocomial infections overall and by age-group for norovirus gastroenteritis (NGE) using official/federal German databases.
Method(s): All hospitalizations in Germany are registered with the German Federal Statistics Office (DESTATIS). We extracted aggregate data for patients hospitalized with NGE (ICD-10 codes A08.1) as primary or non-primary diagnosis for the period 2007–2012. Cases with a non-primary diagnoses were assumed to be due to nosocomial infection.
Results: During the six-year study period and based on our assumption, there were a total of 241,667 nosocomial NGE cases among hospitalized patients in Germany; an average of 40,278 nosocomial cases per year studied (range 32,259–57,561). In any study year the number of nosocomial NGE cases was 1·3 to 1·7-fold higher than the number of community acquired NGE hospitalizations. The average duration of hospitalization was 3.4 to 4.5-fold longer (17–18 days versus 4–5 days) when NGE was a non-primary diagnosis and considered nosocomial. Adults of 85 years of age and older suffered the highest rate of nosocomial NGE cases (range 33·6–59·1/10,000 population).
Discussion and/or Conclusion(s): Noroviruses are an important cause of nosocomial infections among hospitalized patients in Germany. Assuming all non-primary coded NGE episodes to be nosocomial in nature may have lead to an overestimation.

ID: 4992
Case series of parechovirus in neonates and infants in Leicester UK

Christopher Holmes[1], Ayushi Patel[1], Fadwa Elsanousi[1], Srini Bandi[1], Rachel Speight[1], David Allen[2], Julian Tang[1]. *[1]University Hospitals of Leicester NHS Trust, [2]Public Health England*

Background: First described in the 1960s, parechoviruses (PeV) belong to the family Picornaviridae and are non-enveloped, single-stranded, positive-sense RNA viruses. There are multiple genotypes, but PeV genotype 3 in particular has a noted association with severe disease in neonates and infants. Currently there is no specific antiviral drug or vaccine against this virus.
Aim(s)/Objective(s): To describe an unexpected series of PeV cases in a local paediatric population.
Method(s): In infants who present to the emergency department at Leicester Royal infirmary with signs of sepsis (including fever, lethargy, poor-feeding, irritability) a lumbar puncture is performed as part of the routine septic work-up and the cerebrospinal fluid (CSF) is referred to microbiology for viral PCR testing, including HSV, VZV, enterovirus and PeV.
Results: During May–June 2016 PeV was detected in the CSF of 15 (and counting) neonates and infants (median age 33 days; range 8–197 days). In addition, for one severely ill neonate on intensive care, further testing also demonstrated the presence of PeV RNA by PCR testing in faeces, blood, a broncho-alveolar lavage (BAL) and a throat swab, confirming disseminated PeV infection. All samples have been sent to the PHE reference laboratory for viral sequencing and phylogenetic analysis.
Discussion and/or Conclusion(s): Since the introduction of this PeV CSF PCR assay in our laboratory, three years ago, there have only been a few cases detected per year so these cases represent an unusual surge in numbers. Further clinical details and molecular epidemiological analysis will be presented and possible reasons for this sudden rise in cases discussed.

ID: 5043
Local screening for multiple viral respiratory tract pathogens in a District General Hospital; is it worthwhile?

Paul Turner[1], Matthew Harvey[2], Ben Clayton[2], Tamsin McAllister[2], Siba Paul[2]. *[1]Torbay and South Devon NHS Foundation Trust, [2]Dept of Paediatrics, Torbay and South Devon NHS Foundation Trust*

Background: Torbay and South Devon NHS Foundation Trust introduced an extended panel for screening Respiratory Tract viruses in 2014–2016 (FTD Respiratory pathogens 21). Testing was undertaken within the Microbiology department seven days a week and covered 2 consecutive winter periods.
Aim(s)/Objective(s): To determine the usefulness of extended molecular Respiratory testing on patient management and outcomes.
Method(s): Pathogens tested for included RSV A/B, influenza A, influenza A (H1N1 pdm09), influenza B, adenovirus, rhinovirus, metapneumovirus A/B, coronavirus (HKU1, 229E, OC43, NL63), bocavirus, enterovirus, parainfluenza virus (1–4), parechovirus as well as *Mycoplasma pneumoniae*. This extended screen was applied to symptomatic children admitted to hospital who were RSV Antigen negative on NPA and adult symptomatic patients were either immunocompromised (haematology and oncology) or on ICU with community acquired pneumonia. Over 1500 samples were tested during this period.
Results: For children, analysis showed that co-infection was common and that a positive result correlated with shorter duration of inpatient stay. For adults, screening showed that both influenza and RSV infections had been underdiagnosed/ missed, particularly for critically ill patients. Screening symptomatic patients on admission led to improved infection prevention and control measures and better cohorting including those managed on ITU and a Respiratory ward. Many immunocompromised patients had co-infections making cohorting more problematic.
Discussion and/or Conclusion(s): Following these findings, new algorithms for testing both short and long respiratory PCR panels are being introduced for patients admitted during the winter of 2016/17.

Journal of Hospital Infection 94S1 (2016) S135–S144

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevierhealth.com/journals/jhin

Author index

Aarons, E., S107 (ID: 4868)
Abbott, G., S28 (ID: 4808)
Abboud, S., S103 (ID: 5087)
Abdel-Magied, M.A., S94 (ID: 4449)
Abdolrasouli, A., S68 (ID: 5179)
Abdou, M.M.M.E.A., S94 (ID: 4449)
Abduzaimovic, A., S89 (ID: 4433)
Abela, N., S73 (ID: 4423)
Abid, A., S44 (ID: 4991), S44 (ID: 4993)
Ablorh, R., S65 (ID: 4830)
Abu-Rajab, R., S82 (ID: 4471)
Adams, D., S99 (ID: 5078)
Adams, E., S70 (ID: 4579)
Adams, K., S16 (ID: 5012)
Adcock, J., S72 (ID: 5102)
Addidle, M., S95 (ID: 4625)
Adé, A., S115 (ID: 4485)
Adedeji, A., S103 (ID: 4378)
Adeniji, J., S102 (ID: 4854)
Aggarwal, R., S118 (ID: 4697)
Agodi, A., S83 (ID: 4709), S87 (ID: 4764)
Agreiter, I., S66 (ID: 4852)
Ahir, H., S93 (ID: 5111)
Ahmad, R., S1
Ahmad, R., S13 (ID: 4479), S45 (ID: 5022), S95 (ID: 4506)
Ahmed, M.S., S32 (ID: 5067), S32 (ID: 5068)
Ahmed, MO, S115 (ID: 4477), S116 (ID: 4514)
Ahmed, R.N., S94 (ID: 4449)
Aiken, S., S70 (ID: 4714), S70 (ID: 4715)
Aitken, I., S123 (ID: 4939)
Akinbame, O., S93 (ID: 5095)
Akkielah, L., S29 (ID: 4835)
Akpan, M., S45 (ID: 5022)
Al-agouz, M.S., S94 (ID: 4449)
Alajmi, S., S28 (ID: 4827)
Albalawi, L.N., S28 (ID: 4827)
Albiomy, M.M.A., S94 (ID: 4449)
Albur, M., S57 (ID: 4678)
Aldwinkle, P., S48 (ID: 5147)
Alendar, F., S89 (ID: 4433)
Aleshkin, A., S26 (ID: 4776)
Alexander, K., S45 (ID: 5031)
Alexandrova, I., S69 (ID: 4492)
Al-Hajeri, S., S115 (ID: 5046)
AL-Hajjeh, A., S82 (ID: 4502)
Alhamad, A., S104 (ID: 4522)
Alharbi, O., S104 (ID: 4522)
Ali Daw, M., S116 (ID: 4514)
Ali, S., S68 (ID: 5160), S88 (ID: 4983)
Alias, A.M., S46 (ID: 5048), S59 (ID: 4838)
Alicino, C., S121 (ID: 4842), S122 (ID: 4844)
Aliyu, S., S17 (ID: 4984), S41 (ID: 4832), S56 (ID: 5017)
Aljadoa, A., S104 (ID: 4522)
Aljishi, Y., S29 (ID: 4835)
Aljohani, K., S18 (ID: 4420), S72 (ID: 5029)
Alkasaby, N., S24 (ID: 4369)
Alkathlan, M., S29 (ID: 4835)
Allen, C., S42 (ID: 4880)
Allen, D., S134 (ID: 4992)
Allen, J., S79 (ID: 5106)
Almaghrabi, R., S29 (ID: 4835)
Almatroudi, A., S19 (ID: 4809)
Almohaimede, K., S104 (ID: 4522)
Alnomasy, S., S62 (ID: 5093)
Alotaibi, M., S104 (ID: 4522)
Alotaibi, T., S104 (ID: 4522)
Alrajhi, A., S28 (ID: 4827), S29 (ID: 4835)
Alshurtan, K., S28 (ID: 4827)
Alsubaie, A., S104 (ID: 4522)
Al-Talib, M., S38 (ID: 4750)
Althawadi, S., S28 (ID: 4827)
Altunel, M., S27 (ID: 4798), S51 (ID: 4799)
Amariei, N., S30 (ID: 4901)
Ambalkar, S., S78 (ID: 5050)
Amin, I.M., S25 (ID: 4706)
Amour, S., S112 (ID: 4656)
Andersen, T.E., S73 (ID: 5164)
Anderson, E., S11 (ID: 4815), S11 (ID: 4836)
Anderson, K., S48 (ID: 5147)
Andrew Seaton, R., S13 (ID: 4779)
Ansaldi, F., S121 (ID: 4842)
Antonioli, P., S18 (ID: 4905)
Antony F, C., S111 (ID: 4710)
Anwar, A., S27 (ID: 4798), S51 (ID: 4799)
Ara, L., S67 (ID: 4981)
Armstrong-James, D., S68 (ID: 5179)
Arrigoni, C., S83 (ID: 4709)
Arunachalam, N., S53 (ID: 4885)
Asaoka, K., S57 (ID: 4513)
Ascroft, P., S127 (ID: 5015)
Ashall, M., S87 (ID: 4971)
Ashiru-Oredope, D., S14 (ID: 5023), S45 (ID: 5022)
Ashley, E., S107 (ID: 4863)
Ashton, C., S25 (ID: 4728)
Asimakopoulos, P., S49 (ID: 4575)
Astagneau, P., S115 (ID: 4485), S128 (ID: 5033)
Atiya, N., S97 (ID: 4843)
Atkinson, B., S107 (ID: 4868)
Atkinson, R.A., S22
Auckland, C., S100 (ID: 5103), S90 (ID: 4760)
Augustithis, G.A., S82 (ID: 4471)
Austin, T., S60 (ID: 4941)
Auxilia, F., S83 (ID: 4709), S87 (ID: 4764)
Awoniyi, D., S74 (ID: 4497)

Backx, M., S1
Badia, J.M., S114 (ID: 4947)
Badr, R., S123 (ID: 4888), S60 (ID: 4891)
Baggott, A., S47 (ID: 5132)
Bahia, H., S55 (ID: 4987)
Baho, S., S24 (ID: 4673)
Bailey, L., S91 (ID: 5004)
Bailey, M., S132 (ID: 5144)
Bajraktarevic, A., S89 (ID: 4433)
Baker, M., S1
Balakrishnan, I., S123 (ID: 4924), S61 (ID: 5009), S75 (ID: 4866), S76 (ID: 4922)
Bale, S., S84 (ID: 4720)
Balfour, A., S90 (ID: 4680)
Ball, D., S74 (ID: 4713)
Balwinder, B., S25 (ID: 4728)
Bamber, R., S32 (ID: 5052)
Banbury, L., S35 (ID: 4515)
Bandi, S., S134 (ID: 4992)
Banerjee, P., S52 (ID: 4814)
Bánsági, S., S85 (ID: 4902)
Bansal, D., S32 (ID: 5067)
Bao, L.X., S43 (ID: 4969)
Barberis, I., S122 (ID: 4844)
Barbour, F., S132 (ID: 4785)
Barchitta, M., S87 (ID: 4764)
Barker, Z., S124 (ID: 4945)
Barkham, T., S120 (ID: 4811), S12 (ID: 4894), S28 (ID: 4813), S75 (ID: 4757)
Barlow, G., S16 (ID: 5012)
Barnass, S., S107 (ID: 4863), S122 (ID: 4864)
Barnes, C., S122 (ID: 4864)
Barrett, S., S130 (ID: 5127)
Barry, M., S104 (ID: 4522)
Bartoloni, A., S127 (ID: 5013)
Battistini, A., S121 (ID: 4842)
Baumann, R., S74 (ID: 4497)
Baxter, M., S75 (ID: 4858)
Baylis, M., S1
Bayne, G., S40 (ID: 4824)
Bayston, R., S72 (ID: 5102)
Beadsworth, M., S77 (ID: 5011)
Beadsworth, M., S91 (ID: 5004)
Bedford, L., S17 (ID: 4984), S56 (ID: 5017), S72 (ID: 4938)
Begum, S., S44 (ID: 4988)
Behera, B., S27 (ID: 4793)
Belfield, K., S72 (ID: 5102)
Belhaj, W., S34 (ID: 5175)
Bell, C., S96 (ID: 4724)

Bellon, J., S20 (ID: 4738)
Belotti-Ehrhard, L., S19 (ID: 4848)
Bendels, I., S109 (ID: 4970)
Ben Ismail, O.E.H, S102 (ID: 4854), S85 (ID: 4909), S108 (ID: 4908), S127 (ID: 5020), S133 (ID: 4812)
Bennett, A., S71 (ID: 4904)
Bennie, M., S11 (ID: 4822), S38 (ID: 4744), S40 (ID: 4823), S40 (ID: 4824), S41 (ID: 4840)
Bentley, T., S70 (ID: 4579)
Bernatoniene, J., S33 (ID: 5082)
Berrington, A., S46 (ID: 5053)
Berry, L., S48 (ID: 5147)
Bexley, A., S98 (ID: 4979)
Bhagani, S., S48 (ID: 4539)
Bhandari, V., S26 (ID: 4758)
Bharucha, T.B., S15 (ID: 4918)
Bharucha, T., S108 (ID: 4908), S85 (ID: 4909), S120 (ID: 4786), S120 (ID: 4803), S127 (ID: 5020), S133 (ID: 4812)
Bhattacharya, S., S13 (ID: 4994)
Bicknell, K., S16 (ID: 4859)
Bielicki, J.A., S33 (ID: 5082)
Bihari, S., S93 (ID: 5097)
Binder, H., S134 (ID: 4978)
Bird, M., S20 (ID: 4872), S97 (ID: 4881)
Bird, S., S20 (ID: 4737)
Birgand, G., S114 (ID: 5007)
Bishop, C., S105 (ID: 4717)
Biswal, I., S78 (ID: 5032)
Blackmore, K., S55 (ID: 4989)
Blauth, C., S111 (ID: 4465)
Bleotu, C., S30 (ID: 4901)
Bloch, B., S100 (ID: 5086)
Blommaert, L., S105 (ID: 4719)
Bochkareva, S., S26 (ID: 4776)
Bodmann, K.-F., S12 (ID: 4963)
Boelens, J., S65 (ID: 4830)
Bogaert, D., S1
Bohlega, M., S28 (ID: 4827)
Boldock, E., S111 (ID: 5028)
Boli, A.O., S81 (ID: 4435)
Bond, A., S55 (ID: 4989)
Bond, H., S101 (ID: 5174)
Bonington, A., S29 (ID: 4845)
Bono, V.D., S122 (ID: 4844)
Boothby, M., S51 (ID: 4788)
Borg, G., S73 (ID: 4423)
Borg, M., S1, S73 (ID: 4423)
Borrow, R., S129 (ID: 5112), S129 (ID: 5114)
Bosch, T., S104 (ID: 4661)
Boswell, T., S106 (ID: 4853), S18 (ID: 4503), S89 (ID: 4540)
Boszczowski, Ícaro, S116 (ID: 4607)
Bouridane, M., S80 (ID: 5133)
Bovill, B., S15 (ID: 4711)
Bowman, C., S131 (ID: 5182)
Bowskill, G., S109 (ID: 5085)
Boyd, G., S105 (ID: 4717)
Bradley, A., S54 (ID: 4886)
Bradley, C., S113 (ID: 4878), S17 (ID: 4687), S2, S64 (ID: 4686)
Bradley, C., S133 (ID: 4791), S99 (ID: 5005)
Bradley, E., S58 (ID: 4773)
Braithwaite, A., S25 (ID: 4728)
Brandão, D., S116 (ID: 4607)
Brannigan, E., S122 (ID: 4879), S21 (ID: 4877)
Breathnach, A., S95 (ID: 4517)
Brehony, C., S129 (ID: 5112), S129 (ID: 5114)
Broder, M.S., S70 (ID: 4579)
Brookfield, C., S132 (ID: 4768), S58 (ID: 4773)
Broucke, C., S109 (ID: 4970)
Brown, N., S107 (ID: 4899)
Brown, S., S14 (ID: 5023)
Browne, J., S117 (ID: 4679)
Bruce, R., S46 (ID: 5053)
Bruchon, C., S112 (ID: 4656)
Brugués, M., S114 (ID: 4947)
Brusaferro, S., S2, S83 (ID: 4709)
Bryden, A.M., S63 (ID: 5180)
Bryson, G., S86 (ID: 5071)
Buchanan, R., S74 (ID: 4713)
Bucior, H., S99 (ID: 5078)
Budd, E., S14 (ID: 5023)
Bulanda, M., S120 (ID: 4821), S65 (ID: 4819)
Burgess, A., S15 (ID: 4711)
Burgess, P., S21 (ID: 4877)
Burkhart, P., S65 (ID: 4770)
Burnett, H., S90 (ID: 4760)
Burns, D., S132 (ID: 5144), S80 (ID: 5142)
Burns, K., S104 (ID: 4536), S37 (ID: 4700), S71 (ID: 4928), S124 (ID: 4943), S124 (ID: 4945)
Burton-Fanning, S., S133 (ID: 4967)
Butler, M., S16 (ID: 4998)
Butt, F., S107 (ID: 4863), S122 (ID: 4864)
Butt, M., S88 (ID: 5162)

Cabellos, C., S113 (ID: 4930)
Cairney, T., S43 (ID: 4969)
Cajic, V., S52 (ID: 4814)
Calisti, G., S45 (ID: 5031)
Camara, J., S125 (ID: 4953), S87 (ID: 4847)
Camerada, M.T., S18 (ID: 4905)
Campbell, M.K., S132 (ID: 5144)
Cargill, J., S61 (ID: 4959)
Carrara, V., S34 (ID: 4464)
Carratala, J., S113 (ID: 4930), S87 (ID: 4847), S125 (ID: 4953)
Carroll, A., S47 (ID: 5134)
Carson, J., S38 (ID: 4745)
Carter, Y., S123 (ID: 4924), S61 (ID: 5009), S125 (ID: 4957), S125 (ID: 4966)
Cartmill, I., S58 (ID: 4773)
Caselli, E., S18 (ID: 4905)
Casini, B., S66 (ID: 4912)
Castellanos, Álvaro, S64 (ID: 4553)
Castilho, R., S66 (ID: 4833)
Castro-Sanchez, E., S13 (ID: 4479), S95 (ID: 4506)
Catry, B., S105 (ID: 4712), S109 (ID: 4970), S130 (ID: 5150)
Centor, R., S2
Cervera-Jackson, R., S88 (ID: 5172)
Chalker, V., S110 (ID: 5171), S126 (ID: 4999)
Chalmers, L., S34 (ID: 4464)
Chan, D., S54 (ID: 4886)
Chan, D., S82 (ID: 4525)
Chandratillake, S., S25 (ID: 4728)
Chandy, M., S13 (ID: 4994)
Chang, E., S70 (ID: 4579)
Changez, H., S108 (ID: 4925), S55 (ID: 4931), S109 (ID: 5085)
Chapman, K., S128 (ID: 5058)
Charani, E., S47 (ID: 5122)
Chavda, A., S25 (ID: 4728), S50 (ID: 4742)
Chee, C., S28 (ID: 4813)
Cheema, I., S124 (ID: 4943)
Cheema, S., S53 (ID: 4871)
Chegou, N., S74 (ID: 4497)
Cheng, H.H., S61 (ID: 5064)
Chesterfield, H., S60 (ID: 4941)
Chesterton, L., S106 (ID: 4853), S106 (ID: 4862)
Chifiriuc, C., S30 (ID: 4917)
Chifiriuc, M.C., S30 (ID: 4901)
Child, C., S45 (ID: 5031)
Child, J., S67 (ID: 4986)
Chiwera, L., S111 (ID: 4465)
Chmielarczyk, A., S65 (ID: 4819)
Choucair, J., S103 (ID: 5087)
Choudhury, S., S91 (ID: 4893)
Chowdhury, D., S18 (ID: 4420), S19 (ID: 4809)
Chowdhury, J., S56 (ID: 4498)
Christie, M., S11 (ID: 4815)
Chu, C.S., S34 (ID: 4464)
Ciercoles, P., S113 (ID: 4930), S87 (ID: 4847)
Clarkson, A., S25 (ID: 4728)
Clarkson, D., S67 (ID: 4986)
Claxton, A., S32 (ID: 5057)
Claxton, P., S28 (ID: 4826), S76 (ID: 4870)
Clayton, B., S134 (ID: 5043)
Cleary, P., S25 (ID: 4695)
Cleaver, L., S15 (ID: 4807), S52 (ID: 4806)
Clemens, R., S134 (ID: 4978)
Clifford, E., S36 (ID: 4683), S36 (ID: 4685), S37 (ID: 4701)
Coccagna, M., S18 (ID: 4905)
Cockbain, B., S108 (ID: 4908), S85 (ID: 4909), S120 (ID: 4786), S127 (ID: 5020), S133 (ID: 4812)
Cockburn, A., S38 (ID: 4744), S39 (ID: 4771)
Codd, J., S28 (ID: 4808)
Coelho, J., S110 (ID: 5171)
Coia, J., S31 (ID: 4946), S79 (ID: 5126)
Cole, K., S98 (ID: 4979)
Coll, F., S107 (ID: 4899)
Collier, S., S96 (ID: 4747)
Collins, R., S112 (ID: 4681)
Colston, J., S101 (ID: 4684)
Coltel, N., S68 (ID: 5077)
Commane, M., S130 (ID: 5127)
Conlonl, P., S71 (ID: 4928)
Cook, H., S41 (ID: 4832)
Cook, I., S85 (ID: 4892)
Cooke, B., S69 (ID: 4571)
Cooke, R., S61 (ID: 4959)
Coomarasamy, A., S96 (ID: 4724)
Cooper, J., S70 (ID: 4714), S70 (ID: 4715)
Cordey, H.M., S63 (ID: 5180)
Cordina, C.M., S73 (ID: 4423)
Corless, C., S93 (ID: 5095)
Cormican, M., S51 (ID: 4794)
Costa, D., S66 (ID: 4833)
Costello, D., S104 (ID: 4536)
Cotrufo, M., S43 (ID: 4974)
Cottom, L., S108 (ID: 4925), S55 (ID: 4931)
Cox, H., S104 (ID: 4536)
Coyle, P., S122 (ID: 4855)
Cramp, E., S35 (ID: 4469), S42 (ID: 4880)
Crane, J., S81 (ID: 5165)
Creagh, F., S53 (ID: 4885)
Creigton, H., S51 (ID: 4794)

Crépey, P., S128 (ID: 5033)
Cristina, M.L., S87 (ID: 4764)
Cross, J., S34 (ID: 4464)
Cuervo, G., S113 (ID: 4930)
Cuesta, S., S64 (ID: 4553)
Cunin, V., S112 (ID: 4656)
Cunney, R., S129 (ID: 5112), S129 (ID: 5114)
Cunningham, R., S17 (ID: 4861)
Curran, T., S122 (ID: 4855)
Curtis, S., S43 (ID: 4974)
Curutiu, C., S30 (ID: 4901)

D'Accolti, M., S18 (ID: 4905)
D'Alessandro, D., S87 (ID: 4764)
D'Errico, M.M., S83 (ID: 4709)
Da Silva Neto, M., S40 (ID: 4772)
Daba, M.M.H., S94 (ID: 4449)
Dalziel, C., S109 (ID: 4977)
Danilov, G., S69 (ID: 4492)
Darley, E., S19 (ID: 4585)
Das, S., S56 (ID: 4470)
Daturi, V., S122 (ID: 4844)
Dau, A., S115 (ID: 4477), S116 (ID: 4514)
Dave, F., S29 (ID: 4845), S51 (ID: 4774)
Dave, J., S63 (ID: 5166), S74 (ID: 4713)
Davey, P., S12 (ID: 4961), S2
Davies, B.M., S22
Davies, B., S15 (ID: 4896)
Davies, E., S2
Davies, F., S122 (ID: 4879), S21 (ID: 4877)
Davies, H., S103 (ID: 5080)
Davis, S., S79 (ID: 5106)
Davison, S., S2
Daw, M.A., S115 (ID: 4477)
de Barra, E., S59 (ID: 4838)
De Beer, T., S20 (ID: 4738)
De Brabandere, E., S65 (ID: 4830)
De Geyter, D., S105 (ID: 4719)
de Sousa Santos, L.C., S72 (ID: 5029)
De Waegemaeker, P., S65 (ID: 4830)
Deb, M., S127 (ID: 5025)
Deboscker, S., S118 (ID: 4727), S126 (ID: 4976)
Dedicoat, M., S118 (ID: 4697), S3
DeFreitas, D., S71 (ID: 4928)
Defres, S., S101 (ID: 5178)
Delaney, I., S51 (ID: 4794)
Democratis, J., S16 (ID: 4998), S53 (ID: 4874), S60 (ID: 4884)
Denis, O., S109 (ID: 4970)
Denning, D.W., S92 (ID: 5037)
Denning, D., S16 (ID: 4998)
Denton, M., S71 (ID: 4928)
Denton, M., S118 (ID: 4708), S47 (ID: 5132)
Derry, F., S56 (ID: 5021)
Desai, M., S102 (ID: 4763)
Desai, N., S29 (ID: 4845)
Desai, N., S19 (ID: 4501), S44 (ID: 4988)
Deshmukh, A., S32 (ID: 5067)
Deshpande, A., S11 (ID: 4822), S61 (ID: 5062), S79 (ID: 5079), S99 (ID: 5083)
Deva, A., S18 (ID: 4420)
Devassy, T.P., S104 (ID: 4536)
Devine, S., S36 (ID: 4683), S36 (ID: 4685), S37 (ID: 4701)
Dhaeze, W., S109 (ID: 4970)
Dhamija, K., S79 (ID: 5089)
Dhillon, R., S3
Dhole, T., S93 (ID: 5097)
Dicks, S., S110 (ID: 5177)
Dickson, E., S109 (ID: 5085), S79 (ID: 5079)
Dineesh, B., S71 (ID: 4928)
Dinesh, B., S124 (ID: 4945)
Ditommaso, S., S68 (ID: 5139)
Dixit, A., S93 (ID: 5097)
Djurdjevic, A.D., S89 (ID: 4433)
Dnamodaran, S., S102 (ID: 4907)
Dodgson, A., S25 (ID: 4695)
Dodgson, A., S127 (ID: 5015)
Doerholt, K., S33 (ID: 5082)
Dolphin, H., S63 (ID: 5166), S74 (ID: 4713)
Dominguez, M.A., S125 (ID: 4953)
Donaldson, H., S14 (ID: 4867), S59 (ID: 4789)
Donlon, S., S104 (ID: 4536), S71 (ID: 4928), S124 (ID: 4943)
Downie, K., S40 (ID: 4772)
Drake, S., S14 (ID: 4913)
Drnda, A., S89 (ID: 4433)
Dryden, M., S44 (ID: 4991), S44 (ID: 4993)
DuBois, S., S48 (ID: 5147)
Duffy, D., S103 (ID: 5080)
Duffy, F., S104 (ID: 4536), S119 (ID: 4751)
Duguid, A., S38 (ID: 4729)
Dunbar, J., S101 (ID: 5174)
Duncan, C., S30 (ID: 4915)
Dunlop, P., S11 (ID: 4815)
Dunne, E., S124 (ID: 4943)
Dunne, K., S94 (ID: 5153)
Dyakova, E., S122 (ID: 4879)
Dzinovic, A., S89 (ID: 4433)

Eddison, T., S80 (ID: 5133)
Edwards, D., S110 (ID: 5171)
Edwards, F., S14 (ID: 4867)
Edwardson, A., S105 (ID: 4820)
Ekkelenkamp, M., S3
El Gamel, T., S96 (ID: 4748)
Elamin, W., S13 (ID: 4740), S14 (ID: 4883)
El-Bouzedi, A., S115 (ID: 4477)
Elela, M.G.A., S94 (ID: 4449)
Elfick, J., S122 (ID: 4864)
Elgohari, S., S113 (ID: 4775)
El-Hamad, R., S14 (ID: 4883)
Elhusseini, S., S94 (ID: 4449)
Ellis, J., S127 (ID: 5020)
El-Mugamar, H., S125 (ID: 4957)
El-Naqeib, N.N., S94 (ID: 4449)
Elsakka, N., S85 (ID: 4892)
Elsanousi, F., S134 (ID: 4992), S90 (ID: 4851)
Elsheiwi, S.R., S94 (ID: 4449)
Eltayeb, F., S89 (ID: 4552)
Elumogo, N., S110 (ID: 5171)
Elzimaity, D., S20 (ID: 4872)
Emond, J.-P., S77 (ID: 5008)
Endo, S., S57 (ID: 4513)
Enki, D., S17 (ID: 4861)
Enoch, D., S17 (ID: 4984), S41 (ID: 4832)
Eriksen, H.M., S113 (ID: 4775)
Ershova, O., S26 (ID: 4776), S69 (ID: 4492)
Evans, C., S79 (ID: 5106)
Evans, J., S47 (ID: 5134)
Evans, L., S84 (ID: 4767)
Evans, T., S36 (ID: 4698)

Faccio, V., S122 (ID: 4844)
Fadden, E.M., S119 (ID: 4751)
Farah, H., S29 (ID: 4860)
Faraoni, D., S73 (ID: 5148)
Farrelly, M., S119 (ID: 4751)
Farrelly, S., S93 (ID: 5136)
Farrington, B., S45 (ID: 5031)
Fatima, S., S58 (ID: 4773)
Fe Talento, A., S94 (ID: 5153)
Feasey, N., S3
Featherstone, C., S53 (ID: 4885)
Feng, S., S43 (ID: 4980)
Feo, N.D., S66 (ID: 4912)
Ferguson, K., S105 (ID: 4820)
Fernando, R., S77 (ID: 5011)
Fetherstone, L., S94 (ID: 5153)
Fink, D., S53 (ID: 4882)
Finn, C., S104 (ID: 4536), S124 (ID: 4943)
Fitzgerald, AP, S117 (ID: 4679)
Fitzgerald, D.H., S16 (ID: 4805)
Fitzgerald, M., S104 (ID: 4536)
Fitzpatrick, F., S104 (ID: 4536), S37 (ID: 4700), S71 (ID: 4928), S119 (ID: 4751), S124 (ID: 4943), S124 (ID: 4945)
Fitzpatrick, M., S71 (ID: 4928)
Flatt, A., S16 (ID: 4859)
Fleming, N., S25 (ID: 4728)
Fletcher, E., S40 (ID: 4824)
Fletcher, L., S106 (ID: 4862)
Flood, P., S104 (ID: 4536), S119 (ID: 4751)
Flude, E., S82 (ID: 4587)
Foeglé, J., S19 (ID: 4848)
Fogg, C., S16 (ID: 4859)
Fok, R., S100 (ID: 5103)
Fonguh, S., S109 (ID: 4970), S130 (ID: 5150)
Forder, R., S88 (ID: 5125)
Forrest, H., S108 (ID: 4919)
Foster, J., S30 (ID: 4915)
Foster, S., S111 (ID: 5028)
Foster, W., S99 (ID: 5078)
Fox, R., S36 (ID: 4698)
Fox, S., S100 (ID: 5091)
Fox, T., S120 (ID: 4803)
Fraise, A., S113 (ID: 4878), S17 (ID: 4687), S64 (ID: 4686)
Francis, V., S71 (ID: 4928)
Frasquet, J., S64 (ID: 4553)
Freire, M., S116 (ID: 4607)
French, K., S132 (ID: 5173)
Fry, I., S104 (ID: 4466)
Fry, N., S53 (ID: 4885)
Fujita, N., S83 (ID: 4702)

Gabarros, A., S113 (ID: 4930)
Gad, H.A., S94 (ID: 4449)
Gadsby, N., S74 (ID: 4559)
Gaillard, J.-L., S125 (ID: 4973)
Gaind, R., S127 (ID: 5025), S26 (ID: 4758), S78 (ID: 5032)
Galletly, T., S122 (ID: 4879)
Gandhi, R., S53 (ID: 4885)
Gao, B., S43 (ID: 4980)
Garcia, D., S87 (ID: 4847)
Gargiulo, G., S66 (ID: 4852)
Garvey, M., S133 (ID: 4791), S99 (ID: 5005)
Gaughan, L., S119 (ID: 4751), S124 (ID: 4945)
Gavaldà, L., S87 (ID: 4847)
Gelister, Y., S44 (ID: 4991), S44 (ID: 4993)
Gentry, V., S104 (ID: 4466)
Geoghegan, L., S111 (ID: 4562)

Geoghegan, O., S44 (ID: 4995)
Georgiou, P., S33 (ID: 5121)
Gerada, A., S91 (ID: 5004)
Gethin, G., S16 (ID: 4805), S97 (ID: 4765)
Ghanbari, A., S90 (ID: 4851)
Gharbi, M., S33 (ID: 5082)
Gheorghe, I., S30 (ID: 4901)
Giacobbe, D.R., S121 (ID: 4842), S122 (ID: 4844)
Giacomuzzi, M., S68 (ID: 5139)
Gibani, M., S3
Gibbins, C., S133 (ID: 4967)
Gil, H., S28 (ID: 4808)
Gilchrist, M., S122 (ID: 4879), S14 (ID: 4867), S21 (ID: 4877), S29 (ID: 4860), S44 (ID: 4995), S47 (ID: 5122)
Gilham, M., S72 (ID: 4938)
Gillespie, T., S31 (ID: 4927)
Gillies, J., S58 (ID: 4733)
Giorgi, S., S66 (ID: 4912)
Glasbey, T., S19 (ID: 4809), S65 (ID: 4761)
Gloria, E.A., S81 (ID: 4435)
Glynn, J., S110 (ID: 5177)
Gnanarajah, D., S106 (ID: 4862), S42 (ID: 4926), S58 (ID: 4782), S77 (ID: 4932), S108 (ID: 4919)
Goel, G., S13 (ID: 4994)
Goel, N., S107 (ID: 4863), S53 (ID: 4871), S122 (ID: 4864)
Goldstein, E., S31 (ID: 4946), S81 (ID: 5161)
Gollnisch, C., S87 (ID: 4971)
Gomila, A., S114 (ID: 4947)
Goncer, I.R., S92 (ID: 5037)
Good, H., S104 (ID: 4536)
Goodwin, M., S121 (ID: 4839)
Goossens, H., S33 (ID: 5082), S98 (ID: 4968)
Goovaerts, E., S98 (ID: 4968)
Gordon, I., S69 (ID: 4571)
Gordon, M., S64 (ID: 4553)
Gormley, M., S106 (ID: 4862)
Gorton, R., S128 (ID: 5058)
Gosbell, I., S19 (ID: 4809), S27 (ID: 4804)
Gould, I., S85 (ID: 4892)
Gourlay, Y., S40 (ID: 4772)
Grabowski, A., S128 (ID: 5036)
Grammatico, F., S121 (ID: 4842)
Granada, R., S87 (ID: 4847)
Grando, J., S112 (ID: 4656)
Gratarola, A., S121 (ID: 4842)
Graves, N., S124 (ID: 4940)
Green, C., S82 (ID: 4502)
Greene, M., S71 (ID: 4928)
Greenham, R., S31 (ID: 4964)
Gregson, A., S31 (ID: 4982)
Grenkova, T., S64 (ID: 4505)
Griffith, D., S74 (ID: 4559)
Griffiths, B., S49 (ID: 4703)
Griffiths, P., S120 (ID: 4786), S120 (ID: 4803), S127 (ID: 5020), S133 (ID: 4812)
Grillo, S., S125 (ID: 4953), S87 (ID: 4847)
Grønnemose, R.B., S73 (ID: 5164)
Gruteke, P., S104 (ID: 4661)
Gudiol, F., S114 (ID: 4947)
Guglielmi, B., S121 (ID: 4842)
Guintini, R., S48 (ID: 4539), S49 (ID: 4560), S54 (ID: 4898)
Guiver, M., S106 (ID: 4862)
Gunjiyal, J., S71 (ID: 4910)
Gunson, R., S31 (ID: 4946), S93 (ID: 5136)
Gupta, S., S13 (ID: 4994)
Gusarova, M., S64 (ID: 4505)
Guthrie, B., S12 (ID: 4961), S41 (ID: 4840)
Gutierrez, C., S87 (ID: 4847)
Guy, R., S126 (ID: 4999)

Haddock, G., S75 (ID: 4743)
Haidegger, T., S85 (ID: 4902)
Halkerston, R., S28 (ID: 4826)
Hall, A., S88 (ID: 5172)
Hall, C., S129 (ID: 5100)
Hall, S.M., S99 (ID: 5083)
Halliwell, J., S106 (ID: 4862)
Hamid, M., S12 (ID: 4865)
Hamilton, F., S132 (ID: 4785), S34 (ID: 5135)
Hamilton, K., S108 (ID: 4925), S109 (ID: 5085)
Hamilton, S., S74 (ID: 4559)
Hammad, E., S123 (ID: 4888)
Hammad, M.A.A.M., S94 (ID: 4449)
Hammed, E., S60 (ID: 4891)
Hammond, F., S19 (ID: 4585)
Hanboonkunupakarn, B., S34 (ID: 4464)
Hand, K., S46 (ID: 5113)
Hanley, S., S11 (ID: 4815)
Hansraj, S., S14 (ID: 5023), S45 (ID: 5022)
Hanumunthadu, B., S95 (ID: 4517)
Haque, T., S108 (ID: 4908), S85 (ID: 4909), S120 (ID: 4786), S120 (ID: 4803), S127 (ID: 5020), S133 (ID: 4812)
Harber, M., S120 (ID: 4803), S96 (ID: 4747)
Hardy, K., S119 (ID: 4752), S28 (ID: 4808)
Harrington, P., S113 (ID: 4775)
Harrison, T., S118 (ID: 4697)
Hart, J., S108 (ID: 4908), S85 (ID: 4909), S120 (ID: 4786), S127 (ID: 5020), S133 (ID: 4812)
Harvey, M., S134 (ID: 5043)
Harvey-Wood, K., S90 (ID: 4680)
Harwood, J., S133 (ID: 4967)
Hasan, S., S82 (ID: 4502)
Hasnie, S., S27 (ID: 4798), S48 (ID: 4539), S49 (ID: 4560), S51 (ID: 4799), S54 (ID: 4898)
Hassan, R., S123 (ID: 4888), S60 (ID: 4891)
Hatae, S., S83 (ID: 4702)
Hatcher, J., S29 (ID: 4860)
Hawkey, P., S119 (ID: 4752), S28 (ID: 4808)
Hawksworth, G., S36 (ID: 4683), S36 (ID: 4685), S37 (ID: 4701)
Hayden, I., S44 (ID: 4988)
Hayward, C., S114 (ID: 4948)
Heath, P., S3
Hedges, Y., S107 (ID: 4863), S122 (ID: 4864)
Heginbothom, M., S33 (ID: 5082)
Heiba, S.M., S94 (ID: 4449)
Heiligtag, S., S64 (ID: 4584)
Heinlein, W., S12 (ID: 4963)
Henderson, A., S95 (ID: 4692)
Henderson, L., S110 (ID: 5159)
Hendry, E., S78 (ID: 5050)
Herault, H., S22
Herbert, R., S59 (ID: 4838)
Hernandez, C., S19 (ID: 4848)
Hernandez-Santiago, V., S12 (ID: 4961)
Herrero, P., S33 (ID: 5121)
Herrmann, J.-L., S125 (ID: 4973)
Herzig, M., S51 (ID: 4794)
Hewins, P., S133 (ID: 4791)
Hewson, L., S16 (ID: 4718)
Heyderman, R., S3
Heymann, M., S129 (ID: 5100)
Higgins, C., S124 (ID: 4943)
Higgins, M., S95 (ID: 4692)
Higgs, C., S60 (ID: 4941)
Hill, AT, S121 (ID: 4839)
Hills, T., S25 (ID: 4728), S31 (ID: 4964)
Hine, V., S99 (ID: 5078)
Hofer, S., S87 (ID: 4971)
Hoffman, P., S20 (ID: 4737), S84 (ID: 4790)
Holden, K., S133 (ID: 4791)
Holmes, A., S114 (ID: 5007), S13 (ID: 4479), S21 (ID: 4877), S33 (ID: 5121), S47 (ID: 5122), S95 (ID: 4506), S122 (ID: 4879)
Holmes, C.W., S80 (ID: 5133)
Holmes, C., S134 (ID: 4992), S77 (ID: 4951)
Hopkins, K., S22
Hopkins, K., S15 (ID: 4918)
Hopkins, S., S114 (ID: 5007), S14 (ID: 5023), S4, S45 (ID: 5022), S73 (ID: 5181), S131 (ID: 5182)
Horner, C., S118 (ID: 4708)
Hornero, A., S113 (ID: 4930), S125 (ID: 4953)
Horridge, S., S67 (ID: 4986)
Horsely, A., S51 (ID: 4774)
Horwood, J., S69 (ID: 4571)
Hossain, D., S67 (ID: 4981)
Houlihan, C., S110 (ID: 5177)
Hourihan, M., S63 (ID: 5166)
Houseman, K., S128 (ID: 5058)
Houston, A., S126 (ID: 4996), S74 (ID: 4490)
How, M., S25 (ID: 4706)
Howard, A., S93 (ID: 5095)
Howard, P., S36 (ID: 4683), S36 (ID: 4685), S37 (ID: 4701)
Howard, P., S14 (ID: 5023)
Howlin, R., S70 (ID: 4714), S70 (ID: 4715)
Hu, H., S19 (ID: 4809)
Hu, H., S18 (ID: 4420), S27 (ID: 4804), S66 (ID: 4833), S72 (ID: 5029)
Hughes, E.C., S47 (ID: 5134)
Hughes, GJ, S128 (ID: 5058)
Hughes, G., S69 (ID: 4434)
Hughes, H., S32 (ID: 5052), S4
Hughes, K., S118 (ID: 4693)
Hughes-Fitzgerald, D., S97 (ID: 4765)
Hui, YMT, S27 (ID: 4802)
Hulme, C., S31 (ID: 4982)
Humphreys, H., S37 (ID: 4700), S71 (ID: 4928), S97 (ID: 4765), S104 (ID: 4536), S124 (ID: 4943), S16 (ID: 4805), S124 (ID: 4945)
Humphreys, S., S29 (ID: 4845)
Hunter, A., S80 (ID: 5133)
Hunter, P., S31 (ID: 4927)
Hupli, M., S84 (ID: 4810)
Hurding, S., S42 (ID: 4936), S75 (ID: 4743)
Hurt, K., S43 (ID: 4974)
Hutchins, C., S22, S70 (ID: 4688)
Hyrapetian, L., S103 (ID: 5080)

Ibrahim, E., S32 (ID: 5067), S32 (ID: 5068)
Icardi, G., S122 (ID: 4844)
Ijaz, S., S120 (ID: 4803)
Ingebretsen, A., S26 (ID: 4784)
Inkster, T., S105 (ID: 4820), S58 (ID: 4731), S84 (ID: 4790), S86 (ID: 4730), S108 (ID: 4925), S109 (ID: 5085), S112 (ID: 4716), S123 (ID: 4939)
Innes, W., S49 (ID: 4703)
Inoue, M., S120 (ID: 4811), S75 (ID: 4757)
Inverarity, D., S55 (ID: 4987), S61 (ID: 4944)
Iordache, C., S30 (ID: 4917)
Irish, D., S102 (ID: 4854), S85 (ID: 4909), S108 (ID: 4908), S120 (ID: 4786), S120 (ID: 4803), S127 (ID: 5020), S133 (ID: 4812)
Irvine, E., S95 (ID: 4692)
Islam, G., S53 (ID: 4885)
Islam, J., S43 (ID: 4974)
Ismail, O.B., S120 (ID: 4786)
Iuchi, R., S83 (ID: 4702)
Iwami, M., S13 (ID: 4479), S95 (ID: 4506)

Jackson, G., S96 (ID: 4748)
Jacobs, R., S74 (ID: 4497)
Jamdar, S., S69 (ID: 4571)
James, E., S38 (ID: 4729), S86 (ID: 5071)
James, N., S98 (ID: 5001)
Jamous, A., S56 (ID: 4498)
Jans, B., S105 (ID: 4712)
Jansens, H., S98 (ID: 4968)
Jaques, J., S125 (ID: 4957)
Jarchow-MacDonald, A., S63 (ID: 5180)
Jarir, S.A., S32 (ID: 5068)
Järvinen, A., S121 (ID: 4841)
Järvinen, R., S96 (ID: 4739)
Jarynowski, A., S128 (ID: 5036)
Jass, J., S32 (ID: 5068)
Jeffs, B., S48 (ID: 4539), S49 (ID: 4560), S54 (ID: 4898)
Jegina, K., S87 (ID: 4816)
Jenkins, E., S69 (ID: 4571)
Jenkins, M., S15 (ID: 4711)
Jenks, P., S4
Jensen, S., S19 (ID: 4809), S27 (ID: 4804)
Jiang, B., S133 (ID: 4972)
Joannidis, P., S86 (ID: 4730)
Joekes, E., S77 (ID: 5011)
Johani, K., S19 (ID: 4809), S27 (ID: 4804)
Johnson, A., S126 (ID: 4999)
Johnson, A., S119 (ID: 4762)
Johnson, E., S15 (ID: 4711)
Johnson, J., S53 (ID: 4874), S60 (ID: 4884)
Johnson, P., S49 (ID: 4560)
Johnston, C., S93 (ID: 5136)
Johnston, J., S122 (ID: 4855)
Jones, A., S22
Jones, B., S31 (ID: 4946), S40 (ID: 4772), S92 (ID: 5070)
Jones, C., S55 (ID: 4987)
Jones, E., S38 (ID: 4750)
Jones, G., S15 (ID: 4896)
Jones, H., S132 (ID: 5173)
Jones, L., S17 (ID: 4861)
Jones, M.E., S100 (ID: 5124)
Jorens, P., S98 (ID: 4968)
Jørgensen, S.B., S26 (ID: 4784)
Jose, S., S125 (ID: 4957), S125 (ID: 4966)
Joseph, A., S18 (ID: 4550), S20 (ID: 4737), S49 (ID: 4677)
Julie, S., S50 (ID: 4755)
Jumaa, P., S133 (ID: 4791), S59 (ID: 4876), S99 (ID: 5005)

Kabsha, M.I., S94 (ID: 4449)
Kacelnik, O., S113 (ID: 4775)
Kadir, I., S48 (ID: 4452)
Kak, G., S111 (ID: 4710)
Kaku, M., S57 (ID: 4513)
Kalith, S., S72 (ID: 5102)
Kaljic, A.J., S89 (ID: 4433)
Kamaludeen, S., S97 (ID: 4843)
Kamano, H., S116 (ID: 4557)
Kamarulzaman, A., S97 (ID: 4843)
Kamga, H.G., S81 (ID: 4435)
Kanazawa, M., S83 (ID: 4702)
Kandil, H., S13 (ID: 4740), S14 (ID: 4883), S42 (ID: 4958), S43 (ID: 4985)
Kanerva, M., S116 (ID: 4534)
Kanthasamy, S., S60 (ID: 4941)
Kapila, P., S50 (ID: 4742)
Kappeler, R., S56 (ID: 5017)
Kapur, B., S96 (ID: 4748)
Karcher, A.M., S34 (ID: 5176)
Karlikowska, M., S106 (ID: 4857)
Karoung, A., S71 (ID: 4910)
Kassa, D., S74 (ID: 4497)
Kavanagh, K., S11 (ID: 4822), S40 (ID: 4823)
Kean, R., S92 (ID: 5073)
Keeling, F., S124 (ID: 4943)
Keenan, K., S61 (ID: 5062)
Keereecharoen, L., S34 (ID: 4464)
Kennedy, A., S48 (ID: 4539), S49 (ID: 4560), S54 (ID: 4898)
Kennett, A., S76 (ID: 4870)
Keogh, I., S51 (ID: 4794)
Kerr, A., S123 (ID: 4939)
Kerr, F., S35 (ID: 4520)
Keyser, T., S44 (ID: 4993)
Khafagy, A.A., S94 (ID: 4449)
Khalil, N.M.A., S94 (ID: 4449)
Khan, N., S98 (ID: 5001)
Khan, S., S86 (ID: 5000)
Khan, T., S77 (ID: 5011)
Khanna, N., S50 (ID: 4749), S79 (ID: 5079)
Khare, M., S106 (ID: 4862), S42 (ID: 4926), S54 (ID: 4911), S58 (ID: 4782), S77 (ID: 4932), S108 (ID: 4919)
Khonyongwa, K., S44 (ID: 4988)
Khonyongwa, K., S19 (ID: 4501)
Khoo, S.J., S46 (ID: 5048)
Kidd, M., S74 (ID: 4497)
Kiernan, M., S17 (ID: 4687), S4, S66 (ID: 4952)
Kilhus, K.S., S109 (ID: 4950)
King, M.-F., S84 (ID: 4720)
Kinsella, J., S4
Kirk, B., S67 (ID: 4997)
Kirk-Granger, H., S77 (ID: 4951), S90 (ID: 4851)
Kirwan, D., S126 (ID: 4996)
Kiseleva, I., S26 (ID: 4776)
Klenerman, P., S101 (ID: 4684)
Knight, J., S19 (ID: 4809)
Koch, O., S101 (ID: 5156), S128 (ID: 5035)
Koh, A., S82 (ID: 4525)
Kolli, S., S56 (ID: 4498)
Kolmos, H.J., S73 (ID: 5164)
Komuro, S., S57 (ID: 4513)
Kontula, K., S121 (ID: 4841)
Koo, S., S123 (ID: 4890)
Kosmidis, C., S92 (ID: 5037)
Kovacevic, G., S52 (ID: 4814)
Kowalzik, F., S134 (ID: 4978)
Koyama, S., S117 (ID: 4671)
Kridaningsih, T.N., S131 (ID: 4421)
Kriel, B., S74 (ID: 4497)
Krishna, R., S24 (ID: 4422)
Krismawati, H., S131 (ID: 4421)
Kumar, A., S50 (ID: 4742)
Kumar, N., S56 (ID: 4498)
Kumari, P., S27 (ID: 4802)
Kurdumova, N., S69 (ID: 4492)
Kuutamo, T., S84 (ID: 4810), S85 (ID: 4818)
Kuznecova, G., S83 (ID: 4704), S87 (ID: 4816)
Kuznecovs, S., S83 (ID: 4704), S87 (ID: 4816)

Lacey, C., S102 (ID: 4763)
Lacey, J., S25 (ID: 4728), S42 (ID: 4926)
Lackenby, A., S127 (ID: 5020)
Ladenheim, D., S42 (ID: 4880)
Laganà, P., S83 (ID: 4709)
Lalloo, F., S59 (ID: 4789)
Lamagni, T., S113 (ID: 4775), S126 (ID: 4999)
Lamagri, T., S110 (ID: 5171)
Lambourne, J., S63 (ID: 5166)
Lamming, T., S20 (ID: 4737)
Lanzoni, L., S18 (ID: 4905)
Lappin, D., S67 (ID: 4997)
Laundy, M., S37 (ID: 4707), S37 (ID: 4725)
Laurenson, I.F., S100 (ID: 5124), S121 (ID: 4839)
Laurenson, I., S110 (ID: 5159), S28 (ID: 4826), S4, S61 (ID: 4944), S76 (ID: 4870)
Laurent, F., S77 (ID: 5008)
Lavigne, T., S118 (ID: 4727), S19 (ID: 4848), S126 (ID: 4976)
Lawrence, C., S125 (ID: 4973)
Lawrence, C., S108 (ID: 4942)
Laws, P., S60 (ID: 4937)
Lazarus, K., S27 (ID: 4802)
Leanord, A., S75 (ID: 4743)
Leanord, A., S11 (ID: 4815)
Lebascle, K., S115 (ID: 4485)
Ledda, V., S108 (ID: 4942)
Lee, M., S131 (ID: 5019)
Lee, S., S87 (ID: 4971)
Lee, T., S60 (ID: 4884)
Leeming, J., S19 (ID: 4585)
Lefebvre, F., S118 (ID: 4727)
Lefevre, C., S5
Leff, R., S42 (ID: 4880)
Legge, M., S18 (ID: 4420)
Legiest, B., S105 (ID: 4712), S109 (ID: 4970)
Lehotsky, Ákos, S85 (ID: 4902)
Lehtinen, J.-M., S116 (ID: 4534)
Leiblein, T., S87 (ID: 4971)
Lelek, M.M., S26 (ID: 4784)
Leo, S., S25 (ID: 4728)
Leong, J., S120 (ID: 4811), S75 (ID: 4757)
Lerminiaux, C., S73 (ID: 5148)
Leroux-Roels, I., S65 (ID: 4830)
Lewin, M., S110 (ID: 5171)

Lewis, C., S28 (ID: 4808)
Lewis, S., S44 (ID: 4993)
Li, L., S53 (ID: 4871)
Liljendahl, P., S85 (ID: 4818)
Lim, F., S78 (ID: 5050), S90 (ID: 4834)
Lim, S., S70 (ID: 4579)
Limón, E., S114 (ID: 4947)
Lindsay, D., S49 (ID: 4575), S61 (ID: 4944)
Ling, C., S34 (ID: 4464)
Ling, M., S69 (ID: 4434)
Ling, M.L., S25 (ID: 4706), S82 (ID: 4525)
Lipman, M., S106 (ID: 4857)
Lissauer, D., S96 (ID: 4724)
Little, S., S123 (ID: 4939)
Livermore, D., S5
Llewelyn, M., S38 (ID: 4750), S5, S43 (ID: 4974), S98 (ID: 4979)
Lloyd, R., S112 (ID: 4681)
Lockhart, M., S11 (ID: 4836), S34 (ID: 5176)
Long, J.M., S12 (ID: 4894)
Loo, P.S., S49 (ID: 4703)
Lopes, L.K., S66 (ID: 4833)
Louw, A., S56 (ID: 5021)
Lovell, J., S20 (ID: 4872), S97 (ID: 4881)
Lu, W., S43 (ID: 4980)
Lucas, C., S90 (ID: 4680)
Lucey, O., S63 (ID: 5166)
Ludewig, B., S101 (ID: 4684)
Lyall, H., S33 (ID: 5082), S5
Lyons, T., S44 (ID: 4995)
Lytsy, B., S5
Lyytikäinen, O., S121 (ID: 4841)

Mabey, D., S110 (ID: 5177)
Macalister-Hall, S., S58 (ID: 4731)
Macartney, G., S45 (ID: 5016)
Macbride-Stewart, S., S41 (ID: 4840)
MacConnachie, A., S36 (ID: 4698)
Macdonald, A., S40 (ID: 4823)
MacGregor, V., S20 (ID: 4737)
Mack, D., S123 (ID: 4924), S15 (ID: 4807), S15 (ID: 4918), S52 (ID: 4806), S61 (ID: 5009), S75 (ID: 4866), S125 (ID: 4957), S125 (ID: 4966), S131 (ID: 5182)
MacKenzie, F., S78 (ID: 5026)
MacKenzie, L., S74 (ID: 4559)
Mackintosh, C., S101 (ID: 5156)
Macleod, M., S58 (ID: 4733), S62 (ID: 5109), S81 (ID: 5161), S93 (ID: 5136)
Macsween, K., S49 (ID: 4575)
Madalosso, G., S116 (ID: 4607)
Magee, C., S71 (ID: 4928)
Magistri, L., S127 (ID: 5013)
Maguire, J., S40 (ID: 4772)
Mahgoub, H., S110 (ID: 5171)
Mahida, N., S18 (ID: 4503), S89 (ID: 4540)
Mahungu, T., S102 (ID: 4854), S85 (ID: 4909), S108 (ID: 4908), S120 (ID: 4786), S120 (ID: 4803), S127 (ID: 5020), S133 (ID: 4812)
Maiden, M., S129 (ID: 5112), S129 (ID: 5114)
Maillard, J.-Y., S22
Maillard, J.-Y., S66 (ID: 4952)
Majeed, M., S52 (ID: 4869)
Mak, R., S14 (ID: 4913)
Malacarne, P., S66 (ID: 4912)
Maladan, Y., S131 (ID: 4421)
Malcolm, W., S11 (ID: 4822), S5, S38 (ID: 4744), S40 (ID: 4823), S40 (ID: 4824), S41 (ID: 4840), S75 (ID: 4743)
Malik, F., S74 (ID: 4490)
Malik, S., S32 (ID: 5052)
Malone, M., S27 (ID: 4804)
Manavi, K., S52 (ID: 4849)
Mandal, U.K., S67 (ID: 4981)
Manley, R., S48 (ID: 5147)
Manoukian, S., S124 (ID: 4940)
Mansi, M.G.M., S94 (ID: 4449)
Mansour, H., S125 (ID: 4973)
Mantengoli, E., S127 (ID: 5013)
Manuel, R., S79 (ID: 5089)
Marak, R., S93 (ID: 5097)
Marchewka, D., S128 (ID: 5036)
Marek, A., S93 (ID: 5136)
Marek, A., S62 (ID: 5109), S81 (ID: 5161)
Marriott, M., S25 (ID: 4728)
Marshall, N., S133 (ID: 4812)
Martin, A.M., S80 (ID: 5133)
Martin, R., S130 (ID: 5127)
Martins-Simoes, P., S77 (ID: 5008)
Martos, P., S125 (ID: 4953)
Marwick, C., S11 (ID: 4822), S12 (ID: 4961), S40 (ID: 4823), S40 (ID: 4824), S41 (ID: 4840), S41 (ID: 4846)
Masala, A., S89 (ID: 4433)
Mashaly, G., S60 (ID: 4891)
Mason, J., S93 (ID: 5095)
Masson, H., S109 (ID: 4970)
Mathrani, V., S32 (ID: 5052)
Mathur, P., S71 (ID: 4910)
Matthews, S., S19 (ID: 4585)
Maurer-Stroh, S., S120 (ID: 4811)
Mavrogiorgou, E., S14 (ID: 4883), S43 (ID: 4985)
Mawer, D., S14 (ID: 4913)
Mayanja-Kizza, H., S74 (ID: 4497)
Mazzacane, S., S18 (ID: 4905)
Mc Namara, E., S102 (ID: 4850)
McAllister, T., S134 (ID: 5043)
McAnearney, S., S122 (ID: 4855)
McArdle, E., S11 (ID: 4836)
McCartney, K., S69 (ID: 4571)
McClarey, A., S110 (ID: 5159)
McConaghy, M., S111 (ID: 4562)
McConnell, H., S60 (ID: 4937)
McCormick, S., S35 (ID: 4520)
McDavitt, A., S86 (ID: 5071)
McDermott, C., S69 (ID: 4571)
McDermott, S., S104 (ID: 4536)
McDonagh, G., S67 (ID: 4997)
McDonald, F., S45 (ID: 5016)
McDonald, J., S99 (ID: 5083)
Mceldowney, E., S29 (ID: 4845)
McEwen, J., S41 (ID: 4846)
McFadden, E., S124 (ID: 4945)
McFarland, A., S124 (ID: 4940)
Mcgivern, G., S40 (ID: 4823)
McGowan, C., S110 (ID: 5177)
McGowan, D., S124 (ID: 4945)
McGready, R., S34 (ID: 4464)
McGuire, E., S59 (ID: 4838)
McHugh, M., S74 (ID: 4559)
McHugh, T., S106 (ID: 4857)
McIlvenny, G., S111 (ID: 4562)
McKay, J., S86 (ID: 5071)
McKeating, C., S76 (ID: 4929)
McKechnie, L., S71 (ID: 4722)
McLaughlin, T., S41 (ID: 4840)
McLeod, E., S95 (ID: 4692)
McMenemy, M., S42 (ID: 4936)
McMillan, F., S86 (ID: 5071)
McMullan, R., S76 (ID: 4929)
McSparron, C., S121 (ID: 4839)
McWhinney, P., S48 (ID: 4539), S49 (ID: 4560), S54 (ID: 4898)
Meads, D., S31 (ID: 4982)
Meda, M., S104 (ID: 4466)
Medina, M.-J., S80 (ID: 5133)
Meijerink, H., S113 (ID: 4775)
Melhuish, A., S14 (ID: 4913)
Mellor, D., S11 (ID: 4815)
Mellor, S., S20 (ID: 4872), S97 (ID: 4881)
Meltzer, M., S107 (ID: 4863)
Ménard, C., S19 (ID: 4848)
Menson, E., S33 (ID: 5082)
Meriö-Hietaniemi, I., S85 (ID: 4818)
Mermerelis, D., S132 (ID: 4768)
Metcalfe, R., S92 (ID: 5070)
Meyer, B., S25 (ID: 4721)
Micallef, C., S41 (ID: 4832)
Miller, T., S69 (ID: 4571)
Mills, G., S108 (ID: 4925), S109 (ID: 5085)
Mills, J., S36 (ID: 4683), S36 (ID: 4685), S37 (ID: 4701)
Milne, A., S117 (ID: 4689)
Mimmack, S., S59 (ID: 4876)
Minton, J., S15 (ID: 4955), S6, S31 (ID: 4982), S54 (ID: 4903)
Mirza, S., S48 (ID: 4452)
Mishra, S., S24 (ID: 4422)
Mitache, M.M., S30 (ID: 4901), S30 (ID: 4917)
Mitchell, E., S31 (ID: 4982)
Mitchell, J., S95 (ID: 4692)
Mitra, A., S59 (ID: 4789)
Mittal, G., S127 (ID: 5025), S26 (ID: 4758)
Mohana, A., S38 (ID: 4744)
Mohanty, S., S27 (ID: 4793)
Momoi, Y., S117 (ID: 4671)
Moncayo, O.L., S55 (ID: 4987)
Monk, E., S131 (ID: 4828)
Monk, P., S106 (ID: 4853)
Montagna, M.T., S83 (ID: 4709)
Mookerjee, S., S122 (ID: 4879), S21 (ID: 4877)
Moore, G., S70 (ID: 4688), S71 (ID: 4904)
Moore, J., S35 (ID: 4515)
Moore, L.S., S29 (ID: 4860)
Moore, L., S130 (ID: 5145), S33 (ID: 5121), S47 (ID: 5122), S63 (ID: 5155)
Morad, H.M., S94 (ID: 4449)
Morelli, E., S111 (ID: 4562)
Morgan, D., S6
Morgan, M., S54 (ID: 4886), S75 (ID: 4858)
Morrin, M., S124 (ID: 4943)
Moshiri, T., S89 (ID: 4540), S94 (ID: 5140)
Mousavi, F., S81 (ID: 4429)
Mouton, W., S77 (ID: 5008)
Moxon, E.R., S129 (ID: 5112), S129 (ID: 5114)
Mukhtar, N., S28 (ID: 4827)
Mukumbe, N., S99 (ID: 5078)
Mulla, R., S100 (ID: 5091)
Mullen, A., S38 (ID: 4744)
Muller, J., S118 (ID: 4727), S126 (ID: 4976)
Mullick, S., S13 (ID: 4994)

Mumford, S., S6
Munro, W., S43 (ID: 4974)
Muqbill, G., S37 (ID: 4707)
Mura, I., S83 (ID: 4709), S87 (ID: 4764)
Murphy, C., S58 (ID: 4731), S79 (ID: 5079)
Murphy, N., S94 (ID: 5153)
Murphy, OM, S117 (ID: 4679)
Murray, C.C., S31 (ID: 4982)
Musaad, S., S105 (ID: 4717)
Mutuyimana, J., S91 (ID: 4990)
Muzslay, M., S68 (ID: 5160), S88 (ID: 4983)

Nagao, S., S116 (ID: 4557)
Naomi, C., S42 (ID: 4880)
Narayanan, M., S88 (ID: 5125)
Narayanan, M., S114 (ID: 4949), S39 (ID: 4766), S60 (ID: 4937), S61 (ID: 5064)
Nasir, A., S48 (ID: 4452)
Natarajan, K., S111 (ID: 4710)
Natarajan, M., S20 (ID: 4872), S78 (ID: 5050), S97 (ID: 4881)
Nathwani, D., S41 (ID: 4840), S6, S41 (ID: 4846), S46 (ID: 5081), S75 (ID: 4743)
Nayak, V., S55 (ID: 5003)
Nazareth, B., S107 (ID: 4899)
Ndjonya, S.T., S81 (ID: 4435)
Nekkab, N., S128 (ID: 5033)
Nemoto, T., S57 (ID: 4513)
Nettleton, C., S48 (ID: 5147)
Nevin, W., S130 (ID: 5145)
Newsholme, W., S12 (ID: 4865)
Newsholme, W., S111 (ID: 4465)
Newton, P., S92 (ID: 5037)
Ng, E., S82 (ID: 4525)
Ng, S., S53 (ID: 4882)
Ngogang, J.Y., S103 (ID: 4378)
Niala, M., S100 (ID: 5091)
Niaz Mowla, S.M., S67 (ID: 4981)
Niccolini, F., S127 (ID: 5013)
Nicolás, C., S114 (ID: 4947)
Niruttan, K., S63 (ID: 5155)
Njonnou, SRS, S81 (ID: 4435)
Noakes, C., S106 (ID: 4862)
Noakes, C., S84 (ID: 4720)
Nobile, M., S87 (ID: 4764)
Noon, C., S80 (ID: 5133)
Nosten, F., S34 (ID: 4464)
Novikova, L., S26 (ID: 4776)
Nowell, J., S86 (ID: 5071)

O'Callaghan, A., S74 (ID: 4490)
O'Cofaigh, E., S101 (ID: 5174)
O'Connell, B., S94 (ID: 5153)
O'Connell, K., S104 (ID: 4536)
O'Connell, N., S130 (ID: 5127)
O'Donnell, S., S124 (ID: 4945), S37 (ID: 4700)
O'Donovan, E., S130 (ID: 5127)
O′Driscoll, J., S56 (ID: 4498)
O'Gorman, A., S130 (ID: 5127)
O'Hara, M., S130 (ID: 5127)
O'Leary, R., S79 (ID: 5106)
O'Meara, A.-M., S54 (ID: 4911)
O'Neill, E., S23
O′Neill, H., S123 (ID: 4939)
O'Reilly, C., S94 (ID: 5153)
O'Seaghdha, C., S71 (ID: 4928)
O'Shea, D.T., S100 (ID: 5124)
O'Sullivan, C., S59 (ID: 4789)
Obradors, F., S114 (ID: 4947)
Oguguo, J., S101 (ID: 5156)
Oh, H., S102 (ID: 4907)
Ojanperä, H., S96 (ID: 4739)
Oktavian, A., S131 (ID: 4421)
Olalubi, O., S103 (ID: 4378)
Olusoga, A., S14 (ID: 4913)
Olver, W.J., S63 (ID: 5180)
Oma, D., S109 (ID: 4950)
Omrani, A.S., S28 (ID: 4827)
Omrani, A., S29 (ID: 4835), S6
Oosawa, E., S83 (ID: 4702)
Orlando, L., S66 (ID: 4852)
Orsi, A., S121 (ID: 4842), S122 (ID: 4844)
Ottenhoff, T., S74 (ID: 4497)
Otter, J., S122 (ID: 4879), S21 (ID: 4877), S6
Ousey, K.J., S22
Outeiral, T.P., S66 (ID: 4952)
Ovington, L., S70 (ID: 4579)
Oxford, J., S7

Pac, A., S120 (ID: 4821)
Packham, K., S106 (ID: 4853)
Padulles, A., S87 (ID: 4847)
Paganino, C., S122 (ID: 4844)
Palanivel, S., S15 (ID: 4807), S52 (ID: 4806)
Palenzuela, E., S38 (ID: 4745)
Pan, D., S16 (ID: 5012)
Pandey, K., S78 (ID: 5032)
Pang, V., S123 (ID: 4924), S61 (ID: 5009)
Papakonstantinou, D., S80 (ID: 5142)
Parascandalo, A.F., S73 (ID: 4423)
Parcell, B., S34 (ID: 5176)
Parcell, B., S117 (ID: 4689), S78 (ID: 5026)
Parker, C., S128 (ID: 5035)
Parker, N., S44 (ID: 4993)
Parkes, M., S60 (ID: 4941)
Parkhill, J., S107 (ID: 4899)
Parkinson, R., S72 (ID: 5102)
Parks, S., S71 (ID: 4904)
Parneix, P., S7
Parohl, N., S64 (ID: 4584)
Parry, M., S59 (ID: 4876)
Parsons, D., S21 (ID: 4877)
Partridge, D., S78 (ID: 5014)
Pasquarella, C., S83 (ID: 4709), S87 (ID: 4764)
Pasztor, M., S65 (ID: 4770)
Patel, A., S134 (ID: 4992)
Patel, H., S55 (ID: 4975)
Patel, S., S47 (ID: 5134)
Patel, S.V., S33 (ID: 5082)
Patterson, C., S62 (ID: 5101)
Patterson, L., S122 (ID: 4855)
Patton, A., S40 (ID: 4824)
Paul, J., S132 (ID: 4768)
Paul, J., S98 (ID: 4979)
Paul, S., S134 (ID: 5043)
Paulus, S., S33 (ID: 5082)
Payne, B., S133 (ID: 4967)
Paynter, M., S48 (ID: 5147)
Peacock, S., S107 (ID: 4899)
Peckover, Y., S95 (ID: 4625)
Peirse, M., S126 (ID: 4996)
Pelegrin, I., S113 (ID: 4930)
Pelosi, P., S121 (ID: 4842)
Penni, A., S46 (ID: 5053)
Perera, N., S123 (ID: 4890), S55 (ID: 4975), S78 (ID: 5050), S90 (ID: 4834), S90 (ID: 4851), S91 (ID: 4990)
Peretti, N., S112 (ID: 4656)
Perry, A., S88 (ID: 5125)
Perry, J.P., S88 (ID: 5125)
Perry, J., S61 (ID: 5064)
Perry, M., S128 (ID: 5035)
Peters, C., S112 (ID: 4716), S84 (ID: 4790), S99 (ID: 5018)
Peters, E., S36 (ID: 4698), S50 (ID: 4749)
Peters, J., S62 (ID: 5101)
Petric, M., S45 (ID: 5031)
Petridou, C., S107 (ID: 4868)
Petrilli, C., S127 (ID: 5013)
Phee, L., S79 (ID: 5089)
Phelan, P.J., S110 (ID: 5159)
Philip, A., S33 (ID: 5121)
Philip, C., S42 (ID: 4936)
Phyo, A.P., S34 (ID: 4464)
Piastrelli, F., S116 (ID: 4607)
Pickard, D., S54 (ID: 4911)
Piérard, D., S105 (ID: 4719)
Pieruccioni, M., S64 (ID: 4553)
Pike, D., S112 (ID: 4681)
Pilkington, R., S35 (ID: 4515)
Pilot, M., S44 (ID: 4988)
Pinho-Gomes, A.-C., S48 (ID: 4452)
Pink, F., S79 (ID: 5089)
Piriz, M., S114 (ID: 4947)
Pitkäpaasi, M., S116 (ID: 4534)
Planche, T., S74 (ID: 4490)
Plant, A.J., S90 (ID: 4760)
Plant, A., S75 (ID: 4858)
Platt, S., S96 (ID: 4748)
Plecko, V., S65 (ID: 4770)
Poirot, I., S112 (ID: 4656)
Pokhrel, B.M., S24 (ID: 4422)
Pollard, A., S7
Polubothu, P., S79 (ID: 5126)
Popa, M., S30 (ID: 4917)
Pope, C., S74 (ID: 4490)
Popp, W., S64 (ID: 4584), S7
Posso, R., S76 (ID: 4929)
Powell, J., S130 (ID: 5127)
Powell, N., S40 (ID: 4777), S84 (ID: 4767)
Power, L., S130 (ID: 5127)
Power, M., S79 (ID: 5106)
Power, R., S124 (ID: 4943)
Poyner, J., S61 (ID: 4944)
Praharaj, A.K., S27 (ID: 4793)
Prajsnar, T., S111 (ID: 5028)
Prema, S., S14 (ID: 4883)
Prendergast, C., S74 (ID: 4490)
Prevost, G., S118 (ID: 4727)
Price, A., S133 (ID: 4967), S79 (ID: 5106)
Price, J., S98 (ID: 4979)
Prior, A.R., S124 (ID: 4945)
Privitera, G., S66 (ID: 4912)
Proffitt, R., S47 (ID: 5134)
Prtak, L., S53 (ID: 4885)
Pujol, M., S113 (ID: 4930), S87 (ID: 4847), S114 (ID: 4947), S125 (ID: 4953)
Pulci, M.B., S127 (ID: 5013)
Puleston, R., S106 (ID: 4853), S106 (ID: 4862)
Punj, R., S88 (ID: 5162)

Qamruddin, A., S45 (ID: 5031)
Qian, J., S43 (ID: 4980)
Quinn, J., S54 (ID: 4898)

Radcliffe, T., S112 (ID: 4681)
Rajan, L., S104 (ID: 4536)
Rajan, L., S124 (ID: 4945), S37 (ID: 4700), S71 (ID: 4928)
Ramachandran, V. G., S56 (ID: 4470)
Ramage, G., S92 (ID: 5070), S92 (ID: 5073)
Ramasundara, C.M., S39 (ID: 4754)
Ramirez, P., S64 (ID: 4553)
Ramsay, I., S57 (ID: 4558)
Randhawa, A., S62 (ID: 5066)
Rani, V., S26 (ID: 4758)
Rao, P., S12 (ID: 4894)
Rasigade, J.-P., S77 (ID: 5008)
Rastogi, N., S71 (ID: 4910)
Ratcliffe, L., S101 (ID: 5178)
Ratnappuli, A., S102 (ID: 4763)
Raulin, O., S77 (ID: 5008)
Rautemaa-Richardson, R., S92 (ID: 5073)
Rawson, T.M., S47 (ID: 5122)
Rawson, T., S33 (ID: 5121), S63 (ID: 5155)
Raza, M., S79 (ID: 5106)
Razai, M., S24 (ID: 4675)
Reddy, H., S39 (ID: 4766), S50 (ID: 4755)
Reddy, S.R., S70 (ID: 4579)
Reddy, S., S98 (ID: 5001)
Reekie, I., S120 (ID: 4803)
Reeves, N., S59 (ID: 4876)
Rehman, T.-U., S85 (ID: 4892)
Reid, N., S11 (ID: 4822), S40 (ID: 4823)
Reilly, J., S11 (ID: 4815), S7, S124 (ID: 4940)
Relph, K., S81 (ID: 5165)
Renshaw, S., S111 (ID: 5028)
Reuter, H., S64 (ID: 4584)
Ricciardi, E., S68 (ID: 5139)
Richardson, M., S92 (ID: 5073)
Righi, A., S66 (ID: 4912)
Rijal, B., S24 (ID: 4422)
Riordan, A., S33 (ID: 5082)
Riste, M., S80 (ID: 5130)
Ritchie, L., S109 (ID: 4977)
Rizkalla, E., S20 (ID: 4872), S33 (ID: 5117)
Rizwan, F., S131 (ID: 5019)
Robb, F., S36 (ID: 4698), S40 (ID: 4772), S43 (ID: 4969), S50 (ID: 4749)
Robertson, S., S93 (ID: 5111)
Robinson, J., S105 (ID: 4717)
Robotham, J., S21 (ID: 4877)
Robson, S., S38 (ID: 4744)
Rochon, M., S88 (ID: 5172)
Rodger, R., S40 (ID: 4772)
Rodrigues, C., S129 (ID: 5112), S129 (ID: 5114)
Rogers, D., S125 (ID: 4957)
Rogers, T., S94 (ID: 5153)
Romaniszyn, D., S65 (ID: 4819)
Róna, P., S85 (ID: 4902)
Rooney, K., S7
Rosales, M., S119 (ID: 4741)
Rottman, M., S125 (ID: 4973)
Roulston, K., S123 (ID: 4924), S15 (ID: 4918), S61 (ID: 5009)
Roux, A.-L., S125 (ID: 4973)
Rowe, T., S60 (ID: 4941)
Rowson, C., S78 (ID: 5014)
Roy, M.K., S13 (ID: 4994)
Różańska, A., S120 (ID: 4821), S65 (ID: 4819)
Ruiz, J., S64 (ID: 4553)
Russell, C., S100 (ID: 5124), S34 (ID: 5135)
Ryan, J.R., S99 (ID: 5078)
Ryan, L., S88 (ID: 5172)
Ryan, L., S30 (ID: 4915)
Ryan, P., S119 (ID: 4751)

Saba, M., S102 (ID: 4850)
Sadler, B., S107 (ID: 4899)
Saeed, K., S39 (ID: 4754), S44 (ID: 4991), S44 (ID: 4993)
Sah, M., S24 (ID: 4422)
Sahu, R.N., S93 (ID: 5097)
Sahu, S., S27 (ID: 4793)
Saibudeen, A., S91 (ID: 4990)
Said, J., S66 (ID: 4952)
Saif, M., S56 (ID: 4498)
Saigal, K., S78 (ID: 5032)
Saint, S., S7
Sajdeya, R., S82 (ID: 4502)
Salama, H., S123 (ID: 4888)
Salama, M., S115 (ID: 5046)
Saleh, N.M., S94 (ID: 4449)
Salt, C., S25 (ID: 4728)
Samarasinghe, S., S24 (ID: 4673)
Samuel, J., S49 (ID: 4703)
Sandoe, J., S14 (ID: 4913)
Santos, R., S41 (ID: 4832)
Santullo, P., S56 (ID: 4498), S56 (ID: 5021)
Sareen, A., S31 (ID: 4964)
Sargent, C., S15 (ID: 4896), S43 (ID: 4974)
Sathyendran, V., S95 (ID: 4625)
Satta, G., S106 (ID: 4857)
Saunders, R., S55 (ID: 4975)
Savage, E., S117 (ID: 4679)
Savin, I., S69 (ID: 4492)
Sayed, F.E., S125 (ID: 4973)
Schaeffer, M., S118 (ID: 4727)
Schelenz, S., S68 (ID: 5179), S88 (ID: 5172)
Schmid, M.L., S30 (ID: 4915)
Schneider, F., S118 (ID: 4727), S126 (ID: 4976)
Schoffelen, A., S104 (ID: 4661)
Schouls, L., S104 (ID: 4661)
Scicluna, E., S73 (ID: 4423)
Scriven, J., S80 (ID: 5130)
Scriven, J., S80 (ID: 5142)
Seagar, A.-L., S28 (ID: 4826)
Seaton, A., S36 (ID: 4698), S40 (ID: 4772)
Seaton, R.A., S38 (ID: 4744)
Seaton, R.A., S58 (ID: 4731)
Sekhar, M., S120 (ID: 4803)
Selkova, E., S26 (ID: 4776), S64 (ID: 4505)
Sengupta, K., S13 (ID: 4994)
Seoudi, N., S34 (ID: 5175), S48 (ID: 5158)
Seringe, E., S115 (ID: 4485)
Sethi, K., S118 (ID: 4708), S54 (ID: 4903), S55 (ID: 5003), S71 (ID: 4722)
Severac, F., S118 (ID: 4727)
Shabir, S., S28 (ID: 4808)
Shackleton, J., S88 (ID: 5172)
Shaffi, A., S115 (ID: 5038)
Shah, D., S93 (ID: 5097)
Shali, S., S42 (ID: 4880)
Shamarina, D., S111 (ID: 5028)
Sharland, M., S33 (ID: 5082)
Sharma, H., S76 (ID: 4922)
Shaw, E., S113 (ID: 4930), S87 (ID: 4847), S114 (ID: 4947)
Shebl, N.A., S45 (ID: 5022)
Shehata, M.M., S94 (ID: 4449)
Shendi Mohamed, A.M., S96 (ID: 4747)
Sherry, L., S92 (ID: 5070), S92 (ID: 5073)
Shetty, N., S126 (ID: 4999)
Shifrin, M., S69 (ID: 4492)
Shikakura, S., S83 (ID: 4702)
Shikoh, S., S49 (ID: 4703)
Shimizu, V.S., S8
Shiro, S.K., S81 (ID: 4435)
Shoaib, L.O., S94 (ID: 4449)
Shorten, R., S127 (ID: 5015), S45 (ID: 5031)
Shorten, R., S106 (ID: 4857)
Shoukri, M., S28 (ID: 4827)
Simon, A., S130 (ID: 5150)
Simpson, J., S79 (ID: 5106)
Simpson, K.J., S100 (ID: 5124)
Sinclair, C., S117 (ID: 4689)
Singh, P., S43 (ID: 4985)
Singh, S., S63 (ID: 5166)
Singh, S., S112 (ID: 4681)
Singh, T., S56 (ID: 4470)
Singh, Y., S111 (ID: 4710)
Singleton, J., S21 (ID: 4877)
Sissons, G., S88 (ID: 5162)
Sivamakrishnan, A., S79 (ID: 5089)
Skally, M., S104 (ID: 4536), S37 (ID: 4700), S71 (ID: 4928), S119 (ID: 4751), S124 (ID: 4943), S124 (ID: 4945)
Skogberg, K., S121 (ID: 4841)
Sleigh, A., S84 (ID: 4720)
Slevin, B., S130 (ID: 5127)
Slorach, J., S109 (ID: 5085)
Smiddy, M., S117 (ID: 4679)
Smirthwaite, S., S99 (ID: 5078)
Smit, E., S133 (ID: 4791)
Smith, A., S47 (ID: 5134)
Smith, A., S129 (ID: 5112), S55 (ID: 4931), S67 (ID: 4997), S129 (ID: 5114)
Smith, F., S117 (ID: 4689), S95 (ID: 4692)
Smith, G., S8
Smith, J., S41 (ID: 4840)
Smith, M., S31 (ID: 4964)
Smith, P., S35 (ID: 4520)
Smith, R., S123 (ID: 4924), S61 (ID: 5009), S125 (ID: 4957), S125 (ID: 4966), S131 (ID: 5182)
Smyth, E., S124 (ID: 4945)
Smyth, E., S104 (ID: 4536), S37 (ID: 4700), S71 (ID: 4928), S124 (ID: 4943)
Smyth, G., S124 (ID: 4943)
Snape, S.E., S94 (ID: 5140)
Sneddon, J., S38 (ID: 4744), S41 (ID: 4840), S46 (ID: 5081), S75 (ID: 4743), S86 (ID: 5071)
Sneddon, J., S35 (ID: 4545), S40 (ID: 4823), S40 (ID: 4824)
Sneddon, J., S11 (ID: 4822), S40 (ID: 4823), S40 (ID: 4824)
Sneed, E., S119 (ID: 4762)
Sodano, L., S83 (ID: 4709)
Somoza, D., S113 (ID: 4930)
Soo, S., S49 (ID: 4677)
Soulsby, H., S112 (ID: 4716), S58 (ID: 4731)

Spahovic, M., S89 (ID: 4433)
Speekenbrink, T., S79 (ID: 5126)
Speight, R., S134 (ID: 4992)
Sriskandan, S., S130 (ID: 5145)
Stacey, D., S97 (ID: 4873)
Stanley, P., S48 (ID: 4539), S49 (ID: 4560), S54 (ID: 4898)
Stanley, P., S27 (ID: 4798), S31 (ID: 4982), S51 (ID: 4799)
Statham-Gill, K., S80 (ID: 5133)
Steele, A., S47 (ID: 5134)
Steele, H., S86 (ID: 5071)
Stephenson, J., S22
Stevenson, J., S121 (ID: 4839)
Stewart, D., S35 (ID: 4545)
Stewart, L., S36 (ID: 4698), S40 (ID: 4772), S50 (ID: 4749)
Stewart, S., S124 (ID: 4940)
Sticchi, L., S122 (ID: 4844)
Stoodley, P., S70 (ID: 4714), S70 (ID: 4715)
Storkey, H., S41 (ID: 4840)
Stott, D., S112 (ID: 4681)
Strong, E., S121 (ID: 4839)
Subbarao-Sharma, R., S45 (ID: 5016)
Subudhi, C., S47 (ID: 5134)
Sugai, T., S27 (ID: 4802)
Sugiura, M., S83 (ID: 4702)
Sukhina, M., S64 (ID: 4505)
Sulaiman, H., S46 (ID: 5048), S97 (ID: 4843)
Sule, J., S57 (ID: 4558)
Sullivan, C., S11 (ID: 4815), S11 (ID: 4836)
Sullivan, J., S122 (ID: 4879)
Sultan, A., S32 (ID: 5067)
Summers, C., S17 (ID: 4984)
Sunnocks, K., S28 (ID: 4808)
Surewaard, B., S111 (ID: 5028)
Sutherland, J., S74 (ID: 4497)
Sutton, M., S22
Suzuki, Y., S57 (ID: 4513)
Svetoch, E., S26 (ID: 4776)
Sweeney, L., S45 (ID: 5031)
Sykes, A., S86 (ID: 5076), S88 (ID: 5125)
Syrjälä, H., S96 (ID: 4739)
Szerémy, P., S85 (ID: 4902)
Szilagyi, L., S85 (ID: 4902)

Taal, M., S106 (ID: 4862)
Tagliaferri, E., S66 (ID: 4912)
Tahir, S., S18 (ID: 4420), S19 (ID: 4809)
Taki, F., S96 (ID: 4724)
Talamini, A., S122 (ID: 4844)
Tambo, E., S103 (ID: 4378)
Tan, K.Y., S25 (ID: 4706), S82 (ID: 4525)
Tan, L., S130 (ID: 5145)
Tan, N.K., S74 (ID: 4490)
Tang, J.W-T., S80 (ID: 5133)
Tang, J., S134 (ID: 4992), S77 (ID: 4951)
Tang, W.Y., S12 (ID: 4894), S28 (ID: 4813)
Tanti, S., S73 (ID: 4423)
Taori, S., S19 (ID: 4501), S44 (ID: 4988)
Tarbox, M., S70 (ID: 4579)
Tariq, S., S8
Tasse, J., S77 (ID: 5008)
Tayeh, A.A., S82 (ID: 4502)
Taylor, T., S95 (ID: 4625)
Tedder, R., S110 (ID: 5177), S120 (ID: 4803)
Tee, Y.M., S25 (ID: 4706)
Templeton, C., S45 (ID: 5031)
Templeton, K., S132 (ID: 4785), S34 (ID: 5135), S61 (ID: 4944), S74 (ID: 4559)
Theodosiou, A., S46 (ID: 5113)
Theron, H., S54 (ID: 4886)
Theunis, S., S109 (ID: 4970)
Thomas, A., S113 (ID: 4878)
Thomas, S., S115 (ID: 5038), S92 (ID: 5037)
Thomas, T., S16 (ID: 4805), S97 (ID: 4765)
Thompson, K.-A., S70 (ID: 4688)
Thompson, N., S78 (ID: 5050)
Thomson, A., S43 (ID: 4969)
Thomson, A., S13 (ID: 4779), S86 (ID: 5071)
Thomson, C., S119 (ID: 4752)
Thorburn, D., S120 (ID: 4803)
Thorburn, F., S107 (ID: 4868)
Timoney, A., S42 (ID: 4936)
Tiodoung, A.T., S81 (ID: 4435)
Tipple, A., S66 (ID: 4833)
Tischhauser, R., S17 (ID: 4861)
Tivey, A., S47 (ID: 5122)
Tiwari, B.K., S111 (ID: 4710)
Tobias, A., S96 (ID: 4724)
Toh, H.X., S82 (ID: 4525)
Toleman, M., S107 (ID: 4899)
Toner, G., S34 (ID: 5135)
Tonna, A., S35 (ID: 4545)
Tookey, P., S8
Topley, K., S112 (ID: 4681)
Torok, E., S8
Torregrossa, M.V., S83 (ID: 4709)
Totea, G., S30 (ID: 4901), S30 (ID: 4917)
Tran Ba Loc, P., S118 (ID: 4727), S126 (ID: 4976)
Tränkner, N., S12 (ID: 4963)
Treacy, P., S130 (ID: 5127)
Treharne, C., S118 (ID: 4697)
Trip, M., S34 (ID: 4464)
Tristan, A., S112 (ID: 4656)
Troth, T., S80 (ID: 5142)
Troughton, R., S114 (ID: 5007)
Trucchi, C., S121 (ID: 4842), S122 (ID: 4844)
Tsao, A., S47 (ID: 5122)
Tsarfati, E., S49 (ID: 4575), S55 (ID: 4987)
Tubau, F., S87 (ID: 4847)
Tucker, M., S87 (ID: 4971)
Tunbridge, A., S79 (ID: 5106)
Turner, P., S134 (ID: 5043)
Turner, R., S106 (ID: 4862), S58 (ID: 4782), S77 (ID: 4932)
Turner-Gardner, J., S115 (ID: 5038)
Turton, J., S15 (ID: 4918)
Tweed, K., S8
Twiddy, M., S31 (ID: 4982)
Tyler, N., S42 (ID: 4880)

Urch, J., S57 (ID: 4678)
Ustianowski, A., S51 (ID: 4774)
Uwagwu, J., S131 (ID: 4828)
Uwineza, A., S105 (ID: 4712), S109 (ID: 4970)

Vaghela, T., S13 (ID: 4740), S8, S14 (ID: 4883), S42 (ID: 4880), S42 (ID: 4958), S43 (ID: 4985)
Vahdani, A., S81 (ID: 4429)
Valappil, M., S133 (ID: 4967), S30 (ID: 4915)
Valdeyron, M.-L., S112 (ID: 4656)
Vale, L., S79 (ID: 5106)
Van Der Linden, P., S73 (ID: 5148)
van Laer, F., S68 (ID: 5077)
van Popta, D., S22
Van Vaerenbergh, K., S20 (ID: 4738)
Vanhems, P., S112 (ID: 4656)
Vanstone, G., S123 (ID: 4924), S61 (ID: 5009), S75 (ID: 4866), S76 (ID: 4922)
Vargas-Palacios, A., S31 (ID: 4982)
Varia, H., S80 (ID: 5133)
Vasant, J., S19 (ID: 4585)
Vaselli, M., S91 (ID: 5027)
Vashkar, SMK, S67 (ID: 4981)
Vass, D., S78 (ID: 5026)
Vaudrey, K., S101 (ID: 5178)
Vaughan, S., S121 (ID: 4839)
Verbraeken, N., S105 (ID: 4719)
Verge, J.M., S125 (ID: 4953)
Vergnano, S., S33 (ID: 5082)
Verhamme, K., S20 (ID: 4738)
Verma, P.k, S127 (ID: 5025)
Vernham, G., S49 (ID: 4575)
Versporten, A., S33 (ID: 5082)
Verstraeten, T., S133 (ID: 4972), S134 (ID: 4978)
Vickery, K., S18 (ID: 4420), S19 (ID: 4809), S27 (ID: 4804), S66 (ID: 4833), S72 (ID: 5029)
Vilar, J., S51 (ID: 4774)
Villarreal, E., S64 (ID: 4553)
Viscoli, C., S121 (ID: 4842)
Volozhantsev, N., S26 (ID: 4776)
Vyas, A., S33 (ID: 5117)

Waddell, D., S86 (ID: 5071)
Wade, P., S12 (ID: 4865)
Wahab, M., S60 (ID: 4891)
Wake, B., S39 (ID: 4754)
Waldron, R., S51 (ID: 4794)
Wales, A., S46 (ID: 5081)
Walker, A., S104 (ID: 4466)
Walker, G., S86 (ID: 5071)
Walker, J., S70 (ID: 4688), S9
Walker, J., S34 (ID: 5176)
Walker, R., S78 (ID: 5050)
Walker, W., S20 (ID: 4737)
Wallis, G., S96 (ID: 4747)
Walsh, C., S15 (ID: 4955), S54 (ID: 4903)
Walton, K., S59 (ID: 4837)
Walzl, G., S74 (ID: 4497)
Wang, S., S28 (ID: 4813)
Wareham, D.W., S79 (ID: 5089)
Wares, K., S117 (ID: 4689), S95 (ID: 4692)
Warren, S., S15 (ID: 4807), S52 (ID: 4806)
Waters, L., S84 (ID: 4720)
Watkins, E., S107 (ID: 4899)
Watson, D., S35 (ID: 4520)
Watson, E., S104 (ID: 4536)
Watson, K., S49 (ID: 4703), S59 (ID: 4837), S60 (ID: 4937)
Watthanaworawit, W., S34 (ID: 4464)
Watts, V., S25 (ID: 4695)
Waugh, S., S133 (ID: 4967)
Webb, J., S70 (ID: 4688)
Webb, S., S72 (ID: 4938)
Webber, M., S28 (ID: 4808)
Weedall, A., S67 (ID: 4986)

Weerakoon, W., S42 (ID: 4926), S54 (ID: 4911), S58 (ID: 4782), S77 (ID: 4932)
Weidmann, A., S35 (ID: 4545)
Weil, J., S133 (ID: 4972)
Weinbren, M., S78 (ID: 5050), S9
Weinhardt, B., S61 (ID: 5062)
Weir, R., S61 (ID: 4944)
Wellington, L., S61 (ID: 4944)
Westmoreland, D., S20 (ID: 4872), S97 (ID: 4881)
Weston, V., S18 (ID: 4550), S20 (ID: 4737), S78 (ID: 5050), S89 (ID: 4552)
Whatley, V., S114 (ID: 4948)
Wheeler, I., S101 (ID: 5178)
Whitbourn, D., S42 (ID: 4880)
White, B., S36 (ID: 4698), S62 (ID: 5066)
White, J., S53 (ID: 4885)
White, L., S76 (ID: 4929)
White, P.L., S9
White, S., S124 (ID: 4943)
Whitehead, O., S108 (ID: 4942)
Whitehead, S., S31 (ID: 4927)
Whiteley, G.S., S19 (ID: 4809), S65 (ID: 4761)
Whiteside, M., S79 (ID: 5106)
Whitney, L., S37 (ID: 4707), S37 (ID: 4725)
Whyte, A., S79 (ID: 5126)
Wickens, H., S46 (ID: 5113), S9
Wigglesworth, N., S111 (ID: 4465)
Wilby, D., S60 (ID: 4941)
Wilcox, M., S9
Wilde, C., S94 (ID: 5140)
Wilke, M., S12 (ID: 4963)
Wilke, S., S12 (ID: 4963)
Wilkinson, M., S113 (ID: 4878), S17 (ID: 4687), S64 (ID: 4686)
Willemse, A., S20 (ID: 4738)
Williams, C., S59 (ID: 4837), S61 (ID: 5064)
Williams, C., S91 (ID: 5027)
Williams, E., S14 (ID: 4913)
Williams, S., S99 (ID: 5018)
Williams, T., S107 (ID: 4899)
Williams, Y., S124 (ID: 4943)
Williamson, D., S69 (ID: 4571)
Wilson, A., S96 (ID: 4724)
Wilson, D., S128 (ID: 5058)
Wilson, J., S53 (ID: 4882)
Wilson, J., S112 (ID: 4681)
Wilson, J., S11 (ID: 4836)
Wilson, P., S68 (ID: 5160), S88 (ID: 4983)
Winfield, J., S99 (ID: 5078)
Winter, R.D., S3
Winter, S., S67 (ID: 4997)
Wishart, E., S25 (ID: 4721)
Witney, A., S106 (ID: 4857)
Wiuff, C., S11 (ID: 4822)
Wloch, C., S126 (ID: 4999)
Wojkowska-Mach, J., S120 (ID: 4821)
Wong, S., S56 (ID: 4498)
Wong, V., S57 (ID: 4558)
Wood, J., S12 (ID: 4961)
Woodford, N., S22
Woodward-Stammers, L., S107 (ID: 4863), S122 (ID: 4864)
Woolhouse, M., S128 (ID: 5035)
Woolley, S., S51 (ID: 4788), S52 (ID: 4849)
Wootton, M., S10
Worf, K., S12 (ID: 4963)
Wright, J., S31 (ID: 4982)
Wright, J., S43 (ID: 4974)
Wright, P., S62 (ID: 5066)
Wright, S., S51 (ID: 4788), S52 (ID: 4849)
Wybo, I., S105 (ID: 4719)

Xu, Z., S48 (ID: 5158)
Xuereb, D., S112 (ID: 4681)

Yadhunanthanan, P., S52 (ID: 4869)
Yam, T.S., S46 (ID: 5113)
Yamanoue, H., S83 (ID: 4702)
Yang, H., S17 (ID: 4984), S57 (ID: 4558)
Yassen, A., S60 (ID: 4891)
Yates, J., S36 (ID: 4698)
Yau, T., S42 (ID: 4880)
Yazdani, B., S36 (ID: 4683), S36 (ID: 4685), S37 (ID: 4701)
Ye, B., S44 (ID: 4995)
Yepmo, A., S73 (ID: 5148)
Yiannakis, E., S106 (ID: 4853)
Yiannakis, E., S10
Young, S., S59 (ID: 4789)
Youngs, J., S62 (ID: 5101)
Yuen, K., S27 (ID: 4798), S51 (ID: 4799)
Yui, S., S68 (ID: 5160), S88 (ID: 4983)
Yura, H., S83 (ID: 4702)
Yusoff, SIC, S46 (ID: 5048)
Yusuf, A., S73 (ID: 5181)

Zaben, F., S82 (ID: 4502)
Zahraldin, K., S32 (ID: 5068)
Zepp, F., S134 (ID: 4978)
Zezza, L., S66 (ID: 4912)
Zobina, I., S56 (ID: 4498)
Zöller, D., S134 (ID: 4978)
Zotti, C.M., S68 (ID: 5139)

THE JOURNAL OF
HOSPITAL INFECTION

http://www.journals.elsevier.com/journal-of-hospital-infection/