

MEETING ABSTRACTS

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SLIDE SESSION: HEALTHCARE-ASSOCIATED INFECTION SURVEILLANCE SYSTEMS AND BURDENS

O1

Comparing the DebugIT dashboards to national surveillance systems

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BMC Proceedings 2011, **5(Suppl 6)**:O1

Introduction / objectives: An important limitation of existing large-scale surveillance systems of infectious diseases is that they use mostly manual data collection processes and therefore usually deliver trends on an annual basis. The DebugIT project, funded by the 7th EU Framework Programme, provides an access to heterogeneous clinical data sets of different European hospitals. We compared the DebugIT control capabilities to the process and results provided by the French surveillance system of infectious disease (Institut de Veille Sanitaire (InVS)) and the antimicrobial resistance surveillance study of the Paul-Ehrlich-Society (PEG).

Methods: InVS currently controls every year multidrug resistant bacteria in 930 French healthcare facilities and Nosocomial Infection in 176 Intensive Care Units. PEG collects 240 isolates from each of 20-30 microbiology laboratories every three years. The DebugIT platform provides a scalable solution for executing real-time clinical queries over European data repositories about antibiotic resistance and antibiotic consumption.

Results: Despite different methods for aggregating data and calculate incidence rates and antibiotic consumption (e.g. per 1,000 patient-days), the trends observed by national surveillance programs are similar to those reported retrospectively by the DebugIT platform. The detailed comparison is still ongoing.

Conclusion: The use by European surveillance networks of platforms such as DebugIT platform is likely to enhance their ability for real-time identification of new trends in antibiotic resistance and/or antibiotic consumption. An interesting perspective is to connect DebugIT endpoints to general practitioner electronic medical records or private laboratory information systems in order to extend the surveillance to the community.

Disclosure of interest: None declared.

O2

The concordance of European and US definitions for healthcare-associated infections (HAI)

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BMC Proceedings 2011, **5(Suppl 6)**:O2

Introduction / objectives: In Europe comparison of infection rates of HAI is restricted since some countries are using CDC definitions while others use HELICS (Hospitals in Europe Link for Infection Control through Surveillance) definitions. As part of the harmonization process of surveillance, ECDC outsourced a study to analyze the concordance between the definitions.

Methods: A group with experts from 7 European countries was set up to realize the study. Agreement for bloodstream infection (BSI) and pneumonia (PN) was estimated by Cohens kappa.

Results: The study was performed on 47 ICUs and 6506 patients, 180 PN and 123 BSI cases. Agreement for PN was $k=0.99$ (CI95 0.98;1.00). When PN cases were divided in clinically and microbiologically defined PN, kappa values were 0.90 (CI95 0.86;0.94) and 0.72 (CI95 0.63;0.82) respectively. Diagnosis of PN varied among countries: 4 countries predominantly surveyed microbiologically defined PN whereas the others recorded mainly clinically defined PN. Agreement for BSI was $k=0.73$ (CI95 0.66;0.80), BSI cases secondary to another infection site (42% of all BSI) were missed by CDC definitions. BSI concordance was perfect ($k= 1.00$) when only primary BSI cases (HELICS BSI with origin "catheter" or "unknown" and CDC BSI) were analyzed.

Conclusion: Although other methodological differences exist between the two protocols, case definitions per se do not compromise comparability of results and should not be an obstacle for harmonization of European surveillance.

Disclosure of interest: None declared.

O3

Increasing burden of *E. coli* bacteraemia and changing epidemiology

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BMC Proceedings 2011, 5(Suppl 6):O3

Introduction / objectives: According to National surveillance in England *S. aureus* as a cause of bacteraemia has recently declined but that due to *E. coli* has increased by 33%. Mandatory reporting of *E. coli* is being introduced in 2011. At Imperial College Healthcare we investigated *E. coli* bacteraemia occurring between July 2008 and June 2010.

Methods: Microbiological records of patients with *E. coli* bacteraemia were linked with patient data to determine their characteristics, whether CA or HA, and if the *E. coli* produced ESBL. Blood cultures taken within 2 days of admission were defined as CA, 2 days or more after admission as HA and a new episode if greater than 2 weeks between positive blood cultures. *E. coli* ESBL was defined by resistance to cefpodoxime, or by resistance to ceftazidime or cefotaxime whilst remaining susceptible to ceftoxitin. Where possible, the potential source of the bacteraemia was determined from the antibiotic profile of *E. coli* isolated concurrently from other specimens.

Results: 668 *E. coli* bacteraemia were detected (12% of all positive blood cultures), of which 67% were CA; 53% were female. For CA cases, the proportion of females (55%) was higher than males, whilst for HA cases, males accounted for more cases than females (47%). *E. coli* bacteraemia was more common in patients 65 years and over, accounting for 44% of CA and 49% of HA cases. Of the 668, 110 (16%) produced ESBL, of which 61 (55%) were CA. Overall, 14% of CA and 22% of HA cases were ESBLs. The source was identified for 35% of cases; in 30% of these the urinary tract was responsible.

Conclusion: *E. coli* is an important cause of CA and HA bacteraemia with a significant proportion ESBL-strains. Mandatory reporting may facilitate understanding of the epidemiology and target prevention strategies.

Disclosure of interest: None declared.

O4

Secular trends in ESBL, MRSA and VRE incidence in German intensive care units

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BMC Proceedings 2011, 5(Suppl 6):O4

Introduction / objectives: Aim of our study was to quantify and compare trends in incidence of ESBL producing bacteria, MRSA and VRE in intensive care units participating in the German Nosocomial Infection Surveillance System (ICU-KISS) over the last five years.

Methods: A surveillance module for multidrug resistant bacteria (MDR-KISS) was added to ICU-KISS in 2006. Participating ICUs report data on patients with MRSA, VRE and ESBL bacteria. In contrast to ICU-KISS on nosocomial infections, MDR-KISS documents cases of MDR bacteria including colonization and infection present on admission. MDR-KISS collects the following data: date of ICU-admission and ICU-discharge, type of MDR-bacteria and date of first detection, presence of MDR-bacteria on admission or acquisition during the ICU-stay. Incidence of these bacteria was calculated per 100 patients and density per 1000 patient-days.

Results: Up to 2010, 325 ICUs reported data on 253,756 patients. The incidence of ESBL tripled over the last five years from 0.2 to 0.7 per 100 patients. 34% of the ESBL infections were hospital acquired. MRSA incidence stayed stable over time with 1.5 per 100 patients. The incidence of hospital acquired MRSA decreased from 25% in 2006 to 18% in 2010. VRE incidence ranged between 0.1 and 0.2. Hospital acquired VRE showed an incidence of 57% in 2006 and 55% in 2010.

Conclusion: ESBL incidence has been rising steadily and the majority of ESBL producing bacteria were not acquired in the ICU. The dynamic of the ESBL resistance runs not parallel to the stable resistance situation in Gram-positives (MRSA or VRE). To improve the resistance situation it

might not be sufficient to simply restrict interventions to ICUs. Hence, not only ambulatory health care but also veterinary medicine should be included. Physicians and veterinaries should be urged to use antibiotics prudentially for humans and animals.

Disclosure of interest: None declared.

O5

A targeted methicillin-resistant *Staphylococcus aureus* (MRSA) control program did not affect total nosocomial *Staphylococcus aureus* (SA) bloodstream infections (BSI) despite reducing MRSA BSI

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BMC Proceedings 2011, 5(Suppl 6):O5

Introduction / objectives: Background: Intense efforts at reducing MRSA infections have been used in Singapore hospitals from 2007 with active surveillance, intense hand hygiene campaigns, public displays of surveillance results and audio and visual reminders.

Aim: We evaluated the impact of this campaign on overall *Staphylococcus aureus* (SA) bloodstream infection rates.

Methods: All patients with a positive blood culture for SA from Oct 2007 to Feb 2011 were prospectively studied. Infections were classified as community acquired (CA), healthcare acquired (HCA) or nosocomial (NA) according to the US CDC. Rates were calculated per 1000 patient days.

Results: There were a total of 554 SA bloodstream infections during the study period, 115 were CA, 265 HCA and 174 NA of these, 220 were MRSA (10 CA, 111 HCA and 99 NA) and 334 were methicillin susceptible (MSSA) (103 CA, 155 HCA and 76 NA). The trends were analysed using regression models. Despite a decrease in overall SA BSI from 0.62 ± 0.20 to 0.44 ± 0.13 per 1000 pt-days (rate -0.119 , $p=0.023$), there was no significant change in nosocomial SA BSI (from 0.21 ± 0.08 to 0.15 ± 0.10 , rate 0.043 , $p=0.16$). This is because the decline (rate 0.0037 , $P=0.0001$) in nosocomial MRSA BSI from 0.16 ± 0.06 to 0.05 ± 0.09 per 1000 pt days was offset by a rise in nosocomial MSSA infections from 0.06 ± 0.05 to 0.10 ± 0.17 per 1000 pt days (increase rate 0.0013 $P=0.061$).

Conclusion: Our targeted MRSA control program reduced nosocomial MRSA BSI, however replacement by nosocomial MSSA attenuated the overall impact on BSI. A comprehensive approach is needed to reduce all hospital acquired infections.

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O6

A program for audit of infections and antibiotic resistance in critical ill

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BMC Proceedings 2011, 5(Suppl 6):O6

Introduction / objectives: Infections caused by antibiotic resistant pathogens is a growing concern that complicates treatment and influences patient outcome in critical ill. The purpose of this work was to develop and test the feasibility of a system for continuous audit of resistance and compliance to antibiotic treatment guidelines for severe infections in critical care.

Methods: Records from ICU patients (including i.e. reason of admission, illness severity score, interventions and nursing workload, adverse events, outcome in the ICU) were collected in the Swedish Intensive Care Registry (SIR). Mortality data was added weekly for each episode of care (EOC). A web service was developed for individual collection of results from microbiological cultures and analyses for each EOC. Development of the web service included a detailed and cumbersome translation of laboratory specific nomenclatures for samples, cultures, microbials and methods.

Results: Bacteriological data from clinical microbiological laboratories were merged with its respective EOC in SIR yielding data on patient-specific bacteriology and microbial susceptibility. Trends in microbial resistance among alert pathogens were examined. Data on gender, age, co-morbidity were collected from SIR and correlated to microbiological

findings and 30-day mortality. Resistance patterns were analyzed to assess the appropriateness of National guidelines for the treatment of pneumonia in the ICU showing 86% possible accuracy with suggested treatment for community acquired and 82% for hospital acquired disease.

Conclusion: Microbial findings matched with reason of ICU admission can be used to validate or update national guidelines for proper antibiotic treatment. This program may be developed to an early warning system for antibiotic resistance in intensive care

Disclosure of interest: None declared.

SLIDE SESSION: CATHETER-RELATED BLOODSTREAM INFECTIONS

O7

Catheter-related infections in neonatal intensive care units: a prospective multicentre surveillance

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BMC Proceedings 2011, **5(Suppl 6)**:O7

Introduction / objectives: Most infants in neonatal intensive care units (NICU) are exposed to central venous catheter (CVC) and to central-line-associated bloodstream infections and clinical sepsis (CLABICS). The objectives are to measure incidence and assess risk factors of CLABICS.

Methods: A prospective surveillance including all neonates with CVC hospitalized in level 3 NICU is ongoing since 2007. Data are collected using standardized forms validated by a referent physician. Incidence rates (IR) with their 95% confidence intervals (95%CI) were calculated as the number of CLABICS divided by the cumulative number of catheter-days at risk. Risk factors were assessed using adjusted hazard ratio (aHR) in Cox regression.

Results: A total of 1111 neonates exposed to 2049 CVC totalling 14091 catheter-days at risk were included between January 2007 and May 2009. The median gestational age was 30 weeks (range 24-42) and the median birth weight was 1240g (range 440-4400). During study period, 256 CLABICS were detected corresponding to an IR of 16.0 per 1000 catheter-days (95%CI 14.0-18.2): 6.5 (95%CI 4.3-9.3) for umbilical CVC and 20.2 (95%CI 17.5-23.1) for other CVC. The median time to CLABICS was 8 days. Coagulase-negative (82.1%) and aureus (10.8%) staphylococci were the most frequent germs isolated. In multivariate analysis, a birth weight ≤ 750 g (aHR 6.3, 95%CI 1.0-38.1) and intravenous lipid emulsion (aHR 2.3, 95%CI 1.3-3.9) were significantly associated with CLABICS for umbilical CVC. Similar results were observed for other CVC.

Conclusion: The incidence is high in this cohort especially for non umbilical CVC. Comparing IR and risk factors between NICU may allow adapted control measures to be taken. This surveillance will pursue now into a regional survey.

Disclosure of interest: None declared.

O8

Four year surveillance of central line-associated bloodstream infection (CLABSI) in neonatal intensive care unit (NICU)

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BMC Proceedings 2011, **5(Suppl 6)**:O8

Introduction / objectives: From 2007-11 surveillance for CLABSI was performed in our tertiary level, 26 bed NICU. As CLABSI is a preventable nosocomial infection, we are reporting the impact of introducing a Peripherally Inserted Central Catheter (PICC) interprofessional team, dedicated to implement a prevention bundle for CLABSI since 2007.

Methods: All laboratory confirmed blood cultures from the NICU were evaluated to determine CLABSI using the National Healthcare Safety Network (NHSN) definition prior and after 2008. The PICC team are specific bedside nurses trained to insert, monitor insertion site and line removal. They use age/weight specific skin antiseptics (2% CHG, 0.5% and 2% CHG in 70% alcohol) with designated equipment. Bedside nurses access

infusion lines for administering medication, total parenteral nutrition and changing the line/connectors.

Results: Over the past 4 years (2007-11) there were 37 CLABSI using the old NHSN definition versus 22 CLABSI with the new definition. The infection rate was 5.97/1000 Catheter Days (CD) and 3.55/1000 CD respectively. The overall catheter utilization ratio was 0.20. The most prevalent microorganisms recovered were *Coagulase-negative Staphylococci* (71%) followed by *Candida*, *Enterobacter* and *Klebsiella* species (6% each). There were two associated CLABSI mortalities within 30 days. Rates of CLABSI decreased from 8.1 to 3.71 using old definition and from 4.7 to 1.06 per 1000 CD using new definition 2007-08 to 2010-11. Catheter utilization ratio increased from 0.19 to 0.24.

Conclusion: Implementation of a dedicated interprofessional PICC Team and a prevention bundle was successful in decreasing rates of CLABSI in the NICU. The change in definition considerably affects the rates of CLABSI (-41%).

Disclosure of interest: None declared.

O9

Central-line associated bacteremia in intensive care units in Uruguay. 2007-2010 national data

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BMC Proceedings 2011, **5(Suppl 6)**:O9

Introduction / objectives: Intensive Care Unit (ICUs) patients account for a large proportion of hospital infections (HI) and Central Line Associated Bloodstream Infections (CLAB) are one of the most common. We determined the incidence of CLAB in adult (A) and neonatal (N) intensive care units and evaluated the national response to bundle interventions.

Methods: A national surveillance HI system was implemented since 2006 and prospective surveillance is performed using NNIS criteria. The system is mandatory, data are recorded online and sent to the Ministry of Health. Data are audited annually, results are published each year and recommendations were made. Interventions were: alcohol hand rub, alcoholic chlorhexidine for skin antisepsis and maximal barrier precautions for catheter insertion.

Results: Neonatal and adult ICUs from 53 hospitals reported. CLAB rate in NICU was 7.9/1000 catheter-days (474 episodes in 60147 catheter-days), annual incidence lowered in all strata of weight between 2007 and 2010 (15.8 to 8.6, 11 to 6, 6.7 to 1.7 and 4 to 2.3/1000 catheter/days, for < 1000, 1001-1500, 1501-2500 and >2500 gr, respectively). CLAB rate in adult ICUs was 2.7/1000 catheter-days (666 episodes in 247.272 catheter-days), annual incidence was 3.8, 2.6, 2.7 and 1.9/1000 catheter/days, for 2007, 2008, 2009 and 2010, respectively. The main microorganisms were *S. coagulase negative* (AICU 17.3%, NICU 30.6%), *S. aureus* (AICU 14.7%, NICU 14%), *K. pneumoniae* (AICU 12%, NICU 7.1%), *Ps. aeruginosa* (AICU 6.3%, NICU 5.4%) and *Candida* sp (AICU 3.9%, NICU 6.8%).

Conclusion: CLAB surveillance, data publishing and national recommendations contributed to lower the national rates in adults and neonatal ICUs in Uruguay.

Disclosure of interest: None declared.

O10

Transparent semipermeable dressings for peripherally inserted central catheters in neonates – should we be concerned?

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BMC Proceedings 2011, **5(Suppl 6)**:O10

Introduction / objectives: Transparent, semi permeable dressings (TSD) have become a standard means of dressing catheter insertion sites in adults, children and infants. TSDs are used for peripherally inserted central

venous catheters (PICCs) in neonates although their firm adherence to the catheters prevent dressing change after 7 days.

Methods: All neonates with a PICO in 2010 were prospectively included in this single-centre observational study. There was no scheduled dressing change for TSD. Non-selective culture plates, pressed to the PICO insertion site upon catheter removal, were incubated for 24 hours and colony counts within a 1 cm radius were compared to the time of dressing. Dressing-time was defined as days TSDs were in place. Standard definitions were used for central line associated bloodstream infections (CLABSI).

Results: In total, 48 PICCs with a median dwell-time of 8 days (IQR 6-12) totalled 445 catheter-days. Three CLABSI cases (6.7/1000 catheter-days) were detected with a mean time-to-infection of 19 days. No CLABSI case was found before day 15. There was significant correlation between dressing-time and CLABSI (OR 1.16; 95%CI 1.01-1.33; $p=0.036$) as well as between skin colony counts and dressing-time ($p=0.001$). While little growth was found in the first days such was significant after 7 days.

Conclusion: Although TSDs have advantages such as allowing visual inspection of the insertion site, their use for PICCs in neonates should be reconsidered as such dressings cannot be removed easily after 7 days and may stay in place for up to 30 days. This in turn may cause serious infectious complications.

Disclosure of interest: None declared.

O11

Impact of bundle for central line associated bloodstream infections prevention

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BMC Proceedings 2011, 5(Suppl 6):O11

Introduction / objectives: Bundles have been developed to facilitate the application of infection control guidelines. Because in our institution the rates of central line associated bloodstream infections (CL-BSI) were above the international standards it was decided to implement a specific bundle through a multimodal approach.

The aim of this study was to describe the strategy of bundle implementation for prevention of CL-BSI and to estimate their impact.

Methods: Since Mar'10 the following measures were implemented at the ICUs to prevent CL-BSI: use central venous catheters only if strictly necessary; avoiding the femoral site if possible; hand hygiene with alcohol-gel before insertion; using full-barrier precautions during the insertion of central venous catheters; cleaning the skin with chlorhexidine (2%) and removing unnecessary catheters. The implementation was carried out through the model of "5Es" (Engage, Education, Execution, Evaluation and Encouragement). The rate of CL-BSI during the intervention period (Mar'10-Feb'11) was compared with the average of the 12 months prior to implementation. All costs are expressed in US dollars. For economic impact analysis an attributable cost of US\$ 5,500 was used.

Results: The incidence rate of CL-BSI at the baseline period was 6.84 events per ‰ device-days in comparison with 2.70 events per ‰ device-days during implementation period (RR 0.40; 95% CI 0.22 to 0.69, $p<0,01$). There are no changes in the utilization ratio between both periods (0.45 [6429/14222] and 0.44 [7025/16077], respectively). During the implementation period the level of adherence rises to more than 90% in all bundle components. While the annual incremental cost to prevent CL-BSI was US\$ 28,300, the overall net savings was US\$ 130,500.

Conclusion: The effective implementation of this bundle in our hospital reduced the CL-BSI with a significant net saving.

Disclosure of interest: None declared.

O12

Strategies to deploy interventions for prevention of infection related to central venous catheter

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BMC Proceedings 2011, 5(Suppl 6):O12

Introduction / objectives: Bloodstream infections related to central venous catheter are the most frequent causes of morbidity and mortality in intensive care units. Studies show that education and training of health professionals on the practice of dealing with the central venous catheter is an important tool in preventing and reducing infections related to central venous catheter. The aim of this study was to describe the experience of a Brazilian hospital in the deployment of measures to prevent infection-related central venous catheter.

Methods: This is an experience report performed in a midsize charity institution in the city of São Paulo, Brazil, conducted from February 2009. Health institutions seek constantly to improve their practices. Based on that principle, the team was redefined; and an electronic check-list was deployed containing information about the care during insertion. Also manipulation and dressing of central venous catheter were performed with daily fulfilment by the medical and nursing teams, besides a training to all professionals involved with the care of catheters. Data collection, critical analysis and presentation of monthly results were also performed to senior managers and health professionals.

Results: After the project was done, a percentage of compliance was observed at 87% for completing the checklist, and a reduction of blood stream infections related to central venous catheter from 1.3 per 1.000 catheter/day to 0.5 infections related to central venous catheter per 1.000 catheter/day in 2009.

Conclusion: Therefore, it was possible to conclude that the deployment of interventions contributed to the reduction of bloodstream infection fees related to central venous catheter.

Disclosure of interest: None declared.

O13

Sustained reduction of catheter-associated bloodstream infections by simulator-training and self-assessment

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BMC Proceedings 2011, 5(Suppl 6):O13

Introduction / objectives: Central line-associated bloodstream infection (CLABSI) is an avoidable complication in central venous catheter (CVC) use.

Methods: In this study at the University of Geneva Hospitals, individual CVCs were prospectively observed hospital-wide in all adult patients. A baseline period (9/2006-12/2006) was followed by an intervention (1/2008-12/2008) and a sustainability period (1/2009-12/2009). Primary outcome was CLABSI. Interventions aimed at catheter insertion by anaesthesiologists and included (1) a comprehensive checklist, (2) a ready-to-use CVC-insertion set, (3) a CVC-insertion cart containing all necessary material, (4) self-assessment of insertion practice using online documentation, (5) simulation-based CVC-insertion training for residents, (6) web-based information site and (7) feedback during postgraduate education. No intervention was done outside the anaesthesiology division.

Results: Anaesthesiologists, intensivists and other physicians placed 1665 (42%), 1693 (43%), and 617 (15%) catheters, respectively. Cumulative catheter-days and median (IQR) dwell-time were 35,914 and 6 (3-11) days, respectively. Most CVCs were jugular (62%), followed by subclavian (23%) and femoral (15%). CLABSI-rates of anaesthesiologists, intensivists and others at baseline, intervention and sustainability were 4.9, 2.9, 2.0 (IRR 0.75; 95%CI 0.57-0.99; $p=0.04$); 2.7, 1.4, 2.2 (0.96; 95%CI 0.63-1.46; $p=0.85$); and 1.6, 2.1, 3.9 (1.54; 95%CI 0.83-2.84; $p=0.17$), respectively.

Conclusion: Improving CVC-insertion results in significant and sustained CLABSI-reduction. We consider self-assessment at catheter insertion and simulation-based training to have contributed most to the success.

Disclosure of interest: None declared.

SLIDE SESSION: HEALTH-CARE ASSOCIATED INFECTION: BURDEN OF DISEASE AND PREVENTION IN THE DEVELOPING WORLDS

014

Health-care associated infection in Africa

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BMC Proceedings 2011, 5(Suppl 6):O14

Introduction / objectives: To assess the epidemiology of endemic health care-associated infection (HAI) in Africa.

Methods: We searched biomedical databases to identify studies published from 1995 to 2009 on the epidemiology of HAI in African countries. No language restriction was applied. Available abstract books of leading international infection control conferences were also searched from 2004 to 2009.

Results: Nineteen articles met the eligibility criteria for inclusion in the review; only two met high-quality criteria. Four relevant abstracts were retrieved from the international conference literature. Hospital-wide HAI prevalence varied between 2.5 and 14.8 per 100 patients; in surgical wards, the cumulative incidence ranged from 5.7 to 45.8 per 100 patients. Among specific types of infection, the largest number of studies focused on surgical site infection with a cumulative incidence ranging from 2.5 to 30.9 per 100 operated patients. Data on causative pathogens were available from a few studies only and highlighted the importance of Gram-negative rods, particularly in surgical site infection and ventilator-associated pneumonia.

Conclusion: Limited information is available on the endemic burden of HAI in Africa, but our review reveals that its frequency is several-fold higher than in developed countries. There is an urgent need to identify and implement feasible and sustainable approaches to strengthen HAI surveillance and control in Africa, including preventive strategies.

Disclosure of interest: None declared.

015

A mixed-methods study of hospital-acquired infections in Mongolia

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BMC Proceedings 2011, 5(Suppl 6):O15

Introduction / objectives: Official reports of Mongolia indicate that hospital-acquired infections (HAI) occur in 0.01–0.05% of all hospital admissions. This is considerably lower than internationally reported rates. There have been no published HAI prevalence studies from Mongolia. We aimed to determine the first accurate estimate of HAI prevalence in two tertiary hospitals of Ulaanbaatar and to seek explanation for underreporting of HAIs in Mongolian hospitals.

Methods: In 2008, a one-day survey examined all 933 inpatients in two hospitals. Cases of HAI were diagnosed using CDC (USA) definitions. Subsequently, 87 health professionals were recruited for 55 interviews and 4 group discussions. Perceived reasons and mechanisms of underreporting were identified.

Results: Prevalence of HAI was 50/933 (5.4%) overall HAI, 0.3% for bloodstream infection, 1.3% for respiratory tract infection, 1.3%, for urinary tract infection and 1.4%, for other HAI. Among surgical patients, prevalence of surgical site infection was 3.9%. Participants in the qualitative study explained that underreporting of HAI is mainly a response to punitive performance evaluation by the Ministry of Health (MoH) and penalisation of hospitals and staff by the State Inspection Agency when HAI were detected.

Conclusion: The prevalence of HAIs in two Mongolian tertiary hospitals is comparable with reports from some other developing countries. The MoH statistics underestimate the true burden of HAI in Mongolia. Inclusion of the overall HAI rate in the targeted performance indicator set and the

use of strict control and penalisation of hospitals with reported HAI cases are factors that have contributed to gaming, which has resulted in deliberate, extreme under-reporting of HAI cases in Mongolian hospitals.

Disclosure of interest: None declared.

016

Device associated nosocomial infections in a medical intensive care unit of a tertiary care hospital in Jaipur, India

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BMC Proceedings 2011, 5(Suppl 6):O16

Introduction / objectives: Intensive care units (ICUs) are unfortunately the epicenters of nosocomial infections. Limited data is available regarding burden of healthcare associated infections (HAIs) in Indian ICUs, especially the rates of device associated infections by using standardized definitions.

Methods: We conducted a prospective surveillance of device associated infections from January 2010–December 2010 in a 10 bedded Medical ICU of Fortis Escorts Hospital, Jaipur. CDC-NNIS system definitions for all device associated infections were used and rates were calculated per 1000 device days. Device utilization ratio was calculated by dividing the total number of specific device days by the total number of patient days. Microbiological profile of each HAI was noted.

Results: 435 patients were admitted in the Medical ICU representing 3080 patient days. The overall DANI (device associated nosocomial infection) rate was 4.36% (19/435) or 6.16 (19/3080) DAI per 1000 ICU days. The overall VAP rate was 8.9 infections per 1000 ventilator days, CLABSI rate was 2.74 infections per 1000 central day and CAUTI rate was 1.50 infections per 1000 catheter days. Device utilization ratio for central line, ventilator and urinary catheter was 0.59, 0.36 and 0.86 respectively. Non fermenters Gram negative bacteria accounted for 73.68% infections followed by Enterobacteriaceae (21.05%). The most common bacteria were *Acinetobacter baumannii* (26.31% of total) and *Pseudomonas aeruginosa* and *Klebsiella pneumoniae* (10.52% of total each).

Conclusion: Targeted surveillance and calculation of device associated infection rates per 1000 device days allows detection of unique institutional problems that need redress.

Disclosure of interest: None declared.

017

Length of stay and mean cost of patients' hospitalization with healthcare-associated infections acquired in a national hospital in Senegal

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BMC Proceedings 2011, 5(Suppl 6):O17

Introduction / objectives: Economic data on healthcare-associated infections (HCAI) in resource-poor countries are practically nonexistent despite the importance of this issue. Healthcare costs are patients' charges whereas minimum wages is of 72€ in Senegal. The objective of our study was to estimate the length of stay (LOS) and the mean cost of stays of patients who have acquired a HCAI at *Hôpital Principal de Dakar* to increase the awareness of authorities on this issue.

Methods: Retrospective analysis of the hospital stays' database between September and November 2010. Patients admitted in surgical unit, internal medicine unit and intensive care unit and for who at least a bacteriological test was found positive were selected. Probable cases of HCAI were included on clinical data as the delay of appearance, clinical and bacteriological signs like the presence of multiresistant bacteria. Hospital stay's cost was estimated by the daily cost, the cost of therapeutic acts and biological tests.

Results: 19 cases of HCAI were identified in 16 patients. The LOS is of 56 days for HCAI identified in surgical unit (SU), 39 days in internal medicine unit (IMU) and 20 days in intensive care unit (ICU). The mean cost of these patients' stays were of 2 793€ in SU, 1 734€ in IMU and 1 578€ in ICU.

Conclusion: Our study is not exhaustive since infections with no bacteriological data and viral and fungal infections were not included. However, results highlight the economic burden of HCAI. A case-control study would show the overcost induced by HCAI and results would give decisive argument for the prevention of these infections.

Disclosure of interest: None declared.

Note: This abstract was also presented as Poster P351.

O18

Improving infection control in developing countries: the infection control assessment tool

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BMC Proceedings 2011, 5(Suppl 6):O18

Introduction / objectives: The burden of healthcare-associated infections (HAI) is large in developing countries. There is an urgent need to improve HAI prevention in these countries.

Methods: We developed the Infection Control Assessment Tool (ICAT) under the auspices of the Rational Pharmaceutical Management Program at Management Sciences for Health (Washington, DC) with support from the United States Agency for International Development. ICAT enables users with limited infection control expertise to complete hospital-wide, unit-based, or problem-based evaluations of existing infection control infrastructures and practices. ICAT includes 21 modules, each focused on a particular topic (e.g., hand hygiene, isolation and standard precautions, disinfection and sterilization) or department/ward (e.g., labor and delivery, intensive care, medical/surgical ward). ICAT provides a scoring system to evaluate the findings and makes practical, low-cost recommendations for improvement based on guidelines from international organizations (e.g., World Health Organization, Centers for Disease Control and Prevention) and experts.

Results: With the assistance of hospital staff and governmental officials, ICAT was field-tested in acute care hospitals of different types in the Philippines and Uganda. ICAT was refined to ensure that commonly-encountered problems were identified clearly and that its recommendations for improvement were feasible in low resource settings.

Conclusion: ICAT is a simple, practical tool to improve infection control in low-resource healthcare facilities. ICAT is ready for wider implementation to evaluate its effectiveness in reducing HAIs.

Disclosure of interest: None declared.

O19

Promoting surveillance of healthcare related infections (HCRI) in Manhiça (Mozambique)

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BMC Proceedings 2011, 5(Suppl 6):O19

Introduction: The Centro de Investigação em Saúde de Manhiça (CISM) is a research institution whose mission is to promote and conduct biomedical research in priority health areas. The CISM is located in Manhiça, 80km from Maputo (Mozambique).

Methods: The CISM has 3 well developed platforms (demographic, geographic and morbidity surveillance platforms) crucial. These platforms cover a study area of 500 km² with close to 84,000 inhabitants. In this area, all houses are geo-positioned (GPS) and the population is under demographic surveillance. The morbidity surveillance system collects information on all paediatric outpatient visits and admissions to the Manhiça District Hospital. The CISM research agenda is directed at the priority health problems in Mozambique. The CISM maintains stable research collaborations with the HCB/UB and the Barcelona Centre for International Health Research (CRESIB). We are conducting a project to develop a prevalence survey system for HCRI, based on the Spanish EPINE study with more than 20 years of experience. Questionnaires as well as definitions will be tested in a pilot study at the CISM this summer, and data collected and analyzed following the standard protocol. The CISM contributes to the strengthening of human

resources in the country through the training of researchers and other technical personnel. Physicians and Nurses from the CISM will be trained in the use of the surveillance tool, to ensure that the community benefits from research results.

Conclusion: Improving healthcare provision in the Manhiça District is one of the CISM's priorities. There is no data regarding the rates and types of HCRI in Mozambique, and simple, easy to do prevalence studies could be a way to approach this health problem.

Disclosure of interest: None declared.

O20

Adoption of an infection prevention and control programme (IPCP) in the Republic of Kiribati: a case study in diffusion of innovations theory

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BMC Proceedings 2011, 5(Suppl 6):O20

Introduction / objectives: This paper presents a study which holistically examined the innovation processes experienced by the Republic of Kiribati in their adoption of a comprehensive IPCP innovation package.

Methods: A case study methodology was used to explore IPCP adoption. Data sources and analysis included: 1) Chronological and thematic analysis of IPCP documentation and assessments performed by local staff and external agencies/consultants, and 2) semi-structured interviews with local key informants and external agencies (using snow-ball sampling) with thematic analysis. Analysis was informed by the Diffusion of Innovations for Organisations framework.

Results: Identification of the two key activities of the innovation process for organisations, initiation and implementation (of the IPCP) was achieved. The initiation activity included two stages: 1) *agenda-setting*: preparations for severe acute respiratory syndrome (SARS) in 2003 stimulated the identification of organisational IPCP deficits, and 2) *matching*: IPCP deficits were identified and the decision to adopt an IPCP innovation package was made. Implementation included three stages: a) *redefining/restructuring*: identification of the components of an IPCP and how they best fit with the local health structure, b) *clarifying*: integration of IPCP into the health services and defining an infection control role within the nursing division and, c) *routinising*: the IPCP became an ongoing element in health service delivery.

Conclusion: The adoption of the IPCP followed the classic Diffusion of Innovations Process for Organisations. This process can serve as an IPCP adoption model in other low- and middle-income healthcare settings.

Disclosure of interest: None declared.

O21

Avoiding maternal-child death in DR Congo through infection control

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BMC Proceedings 2011, 5(Suppl 6):O21

Introduction / objectives: In sub-Saharan Africa, 1 in 22 women is likely to experience infection or even death in child birth. Along with Nigeria and Ethiopia, the DRC is among the worse off. Hospital acquired infections(HAI) are a neglected and yet crucial factor in maternal mortality. Our objectives were to identify the role of HAI in the mortality observed in Lubumbashi maternal wards and to offer some answers to ensure patient safety.

Methods: Data were collected from two maternity hospitals in the city of Lubumbashi, one tertiary level with 30 births and one secondary level maternity ward with 10 deliveries per day.

The following parameters were selected for study: maternal mortality rates, hospital hygiene, quality of care, performance of biomedical laboratories, supplies of antibiotics.

Results: Maternal mortality is higher in the tertiary level maternity. HAI are a very prominent cause of maternal mortality, especially after a caesarean section.

Working conditions are the same in both hospitals as regards equipment. The level of skills is higher in the tertiary level maternity, but the sanitary conditions are appalling: no access to water, no antiseptics or disinfectants. Blood transfusions, infusions, injections are mostly carried out in extreme emergency, without basic safety precautions. Some deliveries are practiced with bare hands. Caesarean sections are performed without observance of asepsis.

Conclusion: Progress are difficult because of the disorganization of the health system, lack of motivation of health personnel, the paucity of hospitals. A sensibilization of the general population locally and of international partners on the issue of safety in maternal child care is urgent. We need to mobilize partners as well as the public is needed to place emphasis on infection prevention and control through women organizations, patient groups and the media.

Disclosure of interest: None declared.

Note: This abstract was also presented as Poster P396.

O22

Hand hygiene campaigns in a low resource context: a Vietnam perspective

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BMC Proceedings 2011, **5(Suppl 6):O22**

Introduction / objectives: Bach Mai tertiary hospital is a 1900 bed facility in Viet Nam. Previous hospital hand hygiene programs proved unsuccessful which prompted the director to launch an intensive hand hygiene campaign on 5th May 2009 to reduce health-care associated infection (HAI) using World Health Organization (WHO) tools. We would like to present the results and challenges of the Bach Mai hospital hand hygiene campaign.

Methods: A review of hand hygiene compliance rates before and after a two-month campaign. The campaign launched a practical hand hygiene protocol including provision of soap/water and alcohol-based hand rub (ABHR); education and communication materials; and a 20-hour hand hygiene training course for link nurses. Daily audits were done by accredited link nurses in 29 clinical departments. Compliance data was analyzed and results distributed.

Results: In 2007, 2526 hand hygiene observations showed compliance rates of 14.0% (95%CI 12.7%>15.5%). After the 2009 campaign the rate improved significantly ($p < 0.0001$) to 47.0% (1806/3840) (95%CI 45.4%>48.6%). Factors impeding compliance included inappropriate glove use and access to soap/water and ABHR.

Conclusion: The campaign improved compliance by three-fold, however compliance remains less than optimal. Commitment to improving compliance is needed from hospital leadership levels. Current research conducted by the University of New South Wales, Bach Hospital Hanoi and WHO aims to improve hand hygiene and reduce HAIs using standardised surveillance tools. We believe that this will provide evidence of the impacts of hand hygiene on patient safety in a sample of health care facilities in Viet Nam.

Disclosure of interest: None declared.

O23

Developed-developing country partnerships: benefits from South to North?

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BMC Proceedings 2011, **5(Suppl 6):O23**

Introduction / objectives: Developed-developing country partnerships can act as a platform for realizing mutual benefits and contribute to

global health. Benefits accrued by developed countries from partnering with developing countries are often unknown.

Methods: A literature review was conducted using PubMed database, grey literature, media scanning and cited references. A standardized approach was utilized to extract key points from each article to understand benefits accrued by developed countries. Benefits were categorized and interpreted using a hybrid categorization framework combining the Partnership Evaluation Tool (PET) and the WHO health systems framework. Findings were further examined for applicability to infection prevention and control practice.

Results: The review showcased instances of direct benefits accruing to individuals or organisations involved in partnerships. More importantly, the review demonstrated possibilities for system-wide benefits to developed countries in each of the six health system building blocks. Whether it be service delivery; health workforce; health information; medical products, vaccines and technologies; financing; or leadership—opportunities for networking, learning and action constitute the foundation of strong partnerships between developed and developing countries. These findings have particular relevance to knowledge flow from developing to developed countries on infection prevention and control.

Conclusion: Learning to value all forms of knowledge is essential if we are to redesign conventional practices. In this regard, developing countries are proving their ability to lead change. This realization can transform current paradigms on the nature of learning and global knowledge transfer. The global infection prevention and control community can lead this paradigm shift to enhance global health.

Disclosure of interest: None declared.

SLIDE SESSION: MULTI-DRUG RESISTANT GRAM-NEGATIVES

O24

Prevalence and acquisition rate of extended spectrum beta lactamase producing gram-negative organisms (ESBL-GNO) in general medical patients in Switzerland

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BMC Proceedings 2011, **5(Suppl 6):O24**

Introduction / objectives: We aimed to determine the prevalence and acquisition rate of ESBL-GNO amongst patients admitted to general medical units at our hospital.

Methods: Patients consecutively admitted to 13 medical wards from March-June 2010 were screened for ESBL-GNO via rectal swab within 48 hours of admission, and 36 hours of discharge.

Results: Of 1967 patients, swabs were obtained in 1111 (56%) at admission and 491 (25%) at discharge with 441 (22%) having both. Mean age was 64 years and 58% were male. 6.8% (75/1111) of patients were positive for an ESBL-GNO at admission of whom 86%, for whom data were available (24/28), had an ESBL-GNO detected in the previous 6 months. 3.7% (18/487) of patients acquired an ESBL-GNO, having positive cultures at discharge but not at admission. On univariate regression, acquisition of an ESBL-GNO was associated with admission from home (OR 0.2 [95% CI 0.1-0.6], $p = .005$), transfer from another unit (OR 8.3 [95% CI 2-33], $p = .003$) and receipt of a first or second-generation cephalosporin (OR 7.2 [95% CI 1-37], $p = .017$). Receipt of a first or second-generation cephalosporin was the only factor independently associated with ESBL-GNO acquisition (OR 7.1 [95% CI 1-40], $p = .03$). Age, sex, intensive care, provenance and receipt of other antibiotics were not associated with ESBL carriage or acquisition.

Conclusion: Carriage and acquisition of ESBL-GNO is a problem amongst medical patients at our hospital. No risk factors for ESBL-GNO carriage were identified.

Disclosure of interest: None declared.

O25

Transmission of KPC producing *Klebsiella pneumoniae* despite appropriate barrier precautions of an intensive care unit in the Netherlands

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BMC Proceedings 2011, 5(Suppl 6):O25

Introduction / objectives: Enterobacteriaceae producing carbapenemases are very rare in the Netherlands and correspond almost exclusively to imported clones from endemic areas. Here, we report an imported case of KPC-carrying *K. pneumoniae* with transmission to another patient.

Methods: A 68 year old female who was travelling in Greece was admitted to the ICU of the University Hospital of Ioannina in Greece for urosepsis and hypercapnic coma. The patient was transferred to the ICU of the Spaarne Hospital on September 22nd 2010 (day 9). Patient was admitted in strict barrier precautions for MRSA. Intestinal carriage of MDR Enterobacteriaceae was screened at admission and a carbapenem-resistant *K. pneumoniae* strain was isolated from a throat swab. A confirmational PCR was positive for *bla*KPC. On October 14th a routine urine sample from a patient who had been admitted for 15 days at the ICU, tested positive for a genotypically identical KPC producing *K. pneumoniae*.

Results: Secondary spread was investigated by active surveillance. None of the patients or personnel was found to be positive for KPC-carrying Enterobacteriaceae. No further cases were identified.

Conclusion: Here we report dissemination of KPC-producing *K. pneumoniae* from a patient repatriated from a Greece ICU despite continuous barrier precautions. We found no evidence for further local spread within our hospital. We stress the importance of early identification and confirmation followed by intensified infection control measures to prevent the dissemination of Enterobacteriaceae with KPC-enzymes.

Disclosure of interest: None declared.

O26

MDR Acinetobacter baumannii in the short term and long term acute care setting

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BMC Proceedings 2011, 5(Suppl 6):O26

Introduction / objectives: Multi-drug resistant Acinetobacter baumannii is a health care-associated pathogen that can live for months in both a wet and dry environment. The high prevalence of this organism in the hospital environment results in colonization of the skin and respiratory tract in the patient population, which can lead to development of infection. Determine if development of an admission screening protocol and 10% hypochlorite disinfection will significantly reduce the incidence of health care-associated infections in the patient population.

Methods: A case-only study was conducted over a 12-month period. Interventions used to reduce the incidence of healthcare associated Acinetobacter baumannii included 10% hypochlorite disinfection, hand hygiene, special contact isolation for suspected and confirmed cases, educational tool for clinicians, patient and visitors, daily isolation rounds, automated report functions, and standardized nursing unit isolation practices. Pulse-field gel electrophoresis was performed on all isolates to determine if there was a common genotype among the patient population.

Results: There were a total of eighty-five (85) isolates collected during the 12-month period. 52 (61%) were healthcare-associated and 33 (39%) were community acquired. In the first month of implementation of a new protocol to collect respiratory specimens on admission from other acute care facilities, there was an 87.5% reduction in healthcare-associated isolates.

Conclusion: A combination of an admission screening protocol of patients transferred from other acute care facilities, implementation of a 10% hypochlorite disinfection protocol and isolation of those patients at time of admission until negative culture results can prevent transmission of healthcare-associated and community acquired MDR Acinetobacter in a healthcare entity.

Disclosure of interest: None declared.

O27

The emergence of carbapenem resistance in ESBL-producing *Escherichia coli* O25B-ST131 strain from community acquired infection in Kuwait

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BMC Proceedings 2011, 5(Suppl 6):O27

Introduction / objectives: In this study we investigated a multi-drug resistant *E. coli* recovered from ascetic fluid of a haemodialysis patient with community-onset urinary tract infection from Al-Amiri hospital in Kuwait. The patient was suffering from advanced liver disease with portal hypertension and multiple current inter abdominal abscesses.

Methods: Antimicrobial susceptibility was determined by Vitek2, Microscan, disc diffusion, E-test & double disc method against antibiotics. PCR & sequencing were performed for O25pabBspe, *pabB*, *trpA*, *chuA*, *yjaA* TSPE4, *bla*SHV, *bla*TEM, *bla*CTX-M15, *bla*_{OXA-1-like}, *aac*(6['])-*lb-cr*, *tet*(A), *tet*(B), *gyrA*, *parC*, plasmid mediated *qnrA*, *qnrB*, *qnrS*, IMP, SPM, VIM, OXA-48, NDM, KPC and classes 1 and 2 integrons.

Results: The isolate was confirmed as *E. coli* O25b-sequence type (ST) 131 clone of B2 phylogenetic group. The isolate was resistant to all antibiotics tested except sulfamethoxazole, trimethoprim and nitrofurantoin and E-test confirmed that it is highly resistant to meropenem, imipenem, ciprofloxacin, cefotaxime and ceftazidime with MIC values of >16 mg/l, 32 mg/l, >64 mg/l, 32 mg/l & >32mg/l respectively. PCR detected the expected sizes of the amplified resistance genes, and DNA sequencing confirmed that TEM-1, the novel SHV-122 GeneBank (GQ290211), CTX-M-15, OXA-1, variant *aac*(6['])-*lb-cr*, *tet*(A) genes, VIM and KPC were present and it was found to carry a class 1 integron. No mutation was found in *gyrA* but in ParC a mutation at 520 G to C, with amino acid change 174 Val (GTC) to Leu (CTC) was detected. QnrA, B, S and integron 2 were not present.

Conclusion: This is the first report of the emergence and the detection of a multiple antibiotic resistant *E. coli* O25b-sequence type (ST)131 containing 2 carbapenemase genes in Kuwait.

Disclosure of interest: None declared.

INNOVATION ACADEMY: "THE PITCH"

O28

A new serotyping method of *S. pneumoniae* using an automated microarray-based assay

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BMC Proceedings 2011, 5(Suppl 6):O28

Introduction / objectives: Serotype replacement is a major concern following the introduction of polysaccharide-conjugated vaccine against *S. pneumoniae* and requires a close monitoring in the population. Antibody-based serotyping methods are expensive, semi quantitative, cross-reactions are common and a significant number of isolates cannot be typed. Multiplex PCR-based assays have been developed but quantification of PCR products remains problematic. To address these issues a novel PCR-based automated microarray assay was developed and tested on clinical samples.

Methods: Autolysin, pneumolysin and eight other genes located in the capsular operon were first amplified using multiplex PCR. This step was followed by a tagged primer extension step targeting serotype-specific polymorphisms. The tagged primers were then assigned to a specific spot on a microarray, and processed and scanned in an ISO-certified automated molecular diagnostic system, using a confocal laser microscope. Results from the assay were exported to the analysis software/expert system that transformed genetic typing data into capsular serotype identification.

Results: Using this new technology, 51 serotypes of *S. pneumoniae* can be precisely and uniquely identified, including the 13 types present in the new conjugate vaccine. The remaining 39 are assigned to a serogroup. Blood, CSF and nasopharyngeal samples from children with *S. pneumoniae* infection or carriage were tested and serotype was confirmed by sequence analysis. 26 different serotypes were detected and concordance between both methods was greater than 96%.

Conclusion: This automated microarray assay is robust and could identify precise serotypes of *S. pneumoniae* directly from clinical samples. It is easy to handle and will be most useful in clinical settings and for the evaluation of serotype prevalence changes.

Disclosure of interest: None declared.

O29

Smart prevention device for foot infection

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BMC Proceedings 2011, 5(Suppl 6):O29

Introduction / objectives: Each year 30 millions of foot ulcers occur worldwide and 56% of them will become infected. These infected foot ulcer represents the leading cause of lower-limb amputation in the world and shortens dramatically the lifetime of people.

The reduction of high plantar pressure in patients with peripheral neuropathy such as diabetic people is mandatory for the prevention of foot ulcers and amputations.

The device "Power Insoles" is an electronic shoe insole that monitor plantar pressure throughout the day, and prevent apparition of foot ulcers by informing the patient through biofeedback signals on a smartphone.

Methods: After a screening of peripheral vascular disease and loss of protective sensation of the foot. Power insoles are prescribed to the patient. These user friendly stand alone insoles measures plantar pressure continuously in real time.

When repeated high pressure points over time occurs, patient is warned with a bio-feedback signal transmitted wirelessly from the insole. The patient is informed visually, by sound and by vibrations through a smartphone. According to these signals the diabetic can modify his walking gait pattern, decide to rest, or check his feet and/or consult a foot specialist.

The information given by the insoles are also very valuable to medical staff, for diagnostics, choice of treatment, and patient education.

Results: Recent studies at Geneva University Hospital as shown that subjects suffering from foot neuropathy can modify their foot pressure distribution by offloading at-risk area in response to the biofeedback signal. They were able to find by themselves a new walking strategy!

Conclusion: Thereby, "Power Insoles" are design to reduce the number of foot ulcer infections and improve lifetime and health conditions of many people.

Disclosure of interest: None declared.

O30

The development of an online database and mobile web application for the collection and analysis of hand hygiene compliance data

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BMC Proceedings 2011, 5(Suppl 6):O30

Introduction / objectives: Hand Hygiene Australia (HHA) commenced implementation of a National Hand Hygiene Initiative (NHII) in 2008 into all healthcare facilities. Based on the World Health Organization "5 Moments for Hand Hygiene" Program, one of the aims is to establish a uniform system of hand hygiene (HH) compliance auditing to allow local, national and international benchmarking. HH compliance (HHC) data was collected manually on a paper form, input to a local database and then emailed to HHA. This process was time consuming, resource intensive.

Methods: An online database (OLDB) was developed allowing both manual data input and uploading of data collected on a mobile device. Further development included a mobile web application (MWA) which provided for use of mobile devices (Smartphones, iPads etc) to collect data and direct submission into the OLDB via a web interface. The OLDB allows for instant reporting of HHC rates at a unit, hospital, state and national level, by Moment and HCW. An export capability in the Report function allows users to export into other common programs for table and chart formatting to their preference.

Results: Development of the OLDB was completed in July 2010. In March 2011, over 360 hospitals submitted data using the OLDB.

The development of the MWA was completed in February 2011, and its use is increasing.

Conclusion: A cost effective, user friendly electronic HHC data collection and analysis process is now available for all Australian healthcare facilities. Anecdotal reports indicate that the use of the MWA and OLDB has halved the time taken to manage HHC data. This development has been vital to the sustainability of the NHII and is potentially usable by other national programs.

Disclosure of interest: None declared.

O31

Immersive hand hygiene trainer for physicians – a story-based serious game

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BMC Proceedings 2011, 5(Suppl 6):O31

Introduction / objectives: Hand hygiene is a simple yet often omitted gesture to prevent pathogen transmission and healthcare-associated infections. Training healthcare workers in hand hygiene is a key element in any multifaceted promotion strategy. Physicians are notoriously known for their underperformance in this field. We sought to design a natural immersive environment to improve physicians' hand hygiene performance.

Methods: We inserted filmed sequences based on a plot of two physicians interacting with different patients during ward rounds into an interactive computer interface allowing the physician 'gamer' to decide where to use hand hygiene and disposable gloves. Hand hygiene being a very repetitive and often subconsciously executed task, virtual immersion might increase learning and improve long-term retention. Thus, we used both an emotionally engaging but also distracting plot to create role identity and simulate mental load typical for medical activity on the ward. Design features were refined through individual think-aloud protocols and target group testing. Immediate feedback messages and a result tracking mechanism were added.

Results: The design specifications could all be met. The resulting application proofed equally suitable for the training of hand hygiene observers. Computing the user's results allows for benchmarking.

Conclusion: A serious game was successfully launched immersing the 'gamer' into the real-life challenge of hand hygiene. Post-launch evaluation and clinical effectiveness have to be performed in a next step.

Disclosure of interest: None declared.

O32

Design of automated training and monitoring system for alcohol-based hand rub surgical hand preparation

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BMC Proceedings 2011, 5(Suppl 6):O32

Introduction / objectives: Alcohol Based Hand Rub (ABHR) for surgical hand preparation has been proposed and a multi-step procedure was proposed by the World Health Organisation in 2009. This represents a culture change for surgical staff and an automated training and monitoring system supports both the surgical and infection control staff is proposed.

Methods: The proposed system extends the SureWash automated hand hygiene training system developed in Trinity College Dublin. A larger operating space and a wider range of hand and arm motions are required. Three approaches to system design were taken: conventional single camera (IDS, DE), stereo-camera pair (Point Grey, CA) and a 3D camera (Microsoft, US).

Results: The cameras were positioned above the users with a clear view of their hands. For the single camera system background modelling and skin detection were combined to find the hands and arms. The solution was effective but was sensitive to the intensity and colour of light in the workspace. The stereo camera system measured the distances to objects in front of the camera and was combined with the skin detection to find

the hands and arms. The system performed well but required significant processing power. The 3D camera system could detect the arms well but the camera had to be more than 50cm above the top of the user and multiple systems in a confined space can create interference.

Conclusion: Three designs were evaluated in the development of an automated training and monitoring system for alcohol based hand rub surgical hand preparation and the next step is to test each in the surgical scrub room and develop an engaging training programme for surgical staff.

Disclosure of interest: S Ameling: None declared, G. Ó Fearghail: None declared, S. Álvarez: None declared, G. Lacey Shareholder of GLANTA Ltd.

O33

Using innovative antimicrobial glove technology to reduce the risk of surgical wound contamination following glove perforation

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Introduction / objectives: Surgical gloves create a protective barrier, however high perforation rates (6%>60%) are reported in the literature. A recent study has suggested linkage between glove perforation and increased risk of SSI. This investigation evaluated a model of microbial passage through conventional single (A), double-thickness (B) and a tri-layer innovative surgical glove (C) with antimicrobial activity.

Methods: Bacterial passage was assessed following multiple glove puncture using *S. aureus* and *B. (Pseudomonas) diminuta* (BD) in a model of gross wound contamination in volunteers in Groups A, B and C. Using microbiological methods bacterial passage was assessed at 5, 10, 30 and 45 minute exposure, expressed as cfu per unit time. A total of 6 repetitions were made for each glove/time interval. The Mann Whitney test was used to assess the differences in microbial passage between the three groups.

Results: Microbial passage was evaluated separately (5, 10, 30 and 45 min) and combined (5/10 and 30/45). No significant differences were observed in microbial passage between Groups A and B at 10, 30, or 45 minutes, a significant difference was observed in Group C at 5, 30 and 45 minutes compared to A and B for SA and BD. When timed groups were combine a significant reduction in passage of SA and BD was observed compared to Groups A and B.

Conclusion: An antimicrobial surgical glove was effective at reducing microbial passage ($p<0.05$ - $p<0.005$) following glove perforation compared to single or double-layer gloves. These findings suggest further studies are warranted to assess the clinical efficacy of an innovative antimicrobial glove technology as a SSI risk reduction strategy.

Disclosure of interest: None declared.

O34

A novel approach to fit testing of the N95 respirator in real time in a clinical setting

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BMC Proceedings 2011, 5(Suppl 6):O34

Introduction / objectives: A fitted N95 respirator has been recommended, legislated in the USA and other countries. The conventional Portacount fit test method can only be used in a laboratory environment. It cannot deliver real-time measurements of face-seal leakage when the N95 respirator is in use in clinical settings. This study aimed to develop a method to evaluate N95 respiratory protection in real time, in a clinical setting.

Methods: This research was divided into two stages. Stage 1 involved developing and validating a new fit test method to evaluate respirator

protection. Stage 2 evaluated the performance of the new fit test method and the necessity to perform a "fit check"; Eighty-four subjects were selected for this study. They were divided randomly into four groups. The tests were conducted while the subjects were wearing N95 respirators in doing bedside nursing procedures.

Results: Results from the work of Stage 1 showed that the new fit test method measured by the two spectrometers measured ambient particle concentration consistently. Results of Stage 2 showed significant differences among groups in perception of sensation after wearing N95 respirator in terms of the ease in talking ($p=0.026$). The mean of overall comfort perception of Group C was 4.24 (± 0.63), the highest among the four groups. Results of Stage 2 showed significant differences between Groups trained in performing the fit check and those who were untrained.

Conclusion: A novel fit test method to evaluate N95 respirator protection was devised and tested in this study. If implemented, it could significantly reduce the risk of health care workers exposed to infectious diseases in clinical settings.

Disclosure of interest: None declared.

O35

A cross-site antimicrobial resistance surveillance system using semantic web technologies

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BMC Proceedings 2011, 5(Suppl 6):O35

Introduction / objectives: Bacterial resistance to drugs has reached alarming levels but useful cross-site monitoring systems to track resistance evolution are lacking. In this paper we present the *TrendMon* surveillance system, a platform for querying, integrating and visualising antimicrobial resistance information.

Methods: TrendMon is developed within the EU FP7 DebugIT (Detecting and Eliminating Bacteria Using Information Technology) project. It builds on another DebugIT component, the virtual Clinical Data Repository (vCDR), which integrates clinical information systems, using RDF (Resource Description Format) and SPARQL (SPARQL Protocol and RDF Query Language) to formally describe and access sources respectively. It also exploits biomedical domain ontologies, such as NEWT and WHO-ATC, to formalise, normalise and enrich the data content.

Results: Datasets covering microbiology test and antibiotherapy information from 2000 to 2009, from seven healthcare institutes were shared within the consortium. A set of clinical questions of public health interest was proposed to assess the system's ability to track resistance trends from heterogeneous sources. In this limited scope, TrendMon managed to automatically integrate and extract trends from six out of seven hospitals. Furthermore, it allowed generating views by drug (anatomical, therapeutic and chemical axis) and bacteria (genus, taxon) clusters.

Conclusion: TrendMon is a powerful tool for monitoring bacterial resistance patterns. The main challenge found in the design was to represent formally the data sources. The next step is to integrate the proof of concept in real time clinical information systems. Ultimately, the clinical meaning of the extracted trends needs to be validated.

Disclosure of interest: None declared.

O36

When the user is not the chooser: stakeholder involvement in innovation adoption and implementation for addressing HCAIs

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BMC Proceedings 2011, 5(Suppl 6):O36

Introduction / objectives: Whilst evidence based innovations exist for helping to address Health Care Associated Infections (HCAIs), the uptake and implementation of these is highly variable and in some cases very slow. We aimed to investigate organisational innovation adoption decisions and implementation processes in the context of Infection

Prevention and Control (IPC). Here we focus on the implications of stakeholder involvement during these processes.

Methods: We sampled NHS trusts in England, which were winners of the Department of Health 'HCAI Technology Innovation Award 2009'. By analysing data from over 100 semi-structured qualitative interviews with clinical and non-clinical staff at all levels, we looked at technology selection decisions and implementation processes.

Results: Stakeholder involvement varied across the trusts with decisions highly exclusive to the IPC team, to highly inclusive of wider trust members. The context, including previous experience, and logistical factors influenced the level of stakeholder engagement. The method and timing of stakeholder involvement impacted on: the nature of innovations considered, innovations selected, success of the implementation of innovations. Cases of non-adoption and discontinued technologies are presented for important learning. Cases of successful implementation are presented in context of the adopting hospital. A model of potential benefits to 'successful' innovation adoption and implementation is presented.

Conclusion: Key stakeholder involvement can lead to innovation adoption decisions compatible with structural and cultural contexts. There are potential synergies through stakeholder engagement across the two phases of decision making and implementation. Our model has useful application as a strategic and operational toolkit for IPC.

Disclosure of interest: None declared.

O37

A treatment for banknotes against viruses, bacteria and fungi

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BMC Proceedings 2011, 5(Suppl 6):O37

Introduction / objectives: Banknote paper was treated in order to prevent growth of micro organisms and consequently limit risks of contamination during handling.

Methods: The Biogard[®] paper substrate was treated by impregnation with patented harmless active compounds. Antibacterial activity against *Escherichia coli* and *Staphylococcus aureus* was determined using ISO 20743 (transfer method) standard, antifungal activity using AATCC 30 (part III) against *Aspergillus niger* and antiviral activity using EN 1447666+A1 standard against H1N1 influenza A virus. Biocompatibility was assessed according to ISO 10993 standard with a skin irritation study in the rabbit and a sensitization study in the guinea pig.

Results: Antibacterial activity: no CFU was observed for both species after 24 hours of incubation. In these conditions the bacteria could not grow on the paper and were even killed. Antifungal activity: no growth on the surface paper was observed after 7 days of incubation. *Aspergillus niger* development was totally inhibited.

Antiviral activity: the reduction rate of viral titre was greater than 4 (4.15) showing that the paper had a strong virucidal activity against H1N1 influenza A virus after a contact time of 1 hour.

Conclusion: Banknotes are one of the most frequently-handled documents in the world. Most bacteria and fungi can survive a very long time on this kind of support. Even some virus can survive in specific environmental conditions. Moreover, it has been shown that banknotes can contribute to the transmission of pathogenic germs. The antimicrobial properties of Biogard[®] banknote treatment could be an innovative approach in infection control and contribute to preventing cross contaminations.

Disclosure of interest: None declared.

O38

Effectiveness of a novel ozone and hydrogen peroxide gas-vapour system for the rapid high level disinfection of surfaces and healthcare spaces

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BMC Proceedings 2011, 5(Suppl 6):O38

Introduction / objectives: Vapour based fumigant systems for disinfection of healthcare surfaces and spaces are an evolving technology. A new system that uses an ozone based process to create a highly reactive oxidative gas-vapour mixture that is noncorrosive was tested in vitro and in vivo for antimicrobial disinfection effectiveness.

Methods: Ozone gas at 80 parts per million (ppm) was combined with 1% stabilized hydrogen peroxide vapour at 80% relative humidity in a test chamber and upscaled to a 82 cubic meter room using 3.75% hydrogen peroxide at 30 minutes. Test organisms included methicillin resistant *S. aureus*, vancomycin resistant Enterococcus, *E. coli*, *P. aeruginosa*, and *C. difficile* spores dried onto stainless steel discs.

Results: The combination of 80 ppm ozone with 1% hydrogen peroxide vapour in the test chamber achieved a very high level of disinfection of at least 6 log₁₀ reduction of the bacteria and *C. difficile* spores tested on steel discs during a 15 minute exposure. The entire system was scalable such that it achieved the same high level of disinfection of an 81 cubic meter room in 30 minutes with 3.75% hydrogen peroxide and 80 PPM of ozone against MRSA and *C. difficile* spores.

Conclusion: The ozone and hydrogen peroxide gas-vapour mixture provides a very rapid and high level of disinfection of steel surfaces against important healthcare associated bacterial pathogens. The system is an advanced oxidative process providing a rapid and effective means to disinfect healthcare surfaces and spaces to a very high level, particularly against *C. difficile* spores.

Disclosure of interest: D. Zoutman Grant/Research support from Medizone International Inc, Shareholder of Medizone International Inc, M. Shannon Employee of Medizone International Inc, Shareholder of Medizone International Inc, K. Brown Employee of Medizone International Inc.

O39

The canacla, a new technology for hand washing

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BMC Proceedings 2011, 5(Suppl 6):O39

Introduction / objectives: By washing our hands under the tap, we use on average 3 litres of water (3,000 ml). This is an enormous waste of water, a precious natural resource which we should stop wasting.

Methods: With the Canacla, we wash our hands better than under the tap, while using 30 times less water.

The Canacla revolutionizes an everyday gesture: washing hands is no longer a hidden act, done a few times a day, far away from other people: since the Canacla (an attractive and decorative object) is very accessible (because it's placed in the busiest part of the house), "I'm going to wash my hands" is replaced by "I'm washing my hands, right here, right now!" Thus, hands are not only better washed, they are also more often washed.

Results: 1. the Canacla helps us to protect our health better

2. the Canacla contributes to sustainable development

2.1. With the Canacla, we can wash our hands properly while using 30 times less water, a precious natural resource which we should stop wasting.

2.2. Thirty times less water for hand washing also means 30 times less water wasted by hand washing. Water treatment is a polluting activity – a lot of CO₂ is produced – using the Canacla will help reduce the carbon impact and carbon footprint of human activities.

3. The Canacla is economical

3.1. It decreases the overall "health bill" by reducing the contamination risk of diseases spread by insufficient hand washing.

3.2. It decreases the overall water bill.

Conclusion: The Canacla is a new technology for hand washing, a technology which contributes to a better protection of our health and reinforces sustainable development.

Disclosure of interest: None declared.

SLIDE SESSION: ANTIMICROBIAL USE AND STEWARDSHIPS

O40

Can the application of the international health regulations to antimicrobial resistance events help to preserve antimicrobials?

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BMC Proceedings 2011, **5(Suppl 6)**:O40

Introduction / objectives: The global threat of antimicrobial resistance (AMR) needs to be addressed urgently. The global surveillance of AMR pathogens is patchy and limited by financial and technical constraints. Without an early-warning system, the emergence and spread of AMR often goes unnoticed until a given strain has become endemic.

Methods: Using the example of carbapenem-resistant *Enterobacteriaceae* (CRE), we analyzed the potential role of the International Health Regulations (IHR), a legally binding agreement between 194 States Parties, whose aim is "to prevent, protect against, control and provide a public health response to the international spread of disease" with respect to AMR and assess whether selected CRE events fulfil the four criteria of Annex 2 of the IHR.

Results: Certain events marking the emergence and international spread of KPC and NDM-1-producing CRE fulfil the criteria for notifiability to WHO. This can be extrapolated to other types of AMR. At the same time, ambiguities in Annex 2 and limited specific WHO guidance may make notification decisions a matter of debate. Obstacles for the application of the IHR to AMR include a lack of capacities within WHO.

Conclusion: The global threat posed by the spread of AMR requires a coordinated international response. Recognizing the applicability of the IHR to AMR could serve as a "wake-up call" and obligate WHO and States Parties to strengthen surveillance and response, which could in turn contribute to containing the spread of AMR and preserve the efficacy of antimicrobials. Although States Parties and WHO share a collective responsibility in the process, WHO must clearly delineate its position regarding AMR and the intended role of the IHR in this context.

Disclosure of interest: None declared.

O41

Initiating an antimicrobial stewardship program with limited resources

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BMC Proceedings 2011, **5(Suppl 6)**:O41

Introduction / objectives: Antimicrobial stewardship (AMS) is an important strategy for improving patient safety, but many hospitals have limited resources to devote to AMS. We describe formation of an AMS program in a 400-bed hospital with relatively limited resources.

Methods: We developed an AMS program, headed by a pharmacist and infectious diseases (ID) physician. Drug utilization reviews identified an expensive, broad-spectrum agent (piperacillin-tazobactam [P-T]) for initial targeting. An AMS form for listing clinical data and recommendations was developed. A daily list of patients receiving P-T was used to identify target patients for intervention. The pharmacist and ID physician made rounds on wards, placed AMS forms in patient charts, and spoke to caregivers regarding recommendations. Intravenous to oral conversions were performed by pharmacists. After 6 months of AMS activity revealed cost savings, hospital administration approved a ½-time pharmacist position for AMS.

Results: In the first complete year of the AMS program, the hospital spent \$277,833 less on anti-infectives (11% reduction in cost/adjusted patient-day) than in the previous year. Of this amount, \$172,865 less was spent specifically for broad-spectrum agents (22% reduction in cost/adjusted patient-day for broad-spectrum agents). P-T purchases decreased by 20%, levofloxacin by 10% and vancomycin by 19% compared to the previous year. 90% of recommendations were accepted by caregivers. The number of new, nosocomial *Clostridium difficile* diarrhea cases/10,000 patient-days decreased by 28% compared to the previous year.

Conclusion: An AMS program implemented with relatively few resources resulted in cost savings to the hospital and improved patient care.

Disclosure of interest: None declared.

O42

Antibiotic use among Vietnamese hospitals: a multicenter cross-sectional study

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BMC Proceedings 2011, **5(Suppl 6)**:O42

Introduction / objectives: Inappropriate antibiotic use is an important factor associated with antibiotic resistance and related medical costs. These outcomes impede the effectiveness of infection prevention control programmes. Our study is to determine the prevalence of antibiotic prescription and rationale for prescribed antibiotics to hospital inpatients in Vietnam.

Methods: A one-day prevalence survey in 2008 was conducted in 36 hospitals representing three different hospital levels across Vietnam. Medical records of all inpatients were reviewed to collect demographics, number and antibiotic class, and indications for antibiotic prescription. Based on the guidelines of the Association for Professionals in Infection Control and Epidemiology, USA, reasons for antibiotic use were classified into (1) identified pathogen directed, (2) empirical, or (3) prophylactic.

Results: The crude antibiotic use was 67.4% (3811/5654). Broad-spectrum antibiotics such as cephalosporins (70.3%), penicillins (21.6%), and aminoglycosides (18.9%) were most commonly used. Of antibiotic used patients, 54.7% were prescribed empirically and 30.8% were unclearly indicated. Risk factors independently associated with unclear antibiotic prescription were as follows: National level hospitals (adjusted odds ratio [aOR]: 2.2; 95% confidence interval [CI]: 1.7-2.9), provincial/regional hospitals (aOR: 1.3; CI: 1.1-1.6), obstetrics ward (aOR: 15.2; CI: 10.9-21.3), and surgical ward (aOR: 2.6; CI: 2.1-3.1).

Conclusion: Suboptimal antibiotic prescription practices are common in our participating hospitals and emphasise the necessity for evidence-based guideline to be developed and implemented in Vietnamese hospitals.

Disclosure of interest: None declared.

O43

Behaviour change strategies to influence antibiotic prescribing in acute care: a systematic review

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BMC Proceedings 2011, **5(Suppl 6)**:O43

Introduction / objectives: Antibiotic usage in acute care is widely reported to be suboptimal. Inappropriate use of antibiotics is a major contributing factor to emergence of multi-drug resistance and healthcare associated infection. Addressing antibiotic prescribing behaviour (APB) is a key component of antibiotic stewardship.

Methods: We carried out a novel systematic review of both qualitative and quantitative literature on APB in acute care. We assessed the extent to which behavioural sciences and social marketing were applied and whether this could be related to the effectiveness of reported outcomes. MEDLINE, EMBASE, ASSIA, Business Source Complete, The Cochrane Library, PsycINFO, Dare and HMC were searched for studies undertaken in 1999-2009 and published in English.

Results: 5 qualitative and 5 quantitative studies out of a total of 180 met the quality criteria. Qualitative studies highlight the predominant influence of social norms, attitudes, and beliefs on APB. Quantitative

studies reporting interventions to optimise antibiotic prescribing do not use theoretical science or primary research to inform the design and choice of the interventions deployed.

Conclusion: Despite qualitative evidence demonstrating the impact of behavioural determinants and social norms on prescribing, these influences are not given due consideration in the design and evaluation of interventions. To ensure a better understanding of APBs and to improve the quality of interventions and research in this area, the application of behavioural sciences supported by appropriate multidisciplinary collaboration is recommended.

Disclosure of interest: None declared.

O44

Quality of surgical antibiotic prophylaxis using E-prescription conditioning

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BMC Proceedings 2011, **5(Suppl 6):O44**

Introduction / objectives: Hospital da Luz is a paper-free hospital. Antibiotic prescription is made electronically and is automatically conditioned by both context and duration. We aimed to assess the pattern of use of antibiotics in surgical prophylaxis in a general hospital.

Methods: Prophylactic antibiotic prescriptions for patients undergoing surgery in January 2011 were extracted from the medical records. Variables collected included: surgical procedure, prophylactic antibiotic prescribed (ATC code), surgery classification (clean, clean contaminated, contaminated and dirty), and prophylaxis duration. A descriptive statistical analysis and cross-tabulations (chi-square) were performed.

Results: 611 prophylactic antibiotics were initiated for patients with an average age of 49.6 years (SD=16.6), (60.6% females). Surgeries were classified as: clean (39.1%), clean contaminated (29.4%), contaminated (2.1%) and dirty (1.2%). Most prescribed antibiotics were: first-generation cephalosporins (83.6%), second-generation cephalosporins (8.0%), imidazole derivatives (4.6%) and quinolones (1.8%). Antibiotic administration was exclusively intraoperative in 50.8% of the cases. 34.5% of the prescriptions were extended for 24 hours, 12.4% for 48 hours and 2.3% for more than 48 hours. Statistical association between surgery classification and treatment duration was found (chi-square p=0.010). Quinolones were prescribed only in urological surgery and imidazoles were prescribed only in colorectal surgery.

Conclusion: Antibiotic prophylaxis using e-prescription conditioning resulted on adequate compliance with guidelines, although opportunities for improvement were found.

Disclosure of interest: None declared.

O45

Planning for a publicity campaign on use of antibiotics and antibiotic resistance in Hong Kong

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BMC Proceedings 2011, **5(Suppl 6):O45**

Introduction / objectives: Hong Kong presents the first published community-wide publicity campaign on use of antibiotics and antibiotic resistance being conducted in Asia.

Methods: Liaison with stakeholders started early. Literature and local data were reviewed. A population-based telephone survey was commissioned to measure knowledge, attitude, practice of the public related to antibiotics and their awareness of antibiotic resistance. Random sample was drawn from the latest residential telephone directory. A structured questionnaire was used for adults 18 years or above. Baseline survey was conducted in November 2010 and results were used to formulate health messages for the campaign in March/April 2011. Follow-up survey would be conducted in June/July 2011.

Results: 1569 respondents were successfully interviewed in baseline survey. Response rate was 69%, 34% and 67% believed antibiotics could

cure flu and viral infections respectively. Misunderstanding was especially noted in female, older, married, lower education level or household income. 56% heard of antibiotic resistance. Television was the most common information source. They gave a higher rating of impact to information obtained from health professionals. A simple message, "antibiotics do not help in cold and flu", was thus adopted and the public was encouraged to ask their doctors about medications prescribed. Besides printed materials, announcement of public interest was developed for television and radio. Resources were uploaded to Centre for Health Protection website. Doctors and pharmacists were informed of the survey results to enlist their support to the campaign.

Conclusion: A baseline survey helped formulation of key messages and provided evidence to convince stakeholders.

Disclosure of interest: None declared.

O46

Intelligent wide-area resistance surveillance: a novel approach using the semantic web

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BMC Proceedings 2011, **5(Suppl 6):O46**

Introduction / objectives: Proper surveillance of infectious diseases poses special challenges to information technology when it comes to data collection, including wide-area, multi-source and trans-border collection and aggregation of infectious disease and drug resistance information. In this project, we present a novel approach to efficiently monitor bacterial resistance data over multiple international clinical entities.

Methods: The semantic web provides a common framework that allows data to be shared and reused across applications, beyond the borders of the community and independent of any data source. Our framework is based on multiple international clinical sites within Europe, each of which implementing a site-specific semantic information interface to expose their relevant laboratory data related to antibacterial drug resistance. The data can then be directly queried via a dedicated presentation portal generating summary reports based on various criteria.

Results: These reports become instantly available on the portal and represent real-time status of drug resistance. They may be used immediately for further processing and decision taking. Rule based alerts may warn operators of unusual patterns or happenings. Potential decision support engines may be used to suggest next step scenarios based on information provided.

Conclusion: We conclude that due to its simplicity, this framework may be easily implemented and maintained with minimal efforts on the information provider's site paving the way for a secure, real-time site independent data collection. The potential of this framework is immense as the technology itself does not make assumptions on the underlying data provider, practically adaptable to any data source.

Disclosure of interest: None declared.

SLIDE SESSION INNOVATIVE APPROACHES TO INFECTION CONTROLS

O47

The sources and types of innovation knowledge in technology adoption decisions in infection prevention and control – comparative case studies of 12 NHS trusts in England

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BMC Proceedings 2011, **5(Suppl 6):O47**

Introduction / objectives: The nature, sources and format of evidence used by managers and clinicians is important in introducing innovations in healthcare. We investigate the organisational decision making process focusing on the adoption of innovative technologies in the context of infection prevention and control (IPC) and the nature of evidence used.

Methods: Qualitative, multi-level, multiple case study design involving primary & acute care trusts. We conducted 121 semi-structured interviews drawing on a purposive multi-level, multi-stakeholder sample. Data was analysed using an integrated approach.

Results: We mapped out 38 organisational technology selection decisions from July 2009 to August 2010. We specifically mapped the organisational adoption decisions to three types of innovation knowledge: 'awareness' (awareness that the innovation exists), 'principles' (its functioning principles) and 'how to' (information related to its practical use). The leadership role adopted by the Director of IPC and the professional background of key decision makers influenced this asymmetry to different types of knowledge considered.

Conclusion: In the commercial sector innovation adoption focuses at the individual level and majority of attention by change agencies is around *awareness* and *how to* knowledge. In our study we found the converse; overall less attention was given to *how to* knowledge at the point of innovation adoption decision and more attention was attributed to *principles* knowledge both by decision makers and change agents. Attending to 'how to' knowledge at decision making stage may enhance successful technology adoption and effective use. This has important implications for suppliers, managers and clinicians.

Disclosure of interest: None declared.

O48

Impact of systems ambiguity on guideline compliance in intensive care units

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BMC Proceedings 2011, 5(Suppl 6):O48

Introduction / objectives: Health care associated infections (HAI) in intensive care units (ICU) can be significantly reduced or eliminated by increasing care providers' compliance with evidence-based guidelines. Using a human factors and systems engineering approach, we conducted a qualitative study to identify the underlying causes of non-compliance with evidence-based guidelines for preventing four types of HAI in ICUs.

Methods: We conducted semi-structured, in-depth interviews with a total 20 surgical ICU care providers including three attending physicians, two residents, six nurses, three quality improvement coordinators, two infection control practitioners, two respiratory therapists and two pharmacists. Thematic analysis of the qualitative data was performed using a grounded theory approach.

Results: A new framework called "systems ambiguity" that can be used to explain and prevent care providers' non-compliance with evidence-based guidelines emerged from the data. We define systems ambiguity as "uncertainty or vagueness that may prevent a work system from achieving its purpose." Five major types of ambiguity that can affect care providers' compliance behaviors have been identified: task ambiguity, responsibility ambiguity, expectation ambiguity, method ambiguity, and exception ambiguity.

Conclusion: Systems ambiguity framework can be used to (1) identify the underlying causes of care providers' non-compliance with guidelines aimed at preventing HAI, and (2) guide efforts for developing effective interventions aimed at improving compliance rates. Future research should focus on designing multi-faceted interventions based on the systems ambiguity framework and evaluating the impact of these interventions.

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O49

KART, a knowledge authoring and refinement tool for clinical guidelines development

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BMC Proceedings 2011, 5(Suppl 6):O49

Introduction / objectives: Optimal antibiotic prescriptions rely on evidence-based clinical guidelines, but creating such guidelines requires

a time-consuming systematic review of the literature. We aim at facilitating this process by proposing an innovative tool to extract antibiotic treatments from the literature.

Methods: We develop a web application, embedding a question-answering (QA) module based on EAGLI (Engine for Question-Answering in Genomics Literature), which has been specifically tuned for antibiotherapy. The users ask questions (i.e. *what antibiotic is used to treat cystitis caused by E. coli?*) to which the system answers by retrieving a set of MEDLINE records from which the most frequently associated antibiotics are extracted and returned in a relevance-ranked list. The users can then access the annotated abstracts of the publications supporting the antibiotic as being a potential treatment, thus allowing them to use their expert judgment to accept or reject the assumption.

Results: The tool is accessible at <http://eagl.unige.ch/KART>. The QA engine was able to answer correctly to more than half of the queries (top-precision=0.56). In addition, infectious disease specialists from the University Hospitals of Geneva evaluated KART with several clinical scenarios. Despite an overall appreciation of the system and the recognition of its usefulness, improvements are required to use it when generating or updating clinical practice guidelines.

Conclusion: KART seeks to facilitate medical knowledge building by providing an advanced retrieval engine. It provides a novel approach to cope with high volumes of literature generated over systematic reviews by facilitating access to pertinent information on antibiotic-related treatments.

Disclosure of interest: None declared.

O50

Using positive deviance (PD) to reduce antibiotic resistant organisms: the Canadian PD project

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BMC Proceedings 2011, 5(Suppl 6):O50

Introduction / objectives: 5 acute care hospitals were recruited to implement PD (at 6 sites) to determine whether it can reduce healthcare-associated (HA) AROs, specifically methicillin-resistant *S. aureus* (MRSA), vancomycin-resistant Enterococci (VRE), and *C. difficile*.

Methods: Four-month HA-ARO rates, the volume of alcohol hand rub and soap used, and the number of gowns and gloves used, were collected at baseline and then for 12 months prospectively. Social network mapping was conducted at the project start and end. Qualitative staff interviews were conducted at the project end. The percent change from baseline in quarterly HA-ARO rates were measured from September 2009 to December 2010. Process measures were collected and measured in a similar fashion.

Results: Of the 6 sites, 5 implemented PD as planned, while one was unable to, largely due to organizational restructuring. Three of the 5 sites sustained decreases in HA-AROs of 25%, 41.2% and 63.9%. Rates at the 4th site were unchanged, while the fifth site had a VRE outbreak, which resulted in a large increase in the overall HA-ARO rate. HA-MRSA decreased by 100% at 2 hospital sites; HA-VRE decreased by 100% at 2 sites; and HA-*C. difficile* decreased at 3 sites by 53%, 51.9% and 23%. The 1 site that measured hand hygiene compliance had a 53.2% rate increase. Interestingly, decreasing HA-ARO rates did not clearly correlate with the process indicators.

Conclusion: PD has been successfully used in a number of settings facing complex problems. We have shown it to be successful in reducing HA-AROs in Canadian acute care facilities where the organizational climate allowed it to be implemented.

Disclosure of interest: None declared.

O51

Using wearable electronic sensors for assessing contacts between individuals in various environments

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BMC Proceedings 2011, 5(Suppl 6):O51

Introduction / objectives: Transmission of hospital acquired infections (HAI) is mainly based on contacts between patients, patients and health

care workers (HCWs) and between HCWs. Description and quantification of contacts at hospital are key information for HAIs epidemiology and implementing control measures.

Methods: The SocioPatterns project (<http://www.sociopatterns.org>) has developed a technology based on RFID badges that provides a reliable infrastructure to detect face-to-face proximity of individuals. The system was tested at a scientific conference, in a primary school and in a hospital unit.

Results: At the scientific conference, 26,040 contacts (average duration of 54 seconds) were recorded among 402 participants during two days. At school, 77,226 contacts (average number of 160 contacts per children per day) were observed among 233 children during two days. In the geriatric unit, 50 staff and 29 patients participated to the study during 5 consecutive days. Statistical analyses are ongoing. For each study, time-resolved datasets on contact patterns were generated. Analyses provided frequency and duration of contacts, and contact matrices. Modeling of the spread of infections will be presented.

Conclusion: The study of contacts networks is important to better address the prevention and control of known and emerging HAIs. They are also useful tools to build better models for decision making in public health. Collecting contacts data in the hospital setting, using such electronic devices, appeared to be appropriate and will be an added value to other approaches such as observational audit.

Disclosure of interest: None declared.

052

The impact of real-time computerised video analysis and feedback on hand hygiene practice and technique on a surgical ward

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BMC Proceedings 2011, **5(Suppl 6):052**

Introduction / objectives: The fast hand movement and occlusion of observers' views make it difficult to audit hand hygiene technique. We investigate the effect of computerised video observation and real-time feedback on the hand hygiene technique.

Methods: Hand wash monitors (SureWash, Ireland) were placed above clinical sinks in a 28 bed surgical ward. The clinical trial consisted four phases: Phase 1 (1 week) determined the baseline practice without any feedback. Phase 2 (4 weeks) provided real-time feedback. In Phase 3 (5 weeks) a printed report was also presented at the weekly staff meeting. In Phase 4 (1 week) the feedback was turned off. The feedback was shown on a computer screen of each unit. SureWash deemed a hand washing complete if it followed every step of the CleanYourHands protocol.

Results: The number of hand wash events (HWE) for each day was divided by the product of the number of patients and staff. The daily averages of HWE were 0.14 ± 0.01 , 0.36 ± 0.02 , 0.35 ± 0.02 , 0.18 ± 0.2 for phases 1, 2, 3 and 4 respectively. The increase between phase 1 and 2 was 156% ($p < 10^{-7}$) and the fall in phase 3 from 4 was 48% ($p < 10^{-4}$). The daily average number of completed HWE was 0.02 ± 0.004 , 0.17 ± 0.01 , 0.16 ± 0.18 , 0.02 ± 0.005 in phases 1, 2, 3 and 4 respectively. The increase between phase 1 and 2 was 703% ($p < 10^{-9}$) and the fall in phase 3 from 4 was 48% ($p < 10^{-3}$). The total completion rates were: 15.8% (38/240), 49.1% (719/1464), 44.4% (724/1630) and 13.3% (24/180) in each phase respectively.

Conclusion: Real-time computerised feedback on proper technique resulted in a significant increase in the number of HWE (+156%) and in the adherence (+703%) to the CleanYourHands protocol. Feedback acted as a reminder of technique and provided instruction on "difficult" poses.

Disclosure of interest: A. Ghosh: None declared, G. Lacey Shareholder of GLANTA Ltd, C. Gush: None declared, S. Barnes: None declared.

053

Copper surfaces in the ICU reduced the relative risk of acquiring an infection while hospitalized

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BMC Proceedings 2011, **5(Suppl 6):053**

Introduction / objectives: The acquisition of microbes with the subsequent development of an infection while hospitalized continues to

challenge healthcare worldwide. The CDC estimates the overall risk, mortality and cost to the USA to be ~5%, 100,000 deaths and ~45 billion additional dollars; rates for Medical Intensive Care Units (MICU) are higher where the risk often exceeds 25%. At issue is whether reducing the microbial burden of the environment can lead to an effective method to limit the risk of acquiring an infection while hospitalized.

Methods: A multi-site clinical trial was conducted within the MICU of 3 US hospitals. The study addressed two issues. First, the effectiveness with which antimicrobial copper touch surfaces would lower the microbial burden found on commonly touched objects and secondly whether a reduction to burden would mitigate the acquisition of an infection while being treated in rooms with copper objects. Microbial burden was assessed in experimental and control rooms once each week. 650 patients were evaluated in order to address whether the presence of copper objects in the room had an impact on the rate of MRSA and/or VRE colonization/infection and/or HAI acquisitions according to the surveillance definition for acute care settings of the CDC/NHSN.

Results: The median burden observed on copper surfaces was 97% less than the control surfaces which concomitantly resulted in a significant reduction to the number of infections seen in patients treated in copper rooms.

Conclusion: Use of antimicrobial copper surfaces facilitated a reduction in burden to levels below those suggested for the terminal-cleaning standard of 5 cfu/cm². Risk mitigation of the environmental burden resulted in a concomitant mitigation of the HAI rates for patients treated in rooms with selected high impact touch surfaces fabricated from antimicrobial copper.

Disclosure of interest: M. Schmidt Grant/Research support from US Army Medical Research & Materiel Command under Contract W81XWH-07-C-0053.

SLIDE SESSION: SURGICAL SITE INFECTIONS

054

Surgical site infections in Vietnamese hospitals: incidence, pathogens and risk factors

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BMC Proceedings 2011, **5(Suppl 6):054**

Introduction / objectives: Globally surgical site infections (SSIs) are associated with substantial morbidity, mortality and imposed the financial burden to hospitals, patient families and societies. This study is to determine the incidence, aetiology, and risk factors associated with SSIs in Vietnam.

Methods: During 2009, a 3-month prospective survey was carried out in seven hospitals included national and provincial facilities across Vietnam. SSIs were diagnosed according to the criteria established by the Centers for Disease Control and Prevention, USA. All patients who underwent a surgical procedure and were inpatients in trauma, general surgery and obstetrics wards were enrolled in the study. The aggregated data included patient demographics, medical and surgical information, microbiological parameters, and SSI categories.

Results: During the study period, 4,413 patients underwent a surgical procedure. The overall crude SSI incidence was 5.5%. Risk factors independently associated with SSIs were as follows: age ≥ 30 yrs (adjusted odds ratio [aOR]: 1.9; 95% confidence interval [CI]: 1.3 - 2.9), clean-contaminated wound (aOR: 1.7; CI: 1.2 - 2.8), contaminated wound (aOR: 1.8; CI: 1.1 - 3.2), dirty wound (aOR: 3.2; CI: 1.8-5.7), duration of surgery > 120 minutes (aOR: 1.9; CI: 1.3 - 3.4), or small bowel surgery (aOR: 4.0; CI: 2.1 - 7.6). *Escherichia coli* (38.7%) and *Klebsiella pneumoniae* (16.1%) were two most commonly identified pathogen associated with SSI.

Conclusion: Our findings indicate that SSIs constitute a major problem in Vietnamese hospitals. These data suggest areas for intervention and implementation of SSI prevention policies.

Disclosure of interest: None declared.

O55

Using a SCIP-PLUS perspective to reduce the risk of SSI

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BMC Proceedings 2011, 5(Suppl 6):O55

Introduction / objectives: Recent findings suggest that the Surgical Care Improvement Project (SCIP) a US-Based "process initiative" fails to reduce the risk of SSIs. The following evidence-based discussion proposes a SCIP-PLUS perspective for reducing risk of SSIs through enhanced antimicrobial prophylaxis and embracing innovative antimicrobial risk reduction technology.

Methods: Four risk reduction initiatives were studied, A: Impact of BMI on antimicrobial prophylactic dosing in general, OB and CT surgical patients; B: Development of standardized regimen of CHG preadmission cleansing to improve outcome in surgical patients; C: Efficacy of antimicrobial sutures to reduce the risk of suture contamination at wound closure and D: The impact of an innovative antimicrobial surgical glove to reduce the risk of microbial contamination following glove microperforation.

Results: A: 2-gm dosing in surgical patients failed to provide adequate tissue concentrations at BMI >30 ($p<0.05$); B: Standardization of skin cleansing using a 2% CHG polyester cloths was effective at providing skin concentrations sufficient to inhibit/kill wound pathogens compared to non-standardized regimen ($p<0.001$); C: Laboratory/clinical studies demonstrate that antimicrobial suture technology is effective ($p<0.05$) at reducing the risk of suture contamination and SSI; D: Innovative antimicrobial surgical glove was effective ($p<0.001$) at reducing bacterial passage following microperforation which can lead to wound contamination.

Conclusion: An effective SCIP-PLUS strategy requires multi-faceted evidence-based approach including antimicrobial dosing to compensate for BMI, thoughtful preadmission skin cleansing, use of antimicrobial suture technology at wound closure and embracing innovative antimicrobial surgical glove technology reducing the risk of bacterial passage into the surgical wound.

Disclosure of interest: None declared.

O56

Understanding the relationship between hypothermia and surgical site infections (SSI'S) in order to improve recording and management of hypothermia pre, intra and post operatively

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BMC Proceedings 2011, 5(Suppl 6):O56

Introduction / objectives: As part of the of the hospital "No Harm" strategy, hypothermia knowledge, assessment and treatment was identified as being a gap in the prevention of surgical site infections. The aim of this project was to create an awareness of hypothermia management, understand the importance of preventing hypothermia and measure the overall impact of hypothermia on SSI rate.

Methods: Baseline awareness surveys and hypothermia management audits were completed. A program was designed that was inclusive of patients, family and staff and was aimed at creating awareness and knowledge surrounding the importance of hypothermia prevention in the surgical patient. Patients were provided with preadmission information about keeping warm and staff educated regarding the human impact of the adverse effects and consequences of hypothermia. Hypothermia management at one of the hospital sites' theatres had already been instigated. Findings and project outcomes were gathered with the view of implementing at the other sites.

Results: Results demonstrate an increased awareness of hypothermia treatment and management in the surgical patient. There was a reduction in time spent in recovery as patients' temperatures met discharge criteria. The impact of hypothermia on SSI rates will continue to be measured over a twelve month period.

Conclusion: The project achieved its objective by improving awareness and knowledge of hypothermia and SSI's through bright signage, computer screen savers and increased use of active warming techniques. The new knowledge gained is that hypothermia prevention and

management for the surgical patient needs to be ongoing to ensure that the patient's risk of SSI's is minimised as much as possible.

Disclosure of interest: None declared.

O57

Glycemic control and antimicrobial prophylaxis audit in cardiac surgery in Uruguay

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BMC Proceedings 2011, 5(Suppl 6):O57

Introduction / objectives: Glycemic control in cardiac surgery patients (pts) is one important factor that affect the risk of surgical site infection and mortality. Antimicrobial (ATM) profilaxis is complex process in this pts.

We evaluated the antimicrobial prophylaxis and glycemic control en ptes operate of cardiac surgery (CS) in Uruguay.

Methods: An observational retrospective study of a population of cardiac surgery ptes operate between August 2006 and February 2007. A non proportional sample stratified by cardiac surgery center was selected and clinical records reviewed. Intra-operative and all values of the first 24 hours of plasmatic or percutaneous glucose concentration and data of antimicrobial prophylaxis (timing, ATMs, dose, intra-operative re-injection and duration) were recorded. Average peri-operative glycemia was estimated by area under the curve of glucose concentration-time.

Results: 610 (64.2 years, male 70.2%, bypass surgery 74%, diabetics 20.6%) patients were operated in the 5 centers of CS in Uruguay, the sample included 180 pts. All pts had at least one perioperative glycemic value. Average perioperative glycemia concentration was 1.77 g/L (diabetics 2.06, non diabetics 1.7 g/L). Ptes with postoperative infection had higher perioperative glycemia (all sites 1.89 vs 1.68 g/L, surgical site infections 1.9 vs 1.75 g/L, pD 0.001 and p=0.049, respectively). 43% of ptes received crystalline insulin infusion. 96.4% received one dose of ATM before the incision, 75.2% in the hour previous. 31.7% received intraoperative reinjection.

Conclusion: Glycemic control and ATM prophylaxis need to be improved in Uruguay.

Disclosure of interest: None declared.

O58

Implementation of a bundle of care in surgical patients

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BMC Proceedings 2011, 5(Suppl 6):O58

Introduction / objectives: Bundles (BUN) have been proposed to improve the process of care. We describe the implementation of a BUN in surgical patients (SP).

Methods: The Amphia hospital is a large teaching hospital. In the third quarter of 2009 a BUN, defined by the national patient safety initiative, was introduced consisting of 4 components. 1) preoperative hair removal, 2) perioperative antibiotic prophylaxis, 3) normothermia and 4) limit the number of door openings. BUN compliance was measured every quarter by visual observations by dedicated infection control practioners.

Results: BUN compliance was 10% during the first 4 measurements. A multidisciplinary team analysed the reasons for non-compliance and started a program to improve the adherence. Preoperative hair removal was discouraged and when needed a clipper was used. Hypothermia was prevented by preventing cooling down during the transport of the patient to the operating room and before he entered the operating room. A strong reduction in the number of door-openings was achieved by an intensive campaign that created awareness. All HCWs in the OR were involved to create a culture of safety.

BUN compliance improved gradually over the next three quarters to 60% in the first quarter of 2011.

Conclusion: At the start of the program the adherence to the components of the BUN was very low. This is not a unique situation as BUN adherence in Dutch hospitals participating in the national program in 2010 was below 10%. After an intensive program that required a change in the behaviour and in

the culture of the operating room workers a strong increase was observed. The implementation of a BUN is an effective tool to improve the process of care and requires a true change in the awareness and behaviour of all HCWs.
Disclosure of interest: None declared.

O59

Pre-educational intervention survey of healthcare practitioners' compliance with infection prevention measures in cardiothoracic surgery: low compliance but internationally comparable surgical site infection rate

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BMC Proceedings 2011, 5(Suppl 6):O59

Introduction / objectives: Surgical site infections (SSI) are challenging problems leading to significant postoperative morbidity and mortality and may reflect the level of adherence to infection control policies.

Methods: We used a structured observational method to collect data about infection control practices amongst surgeons, anaesthetists, nurses, cardiopulmonary bypass technicians and orderlies practicing in the cardiac operating room during open-heart surgery at Mater Dei Hospital. To prevent bias, we did not disclose the actual procedures observed to the surgical team members, who however knew they were being observed for infection control practices. We measured the 30-day SSI rate by post-discharge telephonic surveillance amongst surviving open-heart surgery patients who had consented to the survey.

Results: We observed infection control practices during 30 randomly chosen operations and found higher level of inadequate practices related to environmental disinfection, hand hygiene, operating room traffic and surgical attire of non-scrubbed personnel (anaesthesiologists and cardiopulmonary bypass technicians).

140 of 155 patients who underwent open-heart surgery were followed up, achieving a response rate of 91.5%. Superficial and deep surgical site infections rates were 16.4% and 4.3% respectively, including both sternal and harvest-site infections.

Conclusion: We found poor compliance with infection control practices of non-scrubbed personnel involved in cardiac surgery and observed a high surgical site infection rate, the majority being leg wound infections following saphenous vein harvesting.

Keywords 'Operating room practices', 'cardiac surgery', 'surgical site infections'.

Disclosure of interest: None declared.

O60

Impact of method and duration of post discharge surveillance on detection of surgical site infections

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BMC Proceedings 2011, 5(Suppl 6):O60

Introduction / objectives: Since surgical site infections (SSIs) arise before and after discharge from the hospital, post discharge surveillance (PDS) of SSIs is inevitable for proper surveillance. Two methods of PDS are recommended by the Dutch surveillance network (PREZIES). Duration of PDS normally is 30 days or 1 year after surgery for implant-free and implant surgery respectively. We compare cumulative SSI rates over time for "recommended PDS" and "other PDS-methods", and investigate whether the advised duration of PDS is justifiable.

Methods: From PREZIES data (1999-2008) four implant-free surgical procedures (breast amputation, caesarean section, cholecystectomy and colon resection) and two implant surgeries (hip and knee replacement) were selected. Using survival techniques and Cox regression analyses SSI rates over time were studied and relative risks (hazard rates, HR) to detect SSIs were calculated for the PDS methods for several periods of time.

Results: 105,607 cases were collected from 87 hospitals. HRs to detect SSIs were significantly increased for recommended PDS for 5 out of 6 procedures. For implant-free procedures this was mainly caused by high HRs

for superficial SSIs. For 2 out of 4 implant-free procedures at least 10% of all SSIs was detected in the final period (day 22-30) while for knee and hip replacement only 2.1% and 1.3% of all SSIs was detected in the final period (months 10-12).

Conclusion: The use of recommended PDS leads to better detection of SSIs, especially of superficial SSIs in implant-free procedures. For implant-free surgeries a 30 day PDS seems justified. For surveillance of hip and knee replacement a PDS duration of 1 year seems less justifiable. It could be worth to consider shortening the PDS duration for these two surgical procedures.

Disclosure of interest: None declared.

SLIDE SESSION: HAND HYGIENE: AROUND THE GLOBES

O61

150 years since "The etiology, concept, and prophylaxis of childbed fever"

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BMC Proceedings 2011, 5(Suppl 6):O61

2011 marks the sesquicentennial anniversary of the publication of "The etiology, concept, and prophylaxis of childbed fever", the *magnum opus* of Ignaz Philipp Semmelweis' (1818-1865) determined, but not infrequently self-defeating, efforts to prove his theories regarding this disease. Now widely regarded as "the father of infection control", his struggle to improve patient safety continues to provide an example - both good and bad - to those who seek to implement system change. He may or may not have been the first person to attribute an infectious aetiology to childbed fever, but he was certainly not the last person to make a few unwise decisions regarding the best means of influencing healthcare worker behaviour. His story remains relevant and this anniversary offers an opportunity to reflect on current challenges in patient safety; what would Ignaz make of the current landscape in patient safety and hand hygiene? Here we compare and contrast Semmelweis' innovations with current approaches to implementation of quality improvement programs, and other patient safety topics such as patient participation and public reporting.

Disclosure of interest: None declared.

O62

Compliance increase in 189 units participating in the German hand hygiene campaign "AKTION Saubere Hände"

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BMC Proceedings 2011, 5(Suppl 6):O62

Introduction / objectives: The national German hand hygiene (HH) campaign "AKTION Saubere Hände" started at January 1st 2008. The campaign is based on the WHO "Clean Care is Safer Care" campaign. By March 30th 2011, over 800 health care institutions are actively participating. Among other measures, hand hygiene compliance observations are a voluntary part of the campaign.

We present compliance rates before and after intervention in 189 units in 43 hospitals.

Methods: All participants used defined observation tools. The definition of HH opportunities (HHO) is based on the WHO Model "My 5 moments of hand hygiene". Observations were done before and after intervention. A minimum of 200 observations per unit and 20 observations per HHO was defined. Results were stratified by HHO, type of HCW and type of unit. Change of compliance was analysed by Wilcoxon and Kruskal Wallis test.

Results: 75,391 HHO's were observed in 189 units in 43 hospitals. There was a significant median increase of compliance in all HHO's (p<0.001) as well as in all unit types (6% internal med., 11% interdisciplinary, 8% Surgery, 21% pediatric, 17% neonatology). Physicians improved by 14% as well as nurses (p<0.001), nurse students by 15% and other HCW by 10% (p<0.001). There was no increase in Medical students.

Conclusion: Hospitals participating in the campaign have to implement a package of interventions. Compliance observations are an option.

These 43 hospitals contain a variety of hospitals from large tertiary care to small (more than 800 and less than 400 beds) primary care hospitals. Our results show, that our multimodal intervention model lead to compliance improvements in different types of settings.

Disclosure of interest: None declared.

O63

Impact of three multimodal countrywide campaigns to promote hand hygiene in Belgian hospitals

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BMC Proceedings 2011, 5(Suppl 6):O63

Introduction / objectives: In Belgium three multimodal, country-wide hand hygiene campaigns were organised between 2005 and 2009 with financial support of the federal government. The objective of these campaigns was to raise awareness among healthcare workers (HCWs) in hospitals and to increase their adherence to good hand hygiene practices.

Methods: In order to increase adherence audit with performance feedback of their compliance and use of alcohol-based hand rubs (ABHR), education, reminders on the workplace and patient empowerment were used.

Results: Voluntary participation and commitment of hospitals was excellent, with participation rates of 95% for acute care hospitals, 65% for chronic care hospitals and 60% for psychiatric hospitals, for all campaigns.

Each of the three national hand hygiene campaigns resulted in a significant increase in hand hygiene compliance among HCWs and a higher consumption of ABHR. Hand hygiene compliance, measured by direct observation, increased significantly from 49% to 69% during the first campaign, from 53% to 69% during the second campaign and from 58% to 69% during the third campaign. In view of these positive outcomes, hand hygiene campaigns will be repeated have now become a priority for our government. every two years.

Conclusion: Government support, one of the WHO's key recommendations was one of the most important reasons for success of the Belgian national campaigns.

The next campaign is ongoing (winter 2010-2011). The main focus of this fourth campaign is the physician's behaviour. The results of hand hygiene compliance among physicians show us that there is more place for improvement.

Disclosure of interest: None declared.

O64

24 month outcomes from the Australian National Hand Hygiene Initiative (NHHI)

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BMC Proceedings 2011, 5(Suppl 6):O64

Introduction / objectives: The NHHI was implemented in January 2009 to establish a standardized hand hygiene (HH) culture-change program, including the increased use of alcohol-based handrub (ABHR), throughout all Australian hospitals.

Methods: A multi-modal culture-change program based on the World Health Organization "5 Moments" program was implemented in all States/Territories, including development of Australian HH guidelines, HHA and State-based healthcare worker (HCW) training program, data collection and analysis tools. Training to standardize HH compliance (HHC) auditing ($\geq 90\%$ internal/external validity) was conducted nationally and a 4 monthly data submission schedule established. Electronic and online data submission capability enhanced efficiency and participation. Outcomes 24 months after NHHI commencement were assessed.

Results: After 24 months, 521 healthcare facilities from all States/Territories submitted HH compliance data, representing approximately 85% and 50% of acute public and private hospital beds, respectively. The overall national (public/private) HHC rate was 68.3% (95%CI: 68.1-68.5%), with State-based rates (public hospitals) of 60.8%>72.6%. National HHC by Moment were: M1: 63.1%, M2: 68.4%, M3: 79.1%, M4: 76.0%, M5: 60.0%,

suggesting that education needs to be focused on improvements in HH prior to patient contact, especially before performing procedures (M2). Overall HHC among public hospital medical staff was 53.4% (95%CI: 52.8%>53.9%).

Conclusion: The NHHI has been associated with a rapid national culture-change among Australian HCWs resulting in significantly improved HHC and a shift to greater use of ABHR. Analysis of NHHI impact on nosocomial disease rates is underway and further improvements in HHC can be expected.

Disclosure of interest: None declared.

O65

Hand hygiene promotion in long-term care facilities (LTCF) – a cluster randomized controlled trial

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BMC Proceedings 2011, 5(Suppl 6):O65

Introduction / objectives: This is the 1st cluster randomized controlled trial showing effectiveness of WHO Multimodal Strategy in promoting hand hygiene (HH) among health care workers (HCW) of LTCF with only 1 registered nurse per home at one time.

Methods: 18 elderly homes with a total of 812 HCW were randomly allocated to 2 intervention arms and a control arm. The study was conducted during November 2009 to July 2010. WHO Multimodal Strategy was employed, homes under interventional arms I and II were supplied with slightly powdered gloves and powderless gloves respectively. Controls were provided with similar promotion materials unrelated to HH. Direct observation by trained nurses was used to measure HH compliance. Self-administered questionnaires served to assess HH knowledge of HCW. Disease notification data during 2007-2010 were used to calculate incidence rate ratio (IRR).

Results: A total of 11,669 HH opportunities were observed. HH compliance increased from 27.0% to 60.6% and from 22.2% to 48.6% in intervention arms I and II respectively. Both intervention arms showed increase in HH compliance after intervention compared to controls of 21.6% (both $p < 0.001$). "Before touching patient" among the WHO five moments for HH, activity index > 40 opportunities/hour, physiotherapist/occupational therapist were associated with less improvement. Mean knowledge score increased from 5.5 to 6.6 after intervention. Respiratory outbreaks (IRR=0.12; 95% CI: 0.01-0.93; $p=0.04$) and MRSA admissions (IRR=0.61; 95% CI: 0.38-0.97; $p=0.04$) reduced after intervention.

Conclusion: Promotion program applying WHO Multimodal Strategy is effective in improving HH among HCW in LTCF.

Disclosure of interest: None declared.

O66

The feedback intervention trial: a national stepped wedge cluster randomised controlled trial to improve hand hygiene

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BMC Proceedings 2011, 5(Suppl 6):O66

Introduction / objectives: Achieving a sustained improvement in hand hygiene compliance is WHO's first global patient safety challenge. There is no RCT evidence showing how to do this. Systematic reviews require long term well designed RCT be done, testing effectiveness of a behavioural intervention designed using behavioural theory.

Methods: Three year stepped wedge cluster RCT of a feedback intervention in 16 English/Welsh Hospitals (16 ITUs; 44 Acute Care of the Elderly [ACE] wards, routinely implementing a national cleanyourhands campaign), testing null hypothesis that intervention no more effective than routine practice.

Intervention-based on Goal & Control theories. Repeating 4 week cycle of 20 mins observation, feedback & personalised action planning, recorded on forms. Computer generated stepwise randomisation.

Primary outcome: direct blinded observation of hand hygiene compliance (%). **Results:** All 60 wards randomised, 33 implemented intervention (11 ITU 22 ACE). Mixed effects regression analysis (all wards) accounting for

confounders, temporal trends, ward type & fidelity to intervention (forms/month used).

Intention to treat (ITT) analysis: estimated odds ratio (OR) for hand hygiene compliance rose post-randomisation (1.44; 95% CI 1.18, 1.76; $p < 0.001$) in ITUs but not ACE wards, equivalent to 7-9% absolute increase in compliance.

Per protocol analysis for implementing wards: OR for compliance rose for both ACE (1.67 [1.28-2.22]; $p < 0.001$) & ITUs (2.09 [1.55-2.81]; $p < 0.001$) equating to absolute increases of 10-13% & 13-18% respectively. OR fell or unchanged on non-implementing ACE & ITU wards. Fidelity to intervention closely related to compliance on ITUs (OR 1.12 [1.04, 1.20]; $p = 0.003$ per completed form).

Conclusion: Despite difficulties in implementation, ITT, per protocol & fidelity to intervention analyses showed an intervention coupling feedback to personalised action planning significantly improved hand hygiene compliance, in wards implementing a national hand hygiene intervention. Further implementation studies are needed to maximise the intervention's effect in different settings.

Disclosure of interest: S. Stone Grant/Research support from GOJO.

O67

Improvement in hand hygiene compliance. The impact of a regional strategy

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BMC Proceedings 2011, 5(Suppl 6):O67

Introduction / objectives: Health-care workers (HCWs) adherence to hand hygiene (HH) guidelines is usually low. According to WHO recommendations, the key strategy components to improve the compliance is evaluation and feedback. In this study we monitored HH compliance of HCWs by direct observation in Madrid and to assess the impact of an interventional strategy.

Methods: We observed 33 Madrid's Public Hospitals (more than 40,000 Health care workers) before and after the implementation of a regional intervention following WHO multimodal HH improvement strategy. It included different interventions but was specially focused in an online education tool with a play learning methodology. Our study involved a wide range of HCWs: dentists, physiotherapist, nurses, physicians and students. We performed a 6-week observation period, March-April 2010 and the same period in 2011.

Results: Around 10,000 opportunities for HH were observed in each period. Compliance in the first period was 30.9% (95% C.I.:30-31.7). The second period is currently taking place, but an interim analysis reveals a HH compliance of a 47% (95% C.I.:44,92-49,38).

In the 1st period the lowest compliance is achieved at the 2nd moment (14.6%; before an aseptic task), followed by the 1st moment (25.1%; before patient contact). In the second period the use of alcohol based solutions have increased reaching a 77% of all HH performed. The technique has also improved.

Conclusion: The result of the regional strategy shows an important improvement in HH compliance.

We believe this improvement is having an impact in reducing health care associated infections. Further studies are needed to assure sustainability in time and impact in infection rates.

Disclosure of interest: None declared.

O68

Background and features of the WHO hand hygiene self-assessment framework

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BMC Proceedings 2011, 5(Suppl 6):O68

Introduction / objectives: To develop a tool for self-assessment of HH resources, practice and promotion in healthcare facilities (HCF), based on the key components of the WHO Multimodal Hand Hygiene (HH) Improvement Strategy (MHHIS).

Methods: A task force (TF) of HH experts developed the tool and identified the following desired features: 1) to reflect the 5 components of the WHO MHHIS; 2) to include measurable indicators based on scientific evidence and expert consensus; 3) to be in the format of a user-friendly questionnaire; 4) to be associated with a score; 5) to be usable repetitively over time. Tool development steps were: 1) identification of indicators, score and format; 2) usability and reliability pilot testing; 3) review and finalization.

Results: The tool was named HH Self-Assessment Framework (HHSAF) and structured in 5 sections corresponding to the WHO MHHIS components (system change; training and education; evaluation and feedback; reminders in the workplace; institutional safety climate for HH). 27 indicators were included and points assigned according to available evidence and importance attributed by experts. WHO implementation tools suited to the improvement of each indicator were referred to within the HHSAF. A score of maximum 100 points was established per each HHSAF section. According to the overall score, 4 HH situation levels were identified: inadequate; basic; intermediate; advanced. Additional leadership criteria for HH reference centres were included. The draft was finalized according to results of usability and reliability tests.

Conclusion: Through a thorough development process, all desired features identified for an optimal HH self-assessment tool at HCF level were successfully fed into the HHSAF.

Disclosure of interest: None declared.

O69

Promoting hand hygiene in the Asia Pacific region

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BMC Proceedings 2011, 5(Suppl 6):O69

Introduction / objectives: Since 2003, countries in the Asia Pacific region understood the importance of a good infection control program following the SARS and Pandemic Flu experiences. However, with limited resources, the challenge remains how one can creatively promote good hand hygiene compliance to prevent the transmission of pathogens along with meeting other important core components of an infection prevention program.

Methods: In 2009 the Asia Pacific Society of Infection Control collaborating with Hôpitaux Universitaires de Genève and Aesculap Academy invited countries in the Asia Pacific region to participate in the Asia Pacific Hand Hygiene Excellence Award. This is a platform to recognize, honor, and celebrate those hospitals and healthcare-worker groups who have made use of their enthusiasm and creativity to improve patient safety through the successful implementation of the WHO multimodal strategy in their hospitals.

Results: For 2010 there are 8 finalists - 3 from Indonesia, 2 from Singapore and 1 each from Australia, Vietnam and India. Innovative ideas were noted in the applications received. In site visits made at potential winner institutions, strong leadership was evident in giving rise to their vibrant programs. These use the Guide to Implementation of the WHO Multimodal Hand Hygiene Improvement Strategy to help them prepare effective Action Plans. Awards will be given to institutions who achieved high scores utilising the WHO Assessment Framework Tool.

Conclusion: The requirements for the award have encouraged many institutions to enhance their hand hygiene program accordingly and we anticipate a larger participation for the 2011 award.

Disclosure of interest: None declared.

O70

Evaluation of hand hygiene compliance in medical educational videos

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BMC Proceedings 2011, 5(Suppl 6):O70

Introduction / objectives: Hand hygiene (HH) is widely regarded as the single most effective measure to prevent healthcare-associated infections. However, physicians' adherence to HH remains poor. Lack of knowledge regarding the proper indications is a known factor contributing to low compliance. However, teachings regarding this basic safety procedure are often overlooked when designing teaching material.

Methods: Observational study of clinical videos published in the *New England Journal of Medicine* between Apr. 2006 and Dec. 2010 to measure reference to HH as recommended by WHO guidelines. An opportunity was defined as a need to perform HH directly related to the procedure.

Results: 29 videos (total running time, 3h42min) depicting 17 sterile, 11 aseptic, and 5 clinical procedures were reviewed. Sixty-six opportunities to explicitly mention the need to perform HH were recorded. Indication to perform HH was properly mentioned 24% (16/66) of time. Proper reference to HH was higher before aseptic procedures (9/14 opportunities [64%]) and before performing a sterile task (7/16 opportunities [43%]). However, explicit indication to perform HH before touching a patient, after body fluid exposure and after touching a patient were never mentioned. Hand washing was more frequently mentioned than hand rubbing with an alcohol-based solution (ratio, 6:1). Additional information regarding HH was present in 3/29 (10%) of written supplements. Respect of guidelines regarding jewellery was high (28/29 videos). Gloves were uniformly used whenever indicated. However, 10 of the 29 videos (34%) depicted ≥ 1 sequence in which gloves were used despite a clear need to do so.

Conclusion: There is a need to adequately portray proper hand hygiene and glove use in teaching material aimed at physicians.

Disclosure of interest: None declared.

SLIDE SESSION: ADVANCED METHODS AND MATHEMATICAL MODELLING IN HOSPITAL EPIDEMIOLOGYS

O71

How to deal with a clustering effect in the assessment of a hand hygiene improvement strategy implemented worldwide?

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BMC Proceedings 2011, 5(Suppl 6):O71

Introduction / objectives: Hand hygiene (HH) is a key measure to prevent healthcare-associated infections. Between 2006 and 2008, the WHO conducted pilot testing of the implementation of a multimodal HH improvement strategy in six sites worldwide. Collected data presented several aspects of complexity and levels of clustering that needed to be taken into account in the analysis. We describe a statistical approach aimed at minimizing potential bias arising from such complex datasets.

Methods: Through a before/after observational study, HH compliance was assessed in several wards of different hospitals in five countries from April 2006 to December 2008 using a validated method. The HH opportunity was the unit of analysis; data on HH indications and actions, observed professional categories, and day of the week observed were available. Simple logistic regression and mixed models using a nested clustering effect (hospital/ward/session) were used to assess the effect of the WHO strategy.

Results: A total of 45 420 HH opportunities were collected during 3613 sessions in 94 wards in 43 hospitals from six pilot sites. Using a logistic regression model with fixed effects only, the crude odds for HH compliance after the intervention were 1.71 (95% CI: 1.65-1.78) and the adjusted odds, 1.80 (95% CI: 1.73-1.88). With a mixed model, the crude odds for HH compliance after intervention were 1.99 (95% CI: 1.86-2.14) and 2.13 (95% CI: 1.97-2.29) after adjustment.

Conclusion: The effect of the strategy implementation may be underestimated if the correlation existing between data is not taken into account. A generalized linear mixed model using a nested clustering effect may be a solution to deal with correlated data, but as paired data are lacking, all correlations cannot be taken into account.

Disclosure of interest: None declared.

O72

The relationship between the antibiotic consumption in hospitals and the community and the selection of methicillin-resistant *Staphylococcus aureus*

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BMC Proceedings 2011, 5(Suppl 6):O72

Introduction / objectives: The impact of reductions in antibiotic use on the selection of antibiotic-resistant bacteria such as methicillin-resistant *Staphylococcus aureus* (MRSA) is difficult to assess, all the more so as they are often accompanied by a concomitant increase in the use of a specific antibiotic class.

Methods: We developed a computerized model of *S. aureus* transmission in a hospital ward and in the community, where methicillin-sensitive (MSSA), community-associated MRSA (CA-MRSA) and hospital-associated MRSA (HA-MRSA) strains co-circulate between these two settings. We assessed the impact of a 15-50% reduction in antibiotic use in community and hospitals, under several hypotheses regarding changes in the distribution of prescribed antibiotics.

Results: An overall reduction in antibiotic use in the community led to decreased frequency of MRSA but increased carriage of *S. aureus* in both hospital and community settings. A similar reduction in hospitals had no impact on community dynamics.

Antibiotic classes-specific changes over the time period of the reduction in global ambulatory antibiotic use had an important impact on MRSA selection in hospitals and in the community. For instance, in the hypothesis of a 15% antibiotic use reduction, the induced decrease in hospital MRSA frequency was 2.6 times less important if this was accompanied by a concomitant 30% increase in the use of quinolones.

Conclusion: Antibiotic reduction policies may not prove sufficient to decrease antibiotic-resistance frequency. They should include a surveillance of changes in the consumption of each antibiotic class.

Disclosure of interest: None declared.

O73

Transmission dynamic of methicillin-resistant *Staphylococcus aureus* in a medical intensive care unit

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BMC Proceedings 2011, 5(Suppl 6):O73

Introduction / objectives: Intensive care units (ICUs) play an important role in MRSA epidemiology. Although successful interventions are usually multimodal, the relative efficacy of single measures remains unknown. We developed a mathematical model to explore the transmission dynamic of MRSA and assess several control strategies.

Methods: A discrete time individual-based stochastic model was built and calibrated on the number of crosstransmissions obtained through prospective surveillance. Most of the input parameters were derived from locally-acquired data. After model fitting and sensitivity analysis, several screening and isolation policies were tested by simulating the number of crosstransmissions and isolation-days under various scenarios.

Results: The three unknown values were fitted to the model. Under the used assumptions, the environment played a negligible role. The number of crosstransmissions increased by almost 40% if only alert patients are screened and isolated, by about 50% if isolation is put in place only after the results of the admission screening become available, and over 60% in the absence of admission screening and isolation. The method used (culture or PCR) for admission screening had no impact on the number of crosstransmissions. Systematic regular screening during ICU stay provided no added-value.

Conclusion: Aggressive admission screening and isolation are effective to reduce the number of cross-transmission. Colonized HCW may play an important role in MRSA transmission and HCW screening should be reinforced.

Disclosure of interest: None declared.

074

Comparing the cost-effectiveness of MRSA control strategies between ICU and non-ICU settings

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BMC Proceedings 2011, **5(Suppl 6):O74**

Introduction / objectives: Many strategies are used to control MRSA in hospitals. Only a few have been assessed in clinical trials and it is not obvious how findings should be generalised between settings. Uncertainty remains about which strategies represent the most appropriate use of scarce resources. We assess the cost-effectiveness of alternative MRSA screening and infection control strategies in England and Wales and discuss international relevance.

Methods: Models of MRSA transmission in ICUs and general medical (GM) wards were developed and used to evaluate different screening methods combined with decolonisation or isolation. Strategies were compared in terms of costs and health benefits (quality adjusted life years, QALYs). Different prevalences, proportions of high risk patients and ward sizes were investigated, and probabilistic sensitivity analyses (PSA) conducted.

Results: Decolonisation strategies were cost-saving in ICUs at a 5% admission prevalence, with admission and weekly PCR screening the most cost-effective (£3,929/QALY). In ICUs, screening and isolation reduced infection rates by ~10%. With admission prevalence ≤5%, targeting screening and isolation to high risk patients was optimal. In GM wards decolonisation and isolation strategies, though able to reduce MRSA infection rates up to ~50%, were not cost-effective.

Conclusion: The largest reductions in MRSA infection were achieved by screening and decolonisation strategies, and were cost-effective in ICU settings. In comparison, there is limited potential for screening and control strategies to be cost-effective in GM wards due to lower infection and mortality rates.

Disclosure of interest: None declared.

OUTBREAKS & PANDEMICS

075

Burkholderia cepacia – outbreak in obstetric patients due to intrinsic contamination of non-sterile ultrasound gel

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BMC Proceedings 2011, **5(Suppl 6):O75**

Introduction / objectives: Ultrasound gel is a potential source of infection. Non-sterile ultra-sound gels can be contaminated due to manufacturing procedures and also during usage of opened bottles. We report a cluster of eight clinical cases of vaginal colonization (one clinically proven colpitis) with *Burkholderia cepacia* (*B. cepacia*) due to intrinsically contaminated ultrasound gel in obstetric patients in an Austrian hospital.

Methods: When the cluster was realised a microbiological investigation of the environment was initiated (e.g. surfaces, equipment, ultrasound

gels of different manufacturers). Isolates of three different patients and four isolates of ultrasound gel bottles (two opened and two sealed) were investigated by Puls-Field-Gel-Electrophoresis (PFGE) to clarify clonality and source.

Results: Environmental specimens revealed no growth of *B. cepacia*. The four bottles from the incriminated manufacturer (two opened, two sealed bottles, all belonging to the same batch) were highly contaminated with *B. cepacia* (up to 40.000 CFU/ml). These isolates and the three patients' isolates showed the same genotype pattern by PFGE.

Conclusion: We, therefore, concluded that the whole batch of these non-sterile gels was affected by monoclonal intrinsic contamination with *B. cepacia* due to insufficiently controlled manufacturing procedures. There is a need for discussion about microbiological contamination levels tolerated in such non-sterile ultrasound gels, especially when used on susceptible sites such as mucous membranes.

Disclosure of interest: None declared.

076

Hospitalary outbreak of *Burkholderia cepacia* bacteremia associated with a decrease of chlorination of water system

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BMC Proceedings 2011, **5(Suppl 6):O76**

Introduction: *Burkholderia Cepacia* (BC) complex is a genomic-related group of gram negative bacilli. Haemato oncological (HO), and dialysis patients (pts) are especially vulnerable to microorganisms that contaminate the hospital environment, especially water.

Objectives: Report a clonal prolonged outbreak of bacteraemia by BC in a tertiary hospital in Uruguay.

Methods: Description and analysis of the outbreak, genetic identification of the organism by molecular biology and communicating the interventions.

Results: Between 27/3/2008 and 3/2/2008, 4 pts in the HO unit developed BC bacteremia.

In March 2008, 6 ptes developed chills during haemodialysis (HD), blood cultures didn't grow BC. At 15/4/2008 another patient in HO unit developed bacteraemia by BC.

In the HO unit the molecular biology confirmed a clonal outbreak. The crops of antiseptic solutions, soap, tap water, and bottled water showed no growth of BC.

Measurements of the levels of chlorine in tap water was less than or equal to 0.25 ppm. Subsequently the chlorination deficit was confirmed at the water system throughout the hospital.

The final molecular biology analysis confirmed the clonality of the bacteremia in the 5 HO pts, one peak of dialysis (11 and 19 March), a HD machine and the tip of a dialysis catheter. A shock chlorination of the water system of hospital was performed.

Conclusion: - A prolonged, and spreaded clonal outbreak of BC was manifested in the pts who are especially vulnerable.

- The organism was identified in ptes and devices, and in the water system associated with decreased chlorination.

- The chlorination of the water system was an effective measure to control the outbreak.

Disclosure of interest: None declared.

077

Massive hospital-wide bacillus outbreak related to hospital linen and construction

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BMC Proceedings 2011, **5(Suppl 6):O77**

Introduction / objectives: At the National University Hospital in Singapore, the baseline average number of bacillus cultures/month is eight. An outbreak became evident when 274 clinical isolates of *Bacillus* were recovered from 230 inpatient episodes between April and August 2010. An investigation was undertaken.

Methods: Chart reviews of affected patients and extensive environmental sampling was followed by a review of hospital ventilation systems,

cleaning protocols and laundry processes. Response to interventions was monitored via clinical case numbers and environmental sampling over a six month period.

Results: *B. cereus* complex constituted 164 cases (71.3%). Bacteraemia comprised 207 patient episodes (90.0%), of which 124 occurred in immunocompromised patients or those with intravascular devices. Physicians treated the organism in 68 episodes (29.5%). Environmental investigations confirmed heavy air contamination particularly within patient rooms and air conditioned wards. Dense airborne contamination outside the hospital adjacent to large earthworks on a construction site was demonstrated ($\sim 600\text{CFU}/\text{m}^3$). Towels were heavily contaminated even after laundering (7403 ± 1054 spores/ cm^2). Amplification of spores occurred in clean linen due to storage conditions (165 ± 84 spores/ cm^2 pre-storage vs 4437 ± 1228 spores/ cm^2 post-storage). Interventions focusing on laundry protocols, environmental cleaning and air filtration saw clinical case numbers return to baseline levels within three months.

Conclusion: Environmental contamination with *Bacillus* may be an under-recognised infection risk in hospitals exposed to construction work. Laundering and environmental cleaning processes that are not sporicidal carry a greater risk. Storage conditions of cleaned linen can amplify *Bacillus* contamination.

Disclosure of interest: None declared.

078

Ventilator touchscreen as source of ESBL-producing *Klebsiella pneumoniae* outbreak

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BMC Proceedings 2011, 5(Suppl 6):078

Introduction / objectives: *Klebsiella pneumoniae* strains producing extended-spectrum β -lactamases (ESBLs) are a major problem in many different hospitals worldwide, causing outbreaks.

Methods: An outbreak of ESBL-producing *K. pneumoniae* occurred from 17 August to 28 December 2009 in an acute care hospital, Lisboa. Four patients in intensive care unit were infected or colonized and strains were isolated predominantly from blood and catheter. All infections or colonization were nosocomially acquired, with the patients having been hospitalized from 11 to 100 days prior to isolation of the organism. A descriptive and prospective surveillance was performed to control the outbreak and environmental investigations were carried out to identify the source, mainly on equipment for monitorization and medical support.

Results: Eighteen *K. pneumoniae* strains were identified from patients: seven and nine strains from clinical and screening specimens respectively; and two strains from ventilator touchscreen and suction device manometer. M13 fingerprint analysis revealed closely related strains confirmed by MLST (ST15) performed in selected strains. All of the *K. pneumoniae* isolates had the same pattern of multiresistance. Molecular experiments revealed that CTX-M-15 and SHV-28 were the prevalent ESBLs. The outbreak was controlled and eliminated by a combination of intensive infection control measures and rigorous local surveillance. These safeguards remain in place and no outbreaks were detected since January 2010.

Conclusion: To our knowledge, this is the first reported hospital outbreak that provides evidence that the ventilator touchscreen can be a transmission vector for ESBL *K. pneumoniae* isolates.

Disclosure of interest: None declared.

079

Swift mobilization of infection control, employee health, clinicians, engineering, laboratory and public health averted secondary cases following a large measles exposure at the British Columbia Children's Hospital, Vancouver, BC, Canada

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BMC Proceedings 2011, 5(Suppl 6):079

Introduction / objectives: During a measles outbreak in British Columbia in 2010, a patient with clinical measles, confirmed by a positive IgM on the same day, was admitted to the Children's Hospital. The patient's room was later determined not to meet airborne isolation standards, leading to a series of patient and staff exposures over 24 hours.

Methods: A massive collaborative effort ensued, involving numerous hospital departments, to identify/ensure control of potentially infected individuals.

Results: *Patients:* 52 patients were exposed: 16, who were immunocompromised, received prophylactic Immune Globulin, 21 had received 2 MMR doses, 3 had 1 dose, 6 were seropositive and 6 patients' immunity remained unknown. *Staff:* 221 staff members were exposed; 103 were immune, 118 had unknown immunity [17 produced immunization record; 22 remained unknown; 79 were tested (71/79 seropositive, 6 susceptible, 2 "equivocal")]. 21 staff members were furloughed from work, representing 231 worker-days. None of those exposed developed measles.

Conclusion: This exposure illustrates the importance of early clinical recognition, rapid laboratory testing, measles risk awareness and strict adherence to airborne isolation protocols. An ongoing education program was created to ensure proper clinical management and infection control measures for all patients with rashes. A tight maintenance program for ventilation monitoring and a database for managers to access staff immunity records were also implemented.

Disclosure of interest: None declared.

SLIDE SESSION: MRSA CARRIAGE AND INTERVENTIONS

080

MRSA admission burden and acquisition in a tertiary care hospital

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BMC Proceedings 2011, 5(Suppl 6):080

Introduction / objectives: The burden of methicillin-resistant *Staphylococcus aureus* (MRSA) impacts on the effectiveness of infection control strategies to prevent MRSA transmission. Few studies examining the admission and acquisition burden of MRSA exist. We investigated the prevalence of MRSA in patients admitted to a tertiary referral hospital that does not conduct universal screening, to determine the MRSA admission burden and acquisition rate.

Methods: Nasal swabs were collected for MRSA culture on admission (n=1159) and discharge (n=373) from patients admitted to acute adult wards. Strain typing for similarity was performed using antibiograms and pulsed field gel electrophoresis (PFGE).

Results: The overall MRSA admission burden was 10.9/100 admissions. This consisted of patients identified by nasal swabs (3.5/100 admissions) or clinical samples (1.1/100 admissions) collected within 48 hours of admission; and those with a known history of MRSA colonisation (6.2/100 admissions). During the study period, 1.7 new MRSA acquisitions per 100 admissions were detected in patients who had exit sampling. Of these, 83% represented colonisation events with the remaining 17% clinical infections. MRSA acquisition was associated with longer hospital stays (p<0.01).

Conclusion: Despite a high MRSA admission burden, the rate of acquisition was modest. 67% of the total MRSA burden was identified without universal screening and could be isolated. However, existing strategies for controlling MRSA are resource and cost intensive. Furthermore, nasal carriage represents an unrecognised reservoir for the transmission of MRSA to new patients, the relative importance of which must be considered. Further exploration of the factors underlying the acquisition rate will assist in identifying strategies to prevent MRSA transmission.

Disclosure of interest: None declared.

O81

Prevalence and risk factors for methicillin-resistant *Staphylococcus aureus* (MRSA) carriage on admission to different hospital sectors in two European countries

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BMC Proceedings 2011, 5(Suppl 6):O81

Introduction / objectives: Knowledge of local MRSA epidemiology at both facility and ward level helps target control measures. This study aimed to determine the prevalence of and risk factors for MRSA colonisation on admission to different healthcare sectors in two European countries.

Methods: Four centres in Spain and France enrolled in 3 intervention trials of MRSA control performed universal MRSA screening on admission to intensive care units (ICUs), surgical wards and rehabilitation units from August 2008 to March 2010. Demographic and comorbidity data were collected. Univariate and multivariate logistic regression analyses were used to identify risk factors for unknown MRSA carriage on admission.

Results: Overall, 1780 previously unknown MRSA carriers were screened, 403 (23%) in ICUs, 1099 (62%) in surgical wards and 278 (16%) in rehabilitation wards. The prevalence of unknown MRSA carriage on admission was 2.7% in ICUs, 3.6% in surgical wards and 7.9% in rehabilitation units. No independent risk factors for MRSA carriage on admission to the ICUs were found. Risk factors for surgical wards were age, wounds, nursing home residency and tracheostomy. Rehabilitation unit risk factors were renal failure, diabetic foot, recent antibiotic use and neuro-rehabilitation.

Conclusion: Prevalence and risk profiles for MRSA carriage on admission to different healthcare sectors varied widely, emphasising the importance of local surveillance data to enable adaptation of MRSA control policies at the ward level.

Disclosure of interest: None declared.

O82

Determinants of MRSA carriage/infection in the Netherlands

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BMC Proceedings 2011, 5(Suppl 6):O82

Introduction / objectives: Recently, the epidemiology of MRSA has changed. Community-acquired MRSA is increasing. The objective of this study was to investigate the determinants of MRSA carriage/infections in The Netherlands.

Methods: All newly identified patients with MRSA in seventeen hospitals dispersed over the Netherlands were included from January 2009 until December 2010. MRSA determinant analysis was done based on the patient's history combined with molecular typing results and then classified in risk groups described in the national infection prevention guidelines.

Results: In two years 1021 patients (369 inpatients and 652 outpatients) were found to be MRSA positive for the first time. Analysis of risk factors revealed that 59.2% (n=604) had been exposed to pigs/veal calves, 7.3% (n=75) had been admitted to a foreign hospital, 4.3% (n=44) were considered to be caused by nosocomial transmission, 0.5% (n=5) were colonised due to transmission in a nursing home, 1.8% (n=18) were adoption children, 0.2% (n=2) were dialysis patients from a foreign country and 26.5% (n=271) could not be classified in a known risk group. The patient's history was not available in 0.2% (n=2).

Panton-Valentine Leucocidin toxic gene expression was mainly seen in the group with unknown risk factor (57 positive, 209 negative, 5

unknown) and only sporadically in other groups (7 positive, 737 negative, 6 unknown, $p < 0.001$). Remarkably, 21.7% of the strains in the group with unknown determinants belonged to the clonal complex ST-398 (59/271).

Conclusion: The majority (n=604) of newly identified MRSA carriers were related to exposure to live-stock. From all other cases (n=415), the majority (n=271) reported no known source. Strains with spa-types indicative for Livestock Associated MRSA were found in 16.5% of individuals who did not report contact to livestock. This indicates that LA-MRSA is spreading in the community.

Disclosure of interest: None declared.

O83

Which anatomical sites should be sampled for screening of MRSA carriage by culture or by rapid PCR test?

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BMC Proceedings 2011, 5(Suppl 6):O83

Introduction / objectives: Rapid and accurate detection of MRSA carriage is a key element for therapy and for implementation of measures to prevent onward transmission. Nose is the anatomical site universally recommended for screening. However, other sites are also recommended, especially in countries with low MRSA incidence. Due to the high price of rapid PCR testing, it is important to know the value of testing each additional site.

Objectives: To evaluate the value of each anatomical site for the screening of MRSA by culture and by a rapid PCR test.

Methods: Screening samples included at least swabs of nose, throat, and groin. If applicable, others samples included swabs of wounds, catheterized urines, sputum, or others. Samples for culture were inoculated into an enrichment broth, which were plated after incubation onto chromogenic MRSA agar. Rapid PCR test were performed with GeneXpert MRSA.

Results: 12456 MRSA screening were performed by culture, among which 3137 (25.2%) had at least one MRSA-positive sample. The cumulative percentages of MRSA detection by culture increased from 48.1% for nose only, to 78.9 by adding groin, to 95.7 % by adding throat, and to 100% by adding other sites. These values were similar if the analysis was performed according to major MRSA genotypes, except a higher percentage of positive groin samples for the ST228-SCCmec-I clone.

2876 MRSA screening were performed by rapid PCR test, among which 312 (10.8%) had at least one positive sample. The cumulative percentages of MRSA detection increased from 61.9% for nose only, to 92.3 by adding groin, to 99.0 % by adding throat, and to 100% by adding other sites.

Conclusion: Neither by culture nor by rapid PCR test is nose sampling sufficient for MRSA detection. Additional anatomical sites should include at least swabs from groin and throat.

Disclosure of interest: None declared.

O84

The staged roll-out of an MRSA intervention bundle in Singapore featuring universal active surveillance

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BMC Proceedings 2011, 5(Suppl 6):O84

Introduction / objectives: Between 2004 and 2006, Singapore's 997 bed National University Hospital (NUH) had 62 hospital acquired MRSA bacteraemias/year. Another 200 inpatients/year had new non blood borne MRSA infections. Minimal active surveillance was undertaken.

Methods: Between 2006 and 2010, universal active surveillance (on admission and discharge), isolation/cohorting, data feedback loops and standardised hand hygiene (HH) audits were rolled out in a stepwise fashion across NUH. A comprehensive hand hygiene programme was institutionalised. MRSA acquisition was defined as having a positive exit swab yet negative entry and no known previous MRSA. Ward specific HH compliance and acquisition rates were fed back via public displays on each ward monthly.

Results: All adult medical and surgical wards had implemented the bundle by July 2010. In that month 3620 entry swabs were taken. Compliance rates with exit swabs are > 85%. MRSA acquisition fell from 10.1 to 3.1% and from 9.2 to 2.8% in our Intensive Care Units and general wards respectively. Nosocomial bacteraemia rates fell from 0.23/1000 pt days in 2008 to 0.11 in 2010. The MRSA burden however remains high hospital wide and vancomycin use has not fallen.

Conclusion: The value of active surveillance remains controversial and near impossible to prove in a real life setting in the short term. A major reservoir continues to exist at NUH. A high baseline transmission rate may represent the initial identification of the reservoir of MRSA using an imperfect screening tool. Genuine success can only be acknowledged with a fall in infection rates, the total burden plus antibiotic useage. Acquisition rates are a useful interim tool but healthy scepticism is required during the collection of early data during major MRSA prevention programmes.

Disclosure of interest: None declared.

O85

Risk factors for previously unknown methicillin-resistant *Staphylococcus aureus* (MRSA) carriage on admission to 13 surgical wards in Europe

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BMC Proceedings 2011, 5(Suppl 6):O85

Introduction / objectives: MRSA carriers admitted to surgical wards may pose both clinical and epidemiological problems. We performed a prospective, observational cohort study of patients screened for MRSA on admission to 13 surgical wards in 4 European hospitals, to identify risk factors of previously unknown MRSA carriage and to define a common predictive rule.

Methods: Multivariate logistic regression models were used to predict probabilities of MRSA colonization on admission based on patient characteristics. A scoring system was defined based on odds ratio results. The c-statistic was calculated to evaluate several models.

Results: We enrolled 2901 patients, of whom 111 (3.8%) were unknown MRSA carriers on admission. We identified 7 independent risk factors associated for newly identified MRSA carriage on admission: urinary catheter, nursing home residency, chronic skin disease, wounds, recent hospitalization, diabetes, and age ≥ 70 years. No risk factor was common to all 4 centres. The overall prediction rule with a lower cut-off had 87% sensitivity and 32% specificity, while values for a higher cut-off were 40% and 89%, respectively. Local predictive rules performed slightly better: 56% sensitivity and 96% specificity for Barcelona. The c-statistic for the model including all centres was 0.64, indicating limited predictive power of the common model.

Conclusion: Risk factors for unknown MRSA carriage vary substantially between surgical wards across Europe. A common predictive rule is of limited clinical value.

Disclosure of interest: None declared.

O86

MRSA: the transmission paradigm investigated

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BMC Proceedings 2011, 5(Suppl 6):O86

Introduction / objectives: Variability in MRSA policies and procedures reflects a need for more information regarding the relative contribution and clinical importance of the different modes of MRSA transmission.

Methods: A prospective 1 year study was conducted within the ICU of two UK hospitals. Conventional sampling techniques were used to recover MRSA from the air and from high contact sites located within the

ward environment. All patients were screened for MRSA on admission and weekly during their stays. Samples from other sites were cultured when clinically indicated. MRSA was considered nosocomially acquired if detected more than 48 h after admission. Possible transmission routes from donor to recipient via the hands of staff, the air or environmental surfaces were identified. Focused molecular typing via PFGE was used to explore these pathway hypotheses.

Results: There were 2654 admissions. 175 patients were positive for MRSA on admission whilst 78 acquired MRSA during their stay. MRSA was isolated from 208 of 18,596 surfaces, from 56 of 859 air samples and from the hands of staff on 59 of 4191 sampling occasions. 28 acquisition events occurred in ICU A. Only those involving an unusual PFGE pulsotype (i.e. one not recognised as being common and widespread within the UK hospital environment) were selected for further study. The likely source of 9 colonizations was identified and of the tested hypotheses, 7 implicated poor hand hygiene, 4 inadequate cleaning and 1 airborne transmission. In ICU B a higher level of endogenous and/or endemic MRSA meant evidence for patient-patient cross-transmission was more limited.

Conclusion: To help minimise the spread of MRSA within an ICU, hand hygiene must be coupled with effective routine environmental cleaning.

Disclosure of interest: None declared.

O87

Reduction of hospital-acquired MRSA as a result of increased use of hydroalcoholic handrub solution: a 7 year follow-up

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BMC Proceedings 2011, 5(Suppl 6):O87

Introduction / objectives: In the Sint Jan General Hospital, a 900 bed public and teaching hospital, incidence of hospital acquired MRSA (HA-MRSA) increased till 2003 to 5.5/1.000 admissions (adm). In 2004 VigiGerme®, a strategy to fight MRSA by reducing transmission was implemented in collaboration with the University Hospitals of Geneva, in order to reduce the HA-MRSA.

Methods: According to standard dosages used and the quantity of Hydroalcoholic Handrub Solution (HAHS) consumed, the theoretical number of handrub actions could be calculated as an indicator for the hand hygiene (HH) compliance in hospital wards by registering the consumption of HAHS related to patient days. Besides, a bed-side measurement of compliance with hand hygiene was performed, indicating the number of opportunities for HH. Data registration and statistical analysis was performed with MS-Excel® and SPSS®. Feedback was given per ward every 6 months. Day by day follow-up of MRSA attack-rate was performed by the infection control team and feedback and education was given per ward on regular base.

Results: Implementation of the IC program resulted in significant increase of the use of HAHS by 81% (p<0.001). HA-MRSA significantly decreased from 5,5/1.000 adm in 2003 to 0,76/1.000 adm in 2010. Hospital-wide analysis indicates a clear correlation between HAHS consumption and decrease of HA-MRSA. Pearson correlation is statistically significant (-.839 p=.018). This suggests that increased use of HAHS is associated with lower HA-MRSA.

Conclusion: During this hospital wide IC program, the significant increased use of HAHS correlated well with the decrease of HA-MRSA. These results indicate that consumption of HAHS is a good indicator for the decrease of HA-MRSA.

Disclosure of interest: None declared.

O88

Do rapid detection and isolation of colonized patients reduce MRSA spread in the intensive care unit?

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BMC Proceedings 2011, 5(Suppl 6):O88

Introduction / objectives: Many studies have examined MRSA control measures, but few have been planned prospective single intervention studies in the endemic setting. We asked whether active surveillance & contact precautions (CP) reduced MRSA transmission. We collected & analysed data to avoid confounding (of MRSA acquisition with length of stay) & serial dependence due to colonisation pressure (CoPr) in accordance with ORION guidelines.

Methods: This was an interrupted time series in a tertiary ICU. Standard precautions only were used for control patients regardless of MRSA status. In the intervention period, rapid PCR was used to detect MRSA colonised patients, who were then cared for in CP. We used a generalised estimating equation (GEE) with each patient-day being the unit of interest. The predictor variables were both time-dependent (antibiotic usage, hand hygiene & infection control precaution compliance & CoPr) & time-invariant covariates (co-morbidities, sex & age) & intra-individual risk correlation was adjusted for using the GEE framework.

Results: The primary outcome measure was the effect of the intervention on MRSA acquisition, adjusting for CoPr & individual & ward covariates. The relative risk of MRSA acquisition was 0.40 (95%CI 0.24-0.65). Secondary measures include the effect of colonised patients in the ward (RR 4.38; 95% CI 1.00-19.21) & the phase-colonised patient interaction, with a reduced risk from colonised patients in the intervention phase to 0.41 (95% CI 0.14-1.18) compared with the control phase.

Conclusion: We demonstrated a clinically significant effect of isolation on MRSA transmission. Our planned single intervention study is unique because of near-complete observations due to short intervals between swabs & full documentation of CoPr & time varying risk factors.

Disclosure of interest: None declared.

089

Excess length of stay due to methicillin-resistant *Staphylococcus aureus* (MRSA) infection at a large Swiss hospital estimated by multi-state modelling

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BMC Proceedings 2011, 5(Suppl 6):089

Introduction / objectives: Excess LoS related to MRSA infections increases hospital costs. Current statistical approaches to estimate excess LoS suffer from methodological limitations including time-dependant bias. We aimed to estimate excess LoS due to MRSA infections in acute care wards at the University of Geneva Hospitals using a novel multistate modelling strategy.

Methods: During 2009, 167 MRSA-infected and 25766 MRSA-uninfected control patients were included in a multistate model where occurrence of MRSA infection was the time-dependent exposure and discharge or death was the study endpoint. Infections were stratified by anatomical site. Excess LoS was extracted computing the Aalen-Johansen estimator of the matrix of transition probabilities. 95% confidence intervals were derived by bootstrap re-sampling. Multivariate Cox regression analysis (adjusted for sex, age, cancer and diseases of the skin and subcutaneous tissue and of circulatory and digestive system) was used to assess the independent effect of MRSA infection on excess LoS.

Results: Median LoS of infected patients was 30 days compared to 6 days for controls. In the multistate model, excess LoS for all MRSA infections was 11.5 days (95% CI, 7.9-15). The highest impact was due to bacteraemia (20 days; 95% CI 8-32) and skin and soft tissue infections (18.8 days; 95% CI 6.1-31.6). The multivariate Cox proportional hazards model confirmed that nosocomial MRSA infection significantly reduced the likelihood of discharge (adjusted HR 0.69; 95% CI 0.59-0.81).

Conclusion: Using a novel multistate modelling strategy to avoid time-dependant bias, MRSA infection at any anatomical site proved to significantly prolong LoS in acute care.

Disclosure of interest: None declared.

INNOVATION ACADEMY: "THE PITCH"

090

O39b. Cascades antibacterial intelligent hand paper

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BMC Proceedings 2011, 5(Suppl 6):090

Introduction / objectives: A US study published in the Journal of Food Protection in 2006 shows that only 32% of food processing-industry workers wash their hands properly. Compliance with proper hand hygiene practices is less than 40% in the healthcare sector. After more than five years of research and development, Cascades entered the Intelligent paper™ market with a novel approach in the fight against the spread of bacteria by hand contact.

Methods: Cascades took a commodity product like paper hand towel and transform it into a tool to prevent infection transmission by hands. This recent innovation by Cascades Tissue Group contributes to optimizing hand hygiene by combining effective drying with persistent antibacterial protection. The Intelligent™ antibacterial paper hand towel quickly reduces the amount of bacteria left on the hands after washing and provides antibacterial protection for 30 minutes afterward. The paper is referred to as Intelligent™ because it compensates for people's imperfect hygienic habits without changing the way they do things. When drying your hands with the antibacterial hand towel, the water on your hands solubilises and releases benzalchonium chloride and transfers it onto the hands, thus reducing residual bacteria almost instantly.

Results: Most importantly, it provides antibacterial protection for 30 minutes, reducing the risks of future contamination. The first application of this new market niche is an antibacterial hand towel with persistent action, which already has a provisional patent. Cascades antibacterial paper is a world premier that responds to unmet market needs.

Conclusion: This domestic hygiene product reduces residual bacteria and compensates for people's imperfect hygienic habits without changing the way they wash and dry their hands. It's proven to be safe, effective and environmentally responsible.

Disclosure of interest: None declared.

Note: This abstract was presented as O39b.

091

O39c. An innovative device for objective hand disinfection control

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BMC Proceedings 2011, 5(Suppl 6):091

Introduction / objectives: The importance of hand disinfection has been known since Semmelweis, however, fundamental problems remain existent with hand hygiene. Our team of young engineers created a universal method to teach and verify proper hand disinfection. We target both the health care system and the general public, to educate and control through visualizing, demonstrating and measuring. Motivation: Hand washing is the most effective way to reduce the spread of germs, pathogens and therefore hospital-acquired infection rates. Improved hand hygiene provides better living for people and huge savings for the national health care systems.

Methods: The idea is to use a non-invasive UV-marked commercial alcoholic hand rub, leave the original hand washing work ow intact, then employ digital image processing to determine clean areas and overlay it on the segmented hand. Images are taken in our prototype box[called Stery-Hand]that gives repeatable and immediate measurement of hand washing quality based on the UV traces of the soap, and visualizes the results in an intuitive form. The modern artificial intelligence method employed for clustering (fuzzy c-means) allows us to customize the evaluation and therefore to improve its performance.

Results: The Stery-Hand was tested in the clinical environment on over a hundred people in three countries: a medical university and a pulmonology institute in Hungary, a county hospital in Romania and a university hospital in Singapore. In addition, it has been widely used at public occasions in Hungary, Austria and France. Beyond providing the comparable numbers of sta compliance, it identified the typical errors, and

also revealed several misbehaviors, such as wearing jewelry or artificial nails. Overall, the participants did not find it useful and informative, some children even amusing.

Conclusion: Stery-Hand may become the next breakthrough in medical hand hygiene control, once tightly integrated to the hospital information management system. Improving compliance decreases hospital costs, and also hinders the spread of major epidemics like SARS or H1N1.

Disclosure of interest: None declared.

Note: This abstract was presented as O39c.

SOCIETY POSTERS

P1

The Hong Kong infection control nurses' association (HKICNA) – small establishment big impact

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BMC Proceedings 2011, 5(Suppl 6):P1

Introduction / objectives: In Hong Kong, the importance of infection prevention and control is recognized indubitably after an outbreak of MRSA with 6 neonatal deaths in 1985. The same year 24 infection control nurses were deployed full-time and formal training course was initiated. In 1989, HKICNA was inaugurated with 44 members and advisers. The followings are the milestones on how HKICNA, developed from a very small establishment, to have significant impacts on healthcare professionals in Hong Kong.

Methods: The first 10 years of establishment, infection control awareness continued to grow. Initially the association focused on local meetings to promote and enhance knowledge in infection control. From 1999 HKICNA had ambitions to expand academically to start training course in 1999, publish biannual HKICNA newsletter in 2002.

2003 was a defining moment for infection control in Hong Kong because of the SARS outbreak. Training was in great demand. In 2003-2004, 10 classes with 3212 nurses and doctors trained from local, Macau and China. In that year alone, members grew to 1400 and HKICNA gained enough seed money to organize International Conference as a platform for exchange of scientific information and experience.

Since conception in 1989, we have flourished to a reputable academic nursing association in Hong Kong. Now HKICNA is providing the following activities: website, 6-monthly newsletters, Biannual International Conference, annual research grant award, annual conference sponsorships, training course, hand hygiene promotion in the community. **Conclusion:** Looking back, it is amazing that how a small establishment of a nursing association can instigate such impressive impact professionally.

Disclosure of interest: None declared.

P2

Dutch Society of Infection Prevention in Healthcare (VHIG)

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BMC Proceedings 2011, 5(Suppl 6):P2

Introduction / objectives: The Dutch Society of Infection Prevention in Healthcare society was founded in 1973 and is since 1987 member of the International Federation of Infection Control (IFIC). VHIG has currently 350 members entitled: Consultant Infection Prevention (CIP).

Methods: Supporting the members in carrying out their task in all healthcare settings and disseminating information about the prevention and control of infections. The VHIG attempts to achieve its objectives by means of: giving information, instructions, advice, conferences, lectures and publications. VHIG takes care of Accreditation and re-registration every 5 year for all the members if they fulfil the requirements.

Results: Since 2006 the Dutch advice is 1 FTE CIP per 5000 admissions, or 1 / 178 hospital beds, which cannot fulfilled for different reasons. Dutch hospitals are committed to pursuing active infection control policies based on the Working group Infection Prevention (WIP). These guidelines are considered as professional standards by the Healthcare Inspectorate. The CIP gives shape to this standard. The professional background of the CIP is Nurse, Lab Technician, and Epidemiologist who graduate with a diploma after an in-service Post-Bachelor training of 18 month.

Conclusion: With the Dutch Society for Microbiology the VHIG drafted in 2008 a guideline for quality assurance to achieve continuous quality improvement 'Kwaliteitsrichtlijn voor Infectiepreventie in Ziekenhuizen' The document is based the ISO 9001:2000 series and the derived Directive for Healthcare.

NPR-CEN/TS 15224:2005. The VHIG try to implement the Recommendations of the Council of European Union on patient safety, including the prevention and control of healthcare associated infections (File:2009/0003 (CNS. Hand hygiene and Surveillance surgical side infections are continuous on the agenda.

Disclosure of interest: None declared.

P3

The Lebanese Society for Infectious Diseases and Clinical Microbiology

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BMC Proceedings 2011, 5(Suppl 6):P3

Introduction / objectives: The purpose is to introduce the Lebanese Society for Infectious Diseases and Clinical Microbiology (LSIDCM).

Methods: The Society was established in 1992.

Results: It includes 46 infectious diseases physicians as well as clinical microbiologists. The members are spread across the country. All physicians are involved in managing infection control programs in their respective hospitals. So far the Society has organized twelve national and regional congresses on infectious diseases and clinical microbiology. Over the last 4 years, a yearly course on infection control is offered during each congress and many national and international speakers are involved.

Conclusion: The LSIDCM is currently working on developing national guidelines for the management and control of infectious diseases, national antibiotic usage monitoring, monitoring of antibiotic resistance on a national background and the establishment of a national registry of health care associated infections.

Disclosure of interest: None declared.

P4

Growing and equipping the infection control community in Singapore

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BMC Proceedings 2011, 5(Suppl 6):P4

Introduction / objectives: Infection Control Association (Singapore), ICAS, founded in 1999, has 153 members of whom 25 are from countries outside Singapore. To facilitate exchange of information and data on infection control principles and practices, ad-hoc seminars and workshops are held to address topics of interest.

Methods: It conducted its 1st basic course in Infection Control in 2002, in collaboration with the Asia Pacific Society of Infection Control (APUSIC). This comprehensive program attracted large number of ICPs from the region and is offered once in 2 years. An Advance Course is held on alternate years to meet needs of senior ICPs. ICAS developed 3 national guidelines or standards through consensus working groups from its members and the Ministry of Health – Schools and Day Care Centres; Intermediate and Long Term Care Centres and the Management of MRSA Patients.

Results: In 2009, it celebrated its 10th Anniversary with the launch of its 1st International Congress of ICAS, which helped to foster research in the Infection Control Community. Its recently held 2nd congress was a success with close to 400 registrants for its congress and post-congress workshops.

Conclusion: The effectiveness of infection control programs now demand that our ICPs turn to creative strategies to achieve improved clinical outcomes with conserved resources and lower cost. The challenge for ICAS in the next decade will be to equip its members to be effective agents of change.

Disclosure of interest: None declared.

MRSA EPIDEMIOLOGY AND CONTROL I

P5

Epidemiology of MRSA at the University of Geneva Hospitals

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BMC Proceedings 2011, 5(Suppl 6):P5

Introduction / objectives: Curbing MRSA has been a challenge for our institution, a hospital with hyperendemic MRSA since 1999.

Methods: An observational cohort study on MRSA trends was prospectively carried out from 1993 onwards. Infection control measures were initiated and intensified at various time points, including patient screening, surveillance, contact isolation, a computerized alert system and hospital-wide promotion campaign of hand hygiene. In 2003, the Vigigerm[®] program was introduced, 2006 a second promotion campaign of hand hygiene took place. The MRSA burden had been recorded by indicators as the proportion of MRSA among *S. aureus* in blood cultures (expressed as percentage); validated on site surveillance data of MRSA infected or colonized patients expressed as incidence rates and MRSA incidence-density, expressed as acquired MRSA cases per 1000 hospital days.

Results: Two distinct periods could be observed. Increasing rates of newly MRSA-infected or -colonized patients were observed from 1989-1994 (from 0.05 to 0.6 cases per 100 admissions); by 1997 it has decreased to 0.24. Since 2000, there was a significant increase in the MRSA burden, recorded by all indicators. This coincided with the introduction of a highly epidemic clone (ST228 South German). From 2000-2006 the incidence rate grew from 1.36 to 2.00 new cases per 100 admissions; with a plateau between 2006 and 2008. It began to decrease by 2008 (from 1.70 to 1.12 new cases per 100 admissions). The attack rate followed the same pattern (decline from 1.36 in 2007 to 0.70 acquired MRSA/1000 per hospital days in 2010). Since 2000, the proportion of MRSA among *S. aureus* in blood cultures stayed around 30%, with a marked decrease in 2010 to 23%.

Conclusion: An ongoing intensive MRSA control program is necessary to contain endemic MRSA rates.

Disclosure of interest: None declared.

P6

Risk factors and colonization status of methicillin-resistant *Staphylococcus aureus* among newly admitted newborns in neonatal intensive care unit

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BMC Proceedings 2011, 5(Suppl 6):P6

Introduction / objectives: To determine the prevalence of methicillin-resistant *Staphylococcus aureus*(MRSA) colonization status among newly admitted newborn in neonatal intensive care unit and risk factors for MRSA colonization.

Methods: All patients admitted to the neonatal intensive care unit(NICU) at a university hospital in Seoul, Korea from January 1 to December 31, 2008. Data were collected by electronic medical record and retrospectively reviewed. Prevalence was assessed and risk factors for MRSA colonization were compared.

Results: A total of 599 patients were admitted to the NICU during the study period. Surveillance culture for MRSA was done within 48 hours after admission. MRSA was isolated from 139(23.3%) of the patients. Among the 361 inborns, Fifty-three percents of the patients were admitted via emergency room, and then 36.1% via outpatient department, 19.3% via nursery room, 0.8% via operating room, and 0% via delivery room. Among the 238 outborns, the prevalence of MRSA was vary from 0% to 80% based on the birth place. In multivariate analysis comparing MRSA colonized patients, over 2,500g of admission weight(P=0.037; odds ratio[OR]=3.2; 95% confidence interval[CI]=1.1-9.6), over 1 day of admission age(P=0.014; OR=4.4; 95% CI=1.4-14.5), admission via outpatient department(P=0.040; OR=11.4; 95% CI=1.1-116.9) and admission via other hospital(P=0.002; OR=31.7; 95% CI=3.4-292.7) were independent predictors of MRSA colonization.

Conclusion: These results showed that MRSA colonization is typically considered to be associated with the neonatal care process than the neonatal status. National support and community participation is necessary to prevent MRSA transmission more effectively.

Disclosure of interest: None declared.

P7

Prevalence and acquisition rate of methicillin resistant *Staphylococcus aureus* (MRSA) in internal medicine wards at the University Hospital of Geneva (HUG)

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BMC Proceedings 2011, 5(Suppl 6):P7

Introduction / objectives: We aimed to determine the prevalence and acquisition rate of MRSA among patients admitted to internal medicine ward at HUG.

Methods: Patients consecutively admitted to 13 medical wards from March-June 2010 were screened for MRSA using pooled axilla and groin swabs within 48 h of admission and 36 h of discharge.

Results: Among 1967 patients, swabs were collected in 1740 (88%) at admission and 712 (36%) at discharge; with 687 (35%) having both. Mean age was 64 years; 58% were male. 4.8% (84/1740) of patients were MRSA positive on admission, of which 79% -for whom data were available (43/54)- had been MRSA positive on screening in the previous 6 months. Of patients who were not MRSA positive at admission, 5.8% (29/496) had previous carriage. MRSA carriage at admission was associated with age (p=0.0016, Wilcoxon rank sum test) and a positive MRSA swab in the previous 6 months (χ^2 233, p<0.0001). 3.8% (27/710) of patients acquired MRSA during hospital stay - having a positive MRSA swab on discharge but not on admission. By Wilcoxon rank sum test, MRSA acquisition was associated with length of hospital stay (p=0.0009) and age (p=0.0087). No association was found between MRSA carriage or acquisition and sex, provenance, antibiotic use, requirement of intensive or high dependency care and type of medical ward.

Conclusion: 4.8% of patients admitted to general medical wards at our hospital were MRSA positive, the majority of these patients had previous MRSA carriage. 3.8% of patients acquired MRSA during hospital stay.

Disclosure of interest: None declared.

P8

Control of methicillin-resistant *Staphylococcus aureus* (MRSA): the impact of active surveillance for MRSA in a non-acute hospital in Madrid (Spain)

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BMC Proceedings 2011, 5(Suppl 6):P8

Introduction / objectives: Because of the frequent interchange of patients between acute hospitals and rehabilitation hospitals, infections

caused by multidrug-resistant bacteria will continue to emerge. There are limited data concerning the epidemiology of nosocomial infection among patients admitted for rehabilitation in non acute hospitals after stabilization of an acute surgical or neurological event. Recognition of such threats has prompted new interest in the prevention and control of infections associated with those health-care facilities.

Objective: To evaluate the impact of an intervention on rates of methicillin-resistant *Staphylococcus aureus* (MRSA) colonization or infection in a geriatric-rehabilitation hospital.

Methods: Design: Quasi-experimental analysis before/after.

Setting: A 160 bed geriatric-rehabilitation hospital in Guadarrama (Madrid), Spain.

Patients: All patients admitted to the hospital during two periods: 2003-2004 and 2010.

Methods: A multimodal intervention consisting on active surveillance for MRSA in all patients admitted and a comprehensive hand hygiene promotion programme is studied.

Results: The preintervention rate of MRSA colonization or infection was 1.02 cases per 1,000 patient-days (95% confidence interval {CI}, 0.93-1.25 cases per 1,000 patient-days). The rate decreased significantly to 0.21 cases per 1,000 patient-days (95% CI, 0.12-0.45 cases per 1,000 patient-days) after the intervention.

Disclosure of interest: None declared.

P9

MRSA surveillance in a Danish region

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BMC Proceedings 2011, 5(Suppl 6):P9

Introduction / objectives: To describe one year surveillance of MRSA in a Danish region with three clinical microbiology departments. The population in the region constitutes approximately 1.2 million inhabitants.

Methods: Using data from a laboratory information system (MADS) data on new MRSA episodes at each of the three clinical microbiology departments was generated monthly. Data was entered into a common MRSA surveillance database for further follow-up.

Results: A total of 142 incident MRSA patients were registered in 2010; an increase of 21% compared with incident MRSA patients in 2009.

There were two hospital clusters, one with four patients and one with three patients and one staff member. There were 14 family clusters each including two to four persons.

Totally, more than 76% of the incident patients had an infection with MRSA. Twenty-three per cent were exposed by family-members or pigs; in 10% exposure was unknown; 17% were supposedly exposed on holidays outside Europe.

The most common spa-types and clonal-complex were t002/CC5 (25 cases), t008/CC8 (14 cases), and t034/CC398 (14 cases).

Conclusion: The number of MRSA patients is still increasing in the region. Hospital clusters accounted for eight patients and family clusters for 33 patients.

Most MRSA patients were exposed by family-members or pigs.

Disclosure of interest: None declared.

P10

Abstract withdrawn

_BMC Proceedings1753-656120115Suppl 6P10

P11

Evaluation of two different control charts (I and U) in the study of mutiresistant bacteria contact precautions dynamics in a non-endemicity hospital setting

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BMC Proceedings 2011, 5(Suppl 6):P11

Introduction / objectives: Data about usefulness of Statistical Process Control in the study of contact precautions (CP) dynamics for control of resistant bacteria are scarce.

Methods: Retrospective cohort study. All admitted patients colonized or infected by MRSA, MDR-PAE and Abaumannii from 2005 to 2010 were included. Period I (01/2005-04/2008) without active surveillance; Period II (05/2008-12/2010), active surveillance in all patients admitted to the Intensive Care Unit and in readmitted previously colonized patients. Clonality was studied by PFGE. Charts: I-graph (Y axis shows the days between two consecutive CP; X axis: consecutive number of CP) and U-graph (CP per 10.000 patients days clustered by quarters).

Results: The average days between two consecutive CP in period I and period II were: 20 vs 31 days for MRSA, 41 vs 46 days for MDR-PAE and 53 vs 59 days for Ab, respectively. The average rate of patients under CP per 10.000 patient-days were: 3.19 vs 2.51 for MRSA, 1.40 vs 1.49 for PAE MR and 1.35 vs 1.09 for Ab (period I and II respectively). All outbreaks were coincident for special negative causes in graph I while the U graph only detected 2 out of 5 (type II error). All special positive causes was detected by graph I just after outbreak intervention (more days between consecutive CP). Although graph I often showed positive special causes in 5 out of 12, a type I error could not be ruled out.

Conclusion: In a non endemic setting when few events are present, the I graph is more sensitive and less specific, while the U graph is more specific but less sensitive.

Disclosure of interest: None declared.

P12

Determinants of MRSA carriage/infection in health care workers in the Netherlands

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BMC Proceedings 2011, 5(Suppl 6):P12

Introduction / objectives: Nosocomial transmission is considered to be the most important source for MRSA colonisation of health care workers (HCW). However, the epidemiology is changing and community-acquired MRSA is increasing. The objective of this study was to investigate the determinants of MRSA carriage/infections in HCW in The Netherlands.

Methods: All newly identified HCW with MRSA in seventeen hospitals in the Netherlands were included from January 2009 until December 2010. MRSA determinant analysis was done based on the HCW's history combined with molecular typing results and then classified in risk groups described in the national infection prevention guidelines.

Results: In two years 68 HCW were found to be MRSA positive for the first time. Analysis of risk factors revealed that 27.9% of the HCW (n=19) were considered to be caused by nosocomial transmission, 19.1% (n=13) had been exposed to pigs/veal calves, 10.3% (n=7) had worked in a foreign hospital, 1.5% (n=1) were colonised due to transmission in a psychiatric home and 41.2% (n=28) could not be classified in a known risk group. Based on spa-typing, Livestock Associated MRSA (ST-398) was found in 100% of the HCW who had been exposed to pigs/veal calves (n=13), in 16.7% of the HCW who had worked in a foreign hospital (1 positive, 5 negative, 1 unknown) and in 15.8% of the HCW who were colonised due to nosocomial transmission (3 positive, 16 negative). Remarkably, 22.2% of the strains in the group with unknown determinants belonged also to this clonal complex (6 positive, 21 negative, 1 unknown).

Conclusion: The majority (n=28) of newly identified MRSA positive HCW reported no known source. Strains with spa-types indicative for Livestock Associated MRSA were found in 18.9% of individuals who did not report contact to livestock. This indicates that LA-MRSA is spreading, in the community and/or in the hospital.

Disclosure of interest: None declared.

P13

Use of MRSA surveillance data for infection control: individual units rather than entire hospital as the basis for improvement

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BMC Proceedings 2011, 5(Suppl 6):P13

Introduction / objectives: To analyze which surveillance system (a hospital based or a unit based) leads to a greater decrease in incidence density of nosocomial MRSA.

Design: Two cohort studies of surveillance data.

Setting: Two MRSA surveillance components exist within the German national nosocomial infection surveillance system KISS: one for the whole hospital (i.e. only hospital based data and no rates for individual units) and one for ICU-based data (rates for each individual ICU).

Participants: Data from a total of 224 hospitals and 359 ICUs in the period from 2004 to 2009.

Methods: Development over time was described first for both surveillance systems. In a second step only data were analyzed from those hospitals/ICUs with continuous participation for at least four years. Incidence rate ratios (IRR) with 95% confidence intervals were calculated to compare incidence densities between different time intervals.

Results: In the baseline year the mean MRSA incidence density of hospital acquired MRSA cases was 0.25 and the mean incidence density of ICU-acquired MRSA was 1.25 per 1000 patient days. No decrease in hospital-acquired MRSA rates was found in a total of 111 hospitals with continuous participation in the hospital-based system. However, in 159 ICUs with continuous participation in the unit-based system, a significant decrease of 29 % in ICU-acquired MRSA was identified.

Conclusion: A unit-based approach of surveillance and feedback seems to be more successful in decreasing nosocomial MRSA rates, compared to a hospital-based approach.

Disclosure of interest: None declared.

P14

Assessment of risk factors in the development of MRSA infection at Gülhane Military Medical Faculty Education Hospital and the role of antibiotic use on the development of MRSA infection

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BMC Proceedings 2011, 5(Suppl 6):P14

Introduction / objectives: This research was carried out to determine most important risk factors in the development of MRSA by comparing infections due to methicillin resistant and susceptible strains to make suggestions to decrease MRSA ratios by pointing out the importance of pre-infection antibiotic usage in the development of MRSA infection and its place among the other risk factors.

Methods: This research was planned as a retrospective case control study and possible risk factors among inpatients owing to *S. aureus* infection at our hospital between 2003-2008 years, were compared as MRSA and MSSA groups.

Results: Hospitalization period, previous hospitalization existence and number, lining in intensive care unit, MRSA existence in the same unit, polymicrobial infection, acute trauma, surgery, open lesion, any intravenous, urethral catheter, mechanical ventilation, invasive device number, previous antibiotic usage, number and period of used antibiotic were found more significant in MRSA patients (p<0.05). Respectively, fluoroquinolone usage (OR, 2.56; %95 CI: 1.052–6.231; p<0.05), the time period of previous antibiotic use (OR, 2.343; %95 CI: 1.697–3.236; p<0.05), hospitalization times (OR, 1.396; %95 CI: 1.235–1.578; p<0.05), previous hospitalization period (OR, 0.992; %95 CI: 0.986–0.999; p<0.05), MRSA existence in the same milieu (OR, 0.283; %95 CI: 0.13–0.618; p<0.05) were determined as independent risk factors in the development of infections due to MRSA.

Conclusion: Controlling these risk factors and either avoiding uncontrolled prescription or decreasing the use of selected antibiotic subcategories like fluoroquinolones and cephalosporins seem to reduce infection due to MRSA.

Disclosure of interest: None declared.

P15

Differences in the prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA) among health-care workers using a “single” vs. “double” screening strategy

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BMC Proceedings 2011, 5(Suppl 6):P15

Introduction / objectives: Within healthcare institutions, healthcare workers (HCW) who are nasal MRSA carriers can facilitate its spread. This study assesses the colonization rate of HCW outside outbreak situations and compares results of a “single” vs. “double” strategy of MRSA-screening.

Methods: HCW from nine hospitals in the German part of the Dutch-German EUREGIO participated. Two nasal-pharyngeal swabs were derived from each participant on two days. MRSA were characterized using typing of the *S. aureus* protein A gene (*spa*). If MRSA was detected from both specimens, a decolonization therapy was used.

Results: 726 HCW have participated in the study. 33 participants (4.5%) were MRSA-positive in at least one swab. 23 of them (3.2%) were positive in both swabs, whereas for 10 persons (30% of all participants with at least one positive result) MRSA was isolated on one of the two days. Among physicians, nurses and other personnel, the prevalence of MRSA was 1.2%, 3.7% and 2.8%, respectively. Nine different *spa*-types were detected with typical hospital-acquired strains (t003, t032) being the most frequent.

Conclusion: The study revealed that outside outbreaks situations, HCW are frequently colonized with typical hospital-acquired MRSA clones. Notably, livestock-associated MRSA molecular types were not found in this study although such strains are amongst the predominant MRSA lineages isolated from patients. If HCW were tested on a single day, the prevalence was 30% lower compared to a duplicate testing. This might either reflect the less than 100% sensitivity of nasopharyngeal screening cultures or a non-persistent MRSA carriage. Importantly, all HCW were successfully decolonized.

Disclosure of interest: None declared.

P16

Prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA) in nasal swab specimens obtained from hospitalized patients and healthcare workers in a Belgrade hospital

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BMC Proceedings 2011, 5(Suppl 6):P16

Introduction / objectives: The aim of the present study was to provide the analysis of carriage of MRSA in hospitalized patients and HCWs in the largest healthcare facility in Serbia.

Methods: Nasal swab were taken from 195 hospitalized and 105 HCWs at the Clinical Center of Serbia in Belgrade. Each swab was inoculated directly onto MRSA-ID agar (bioMérieux, France). All inoculated solid media were incubated at 35°C and read after 24 h and 48 h of incubation. Identification of isolates was confirmed by PCR for *nuc* and *mecA* gene. Susceptibility to antibiotics was performed by disk diffusion method in accordance to the CLSI recommendations. Determination of SCC_{mec} types was done by previously described PCR protocol.

Results: Among 195 hospitalized patients and 105 HCWs, 23 (11.8%) and 8 (7.6%) respectively were colonized MRSA. All tested MRSA strains were susceptible to fusidic acid, trimethoprim/sulfamethoxazole, vancomycin, linezolid, pristinamycin and mupirocin, while 27 (87.1%) were resistant to gentamicin, 28 (90.3%) to kanamycin, 27 (87.1%) to tobramycin, 17 (54.8%) to erythromycin, 17 (54.8%) to clindamycin, 25 (80.6%) to ciprofloxacin, 3 (9.7%) to rifampin, 4 (12.9%) to tetracycline and 5 (16.1%) to chloramphenicol. Among MRSA strains isolated in this study, 6 (19.4%)

strains could be classified as CA-MRSA, because they were SCCmec type IV or V and most of them were susceptible to all tested antibiotics except beta-lactams. The remaining 25 (80.6%) MRSA strains had characteristics of HA-MRSA, they were SCCmec I or III, and all were resistant to different antibiotics beside beta-lactams.

Conclusion: Carriage of MRSA among hospitalized patients and HCWs was determined to be high, 10.3%. Carriage was higher in hospitalized patients than in HCWs. Most of the isolated strains were HA-MRSA.

Disclosure of interest: None declared.

P17

Carriage of healthcare-associated methicillin-resistant *Staphylococcus aureus* and empiric treatment for skin and soft tissue infections

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BMC Proceedings 2011, 5(Suppl 6):P17

Introduction / objectives: Previous skin carriage of healthcare-associated methicillin-resistant *Staphylococcus aureus* (HA-MRSA) leads frequently to empiric MRSA coverage for the antibiotic treatment of skin and soft tissue infections.

Methods: Retrospective cohort study between January 1996 and -June 2010 including adult orthopedic patients hospitalized at Geneva University Hospitals (MRSA prevalence; 30%).

Results: A total of 378 skin and soft tissue infections in 346 patients were retrieved. Among all episodes, 102 revealed a positive current MRSA status (during 2 weeks preceding infection; 102/378; 27%) and 70 (19%) were MRSA carriers in the past. The sensitivity, specificity, positive and negative predictive values of current MRSA skin carriage to predict abscesses due to MRSA were 0.68, 0.77, 0.19, and 0.97, respectively. Fifty-four current MRSA carriers (54/102, 53%) and 30 past carriers (43%) were successfully treated with a non-MRSA antibiotic agent. In multivariate Cox regression analysis, anti-MRSA antibiotic coverage (hazard ratio 1.2, 95% CI 0.5-2.8) and duration of antibiotic therapy (HR 1.0, 95% CI 0.96-1.02) did not influence treatment failure among patients with positive MRSA carriage, in contrast to presence of immune suppression (HR 7.8, 95% CI 1.8-34.1).

Conclusion: Current or past HA-MRSA skin carriage poorly predicts the need for anti-MRSA coverage for the antibiotic treatment of skin and soft tissue infections in hospitalized orthopaedic patients.

Disclosure of interest: None declared.

P18

Community-acquired methicillin-resistant *Staphylococcus aureus* in a Malaysian tertiary centre in year 2009

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BMC Proceedings 2011, 5(Suppl 6):P18

Introduction / objectives: Community-Acquired Methicillin-Resistant *Staphylococcus aureus* (CA-MRSA) is a pathogen recognized to be distinct from hospital-acquired MRSA phenotypically and genotypically. We aimed to identify CA-MRSA cases in UKMCMC, their antibiotic susceptibility patterns and genotypic characteristics.

Methods: Cases were identified prospectively from January to December 2009, where culture and antibiotic susceptibility results yielding pauciresistant MRSA isolates were suspected as CA-MRSA. The patients' clinical data were collected and their specimens were sent for molecular confirmation and analysis at IMR.

Results: Five cases of CA-MRSA were identified. The isolates had multisensitive pattern on antibiotic susceptibility testing and were resistant to only penicillin and oxacillin. All cases were skin and soft-tissue infections, namely diabetic foot with gangrene, infected scalp haematoma, philtrum abscess in a healthcare worker, thrombophlebitis complicated

with abscess and infected bedsore. All five cases were confirmed MRSA by detection of *mecA* gene. SCCmec typing (*ccr* gene and *mec* complex gene) revealed SCCmec type IV for all except the infected bedsore case. Panton-Valentine Leucocidin gene was positive in all isolates.

Conclusion: The clinical confines between methicillin-sensitive *Staphylococcus aureus*, CA-MRSA and "nosocomial CA-MRSA" are indistinct. Early recognition is necessary in instituting appropriate antibiotics and infection control measures. Continued surveillance of pauciresistant MRSA and molecular analysis is useful to identify emerging strains and their epidemiology and transmission, both in the community as well as healthcare settings.

Disclosure of interest: None declared.

P19

MRSA in pig farms: a prospective cohort study

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BMC Proceedings 2011, 5(Suppl 6):P19

Introduction / objectives: The aims of this study were to determine the prevalence, determinants and dynamics of human carriage of livestock associated methicillin-resistant *Staphylococcus aureus* (MRSA) in pig farms.

Methods: In this prospective cohort study in 50 pig farms in The Netherlands, human nasal samples were collected on 5 time points in 8 months. At start of the study, throat samples and environmental samples were taken. Persistent carriers were defined as persons with 100% of nasal samples positive for MRSA, non-carriers had no MRSA and intermittent carriers had at least one positive sample. Data collection is still ongoing (total follow-up 1 year).

Results: In total, 281 persons participated in the study. At start of the study, 21% of household members (31/147) and 68% of farmers/employees (90/132) were MRSA positive in nose or throat. Fifty-four persons were persistent MRSA carriers (54/281=19%): 5 household members (5/149=4%) and 49 farmers/employees (49/132=37%). Furthermore, 79 intermittent carriers and 148 non-carriers were found. Sixty-seven percent (33/49) of the residences and 80% (40/50) of the stables harboured MRSA. Working in the stables on a daily base and presence of MRSA in throat samples were significantly associated with persistent carriage (OR=12.7, 95%CI 4.1-39.3, and OR=5.0, 95%CI 2.3-10.9, respectively).

Conclusion: Persistent MRSA nasal carriage is common in persons working at pig farms. A possible explanation is the frequent exposure to high amounts of MRSA in the stables. Working in the stables still is an important factor in persistent carriage, as is throat carriage.

Disclosure of interest: None declared.

CONTROL OF VANCOMYCIN-RESISTANT ENTEROCOCCI (VRE)

P20

Epidemiological aspects of healthcare-associated enterococcal infections

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BMC Proceedings 2011, 5(Suppl 6):P20

Introduction / objectives: Enterococci (E.) have become a significant nosocomial pathogen, and their epidemiology is largely obscured.

Methods: Data were obtained by monitoring of 1946 cases of E. infections in 1983-2010 including 17 outbreaks with 172 patients. Isolates (1728) were tested for susceptibility to ampicillin, gentamycin and vancomycin, 31 epidemic isolates of *E.faecium* were investigated by MLST (Gdh, PstS, PurK and AtpA loci).

Results: Before 2000 maximal incidence of E. infections in Kemerovo Region hospitals was 0,8/1000 patients and share of *E.spp.* among all pathogens of HAIs was <2%. During the past decade the incidence of

E. infections increased 20-fold and mortality rate increased 5-fold. The *E. faecalis*/*E. faecium* ratio was 9:1, but in bacteremia cases *E. faecium* was predominant. Hospitalized patients had 63% isolation rate of *E. faecalis*, depending on duration of hospital stay. Primary selection of epidemic *E. spp.* clones occurred in ICU, further spreading to other units. The *E. spp.* epidemic potential was as high as of *S. typhimurium* and *P. aeruginosa*. The level of epidemic hazard was higher for *E. faecium* compare to *E. faecalis*. The minimal selection time for epidemic clones of *E. spp.* was 7 days (maximal circulation-4 months). Specific allelotype of the *purK1* gene was related to hospital outbreaks. Infections mainly arised from endogenous sources, mainly after colonization of the gastrointestinal tract by epidemic *E. spp.* clones, but infection has also spread from patient to patient or by hands of healthcare staff, uniform or indirectly by contaminated surfaces and equipment. About 40% of *E. faecalis* isolates and 72% of *E. faecium* isolates were resistant to ampicillin, 79% and 82% - to gentamycin, respectively. The VRE share was 31%. Epidemic clones of *E.* survived on surfaces in hospital environment for 37 days.

Conclusion: Our findings can be taken into account for prevention of HAIs.

Disclosure of interest: None declared.

P21

Experience report on surveillance of vancomycin-resistant enterococci

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BMC Proceedings 2011, 5(Suppl 6):P21

Introduction / objectives: Over the years, there has been an increase in infection rates associated with vancomycin-resistant Enterococcus (VRE). Patients with VRE with clinical findings may show signs and symptoms of infection of the urinary tract, bloodstream, wounds, abdominal pain, diarrhea and can progress to septic shock. However, patients may be colonized and have no signs and symptoms, but they represent a strong threat in the spread of bacteria. In the body of the colonized subject, the most important reservoir of VRE is the gastrointestinal tract, especially the colon.

Methods: This is an experience report retrospective from 2005 to 2010, involving the description of the monitoring of 547 cases of patients who fit the protocols for surveillance of a General Hospital of São Paulo. The 437 cases evaluated by collecting a sample of anal swab for VRE in the research situation Empirical Contact Precautions (at admission) and 110 cases evaluated in Directed Surveillance, including a collection of four samples from each patient, considering the criterion of patient risk.

Results: In the sample of 437 patients investigated, 2.28% of patients had positive VRE while in the performance of periodic surveillance directed at patients at risk (110 cases), 8.08% showed positive result for the VRE.

Conclusion: This report demonstrates the prevalence of VRE, considering the microorganisms found in patients who are admitted in Empirical Contact Precautions and the importance of directed surveillance to microorganisms such as VRE, *Clostridium difficile* and KPC production. Evidence of colonization of patients means it can be empirical precaution and thus provide patient safety by minimizing the risk of nosocomial infection.

Disclosure of interest: None declared.

P22

Unprecedented nosocoimal spread os vancomycin-resistant *Enterococcus faecium* in a tertiary-care hospital in Switzerland

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BMC Proceedings 2011, 5(Suppl 6):P22

Introduction / objectives: The incidence of vancomycin-resistant enterococci (VRE) remains sporadic in Switzerland. We report an unprecedented VRE (*E. faecium* van B) outbreak in a 900-bed tertiary care hospital and describe its molecular epidemiology.

Methods: VRE was detected in clinical specimens by standard procedures. Carriage screening was performed by rectal swab. Swabs were inoculated into an enrichment broth and grown on chromogenic VRE agar. Isolates were typed by PFGE.

Results: In November 2010, a first case of VRE was detected in a urine culture. The investigation identified 3 secondary cases in roommates

(asymptomatic carriage). A second clinical case was detected in January 2011. Four secondary cases were identified. Both index cases were previously hospitalized in the same regional hospital. All patients transferred from the regional hospital were screened for VRE. In addition, weekly screening was initiated in patients hospitalized in the epidemic ward.

In total, from November 2010 to March 2011, 31 VRE cases were identified: 4 in clinical specimens (urine 2, wound 2) and 27 in screening swabs. One patient presented a VRE bacteremia. Molecular analysis showed that all isolates except 2 had the same PFGE pattern. The 2 different strains had only a variation of 1 to 2 bands and were probably related to the outbreak. Infection control measures (contact isolation of carriers and roommates, quarantine of the epidemic ward and reinforcement of environment disinfection) were implemented.

Conclusion: This is the first report of a large VRE outbreak in Switzerland. Molecular typing confirmed the occurrence of an outbreak and showed that no sporadic case occurred during this period. The outbreak was controlled by implementation of strict infection control measures.

Disclosure of interest: None declared.

P23

Active surveillance for vancomycin-resistant enterococci colonization in intensive care unit

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BMC Proceedings 2011, 5(Suppl 6):P23

Introduction / objectives: Introduction: Asymptomatic vancomycin-resistant enterococci (VRE) colonization is known to precede actual infection. The VRE isolation rate has rapidly increased in tertiary hospitals, but there is few data in this area of China, hindering the local infection control efforts.

Objectives: To understand the local prevalence of VRE in patients hospitalized in ICU.

Methods: A prospective observational study to estimate the prevalence of VRE colonization among inpatients in a 50-bed medical ICU was performed. From November 2010 to February 2011, rectal swabs were collected from inpatients at the time of ICU admission, a week later and at discharge from ICU and were then subject to culture and detection of VRE.

Results: During the study period, 21(7.1%) out of 295 patients have been colonized with VRE at the time of ICU admission. Among the 295 patients included, 35 had a ICU stay less than 48 hours and their rectal swabs were not collected at discharge from ICU. A total of 133 patients were discharged from ICU within a week but beyond 48 h, among which 12 (9.0%) were colonized with VRE at discharge. The remaining 127 patients were hospitalized in ICU for more than one week and 21 (16.5%) of them were positive for VRE at one-week ICU stay and 24 (18.9%) were positive at discharge.

Conclusion: Although infection due to VRE is not common in China, the VRE colonization rate was not negligible among local medical ICU patients, especially when they had a ICU stay beyond one week. Active surveillance is required to investigate the epidemiology of VRE in local settings.

Disclosure of interest: None declared.

P24

Marked reductions in rates of vancomycin-resistant enterococci (VRE) colonization & disease associated with introduction of a routine hospital-wide bleach cleaning program

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BMC Proceedings 2011, 5(Suppl 6):P24

Introduction / objectives: To reduce rates of VRE colonization/disease, we introduced a multimodal hospital-wide bleach-based cleaning program (BBCP) that included a new product (sodium hypochlorite 1000ppm + detergent), new standardised (routine and detailed) cleaning practices & modified glove/gown protocols to rely on alcohol-based handrub & sleeveless aprons. Rates of VRE pre- & post-BBCP were compared.

Methods: Patients in 4 high-risk wards (liver transplant, renal, ICU, hem/oncology) were screened on admission & weekly for rectal VRE colonization, & rates were compared pre-BBCP (Period A [6 mo] – Feb-July 2009) vs post-BBCP (Period B1 & B2 – Feb-July & Aug-Jan 2010/11). Rates of VRE bacteremia (per 100 patients blood cultured [100PBC]) & of urinary tract infection [UTI] were compared - Period A vs B1 & B2.

Results: A 37% reduction in newly recognised VRE colonizations was observed post-BBCP (208/1948 patients screened [Period A] vs 181/2129 [Period B1] vs 143/2141 [Period B2], $p < 0.0001$), despite an increase in screening compliance (68.1% vs 74.6% vs 71.9%, $p = 0.061$) and a stable rate of on-admission VRE colonization (38/1461 [2.6%] vs 44/1795 [2.5%] vs 38/1840 [2.1%], $p = 0.34$). VRE bacteremia declined from 0.48/100PBC (14/2935) pre-BBCP to 0.08/100PBC (5/6194) during the 12 mo post-BBCP ($p = 0.0002$), with a reduction in UTI cases (24 [A] vs 19 [B1] vs 17 [B2]).

Conclusion: The BBCP was associated with a significant reduction in rates of both new VRE colonizations (37% decrease) & VRE disease. This approach potentially represents a new paradigm in the management of VRE.

Disclosure of interest: None declared.

P25

Modelling the impact of infection control measures on the incidence of vancomycin-resistance enterococci: a time-series analysis

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BMC Proceedings 2011, 5(Suppl 6):P25

Introduction / objectives: Vancomycin-resistant enterococci (VRE), an important pathogen causing healthcare associated infection emerged and increased rapidly worldwide. Several measures have been implemented to control the spread of VRE. This study aimed to evaluate the impacts of the annual hand hygiene promotion program (HHPP) and the active VRE surveillance (AS) on VRE infection/colonization incidence in a 2300-bed teaching hospital in Taiwan.

Methods: From January 2001 through December 2010, monthly VRE infection/colonization incidence identified according to clinical microbiology lab results and the infection control measures implemented were analyzed retrospectively. A time-series analysis was conducted using a multiple linear regression model to estimate the effects of the HHPP and the AS on the incidence of VRE infection/colonization.

Results: A total of 1069 VRE cases were identified in 6577541 patient-days. The incidence of VRE (per 10000 patient-days) was 0.22 cases in January 2001, reached the peak of 6.40 cases in March 2009, and then decreased to 1.76 cases in December 2010. The multivariate analysis of the data showed that the incidence of VRE was significant increasing over time in these 10 years (Coefficient 0.015, $P = 0.02$). Implementation of the HHPP had significant decreased the incidence of VRE (Coefficient -0.599, $P = 0.05$). Establishment of the VRE AS also had significant decreased the incidence of VRE (Coefficient -0.971, $P = 0.001$). However, there was a time lag of 12-months to see the significant impact for the AS to the incidence of VRE.

Conclusion: Though the secular trend of VRE was increasing, implementation of both hand hygiene promotion program and active VRE surveillance were effective in lowering the VRE burden. There was a time lag to the impact of active surveillance.

Disclosure of interest: None declared.

INNOVATION IN INFECTION CONTROL AND ANTIMICROBIAL RESISTANCE PREVENTIONS

P26

Meeting global standards for hand sanitizer efficacy: formulation matters

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Introduction / objectives: Critical questions have been raised in the scientific literature and by hand-hygiene thought leaders regarding the minimum alcohol concentration that assures efficacy of alcohol-based hand rubs (ABHR). The objective of this study was to determine the relative influences of alcohol concentration and product formulation on the efficacy of ABHR using internationally recognized methods.

Methods: Eleven commercially available alcohol-based hand rubs (gels and foams) containing between 60-90% (v/v) ethanol and WHO-recommended hand rub formulations containing 75% isopropanol or 80% ethanol were evaluated in a series of studies. Test methods included EN 1500 (Hygienic Hand Rub) and ASTM E1174 (Healthcare Personnel Handwash).

Results: Four ABHR ranging from 70-80% ethanol met EN 1500 requirements with a 3 ml application volume applied for 30 seconds. Nine ABHR and the 2 WHO formulations were evaluated per E1174 at 2-ml application volumes. Of the products tested, only 2 products, a well-formulated 70% ethanol ABHR gel and well-formulated 70% ethanol foam, met the U.S. FDA requirements (reductions of $\geq 2 \log_{10}$ after 1 application and $\geq 3 \log_{10}$ after 10 applications). None of the other nine products achieved a 3- \log_{10} reduction following the tenth application.

Conclusion: Product formulation was found to have a greater influence on efficacy than alcohol concentration. Well-formulated products containing 70% ethanol, including ABHR foams, can exhibit greater efficacy than products with higher alcohol levels. These results demonstrate that alcohol concentrations in excess of 70% are neither necessary, nor always sufficient to meeting global efficacy standards.

Disclosure of interest: S. Edmonds Employee of GOJO Industries, D. Macinga Employee of GOJO Industries, P. Mays-Suko: None declared, C. Duley: None declared, J. Arbogast Employee of GOJO Industries.

P27

A novel method to determine the antiviral efficacy of hand rubs using murine norovirus (MNV) as surrogate of human norovirus

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Introduction / objectives: So far there is no method available in Europe to determine the antiviral efficacy on contaminated hands. Aim was therefore to develop a method which resembles both contamination and hand treatment in clinical practice as closely as possible.

Methods: Each fingerpad (8 fingers per 4 subjects) was contaminated by dipping for 15 s in 0.4 ml of MNV suspension + 10% stool suspension and allowed to dry. The virus titre on fingers was determined by shaking a plastic vial with 1 ml of sampling fluid for 20 s. Infectivity was determined by transferring 100 μ l after dilution to 8 wells of a microtitre plate with 100 μ l of RAW 264.7 cells. After 4 days cultures were assessed for cytopathic effects, the infective dose was calculated with the method of Spearman and Kärber. Hands were similar to EN 1500 either treated with 3 ml of a hand rub or with 3 ml of water of standard hardness using responsible application. Four hand rubs (based on ethanol 80%, 85% or 95%, or based on a combination of 30% propan-1-ol, 45% propan-2-ol and 0.2% mecetronium etilsulphate) and one hand gel (based on 85% ethanol) were evaluated.

Results: Mean baseline viral titre was between 5.99 and 6.52. The ethanol-based products reduced the viral load by 4.32 ± 0.69 (80% ethanol), 4.59 ± 0.36 (85% ethanol, rinse), 4.52 ± 0.67 (85% ethanol, gel) and 4.44 ± 1.07 (95% ethanol) which were all significantly more effective compared to the application of water (means between 2.29 ± 0.45 and 2.67 ± 0.61). The propanol-based hand rub was somewhat less effective (3.77 ± 0.66).

Conclusion: The new method allows determining the efficacy of hand rubs against MNV. The contamination is clinically relevant, the application

of a hand rub is done as in patient care, the negative control allows determining the reproducibility.

Disclosure of interest: G. Kampf Employee of Bode Chemie GmbH, Hamburg, Germany, E. Steinmann Consultant for Mikrolab GmbH, Bremen, Germany, J. Steinmann Employee of Mikrolab GmbH, Bremen, Germany.

P28

A personal memory aid augmenting the 'My five moments for hand hygiene' concept

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Introduction / objectives: Human memory capacity is limited and even relatively simple concepts are not easily retained if not central to the individual's emotional engagement. The 'My five moments for hand hygiene' (Sax H, et al. J Hosp Infect 2007;67:9-21) has been designed to be simple and 'sticky'. But even so, as informal surveys show, only 2 of 5 hand hygiene indications are accessible in active memory and correctly reproduced by healthcare workers upon request.

Methods: Search for a simple memory aid using concepts of emotional design and human factors engineering principles through a heuristic try and error design process.

Results: The solution is simple, almost for-free, and in most basic healthcare settings universally available. It enhances memorizing five distinct indications for hand hygiene and correct use of disposable gloves through a phase of personal physical challenge, joy of final success, simplicity and the principal of chunking the 6 items (5 indications for hand hygiene and correct glove use) into 3 items. Preliminary small-scale testing shows a strong memory-enhancing effect.

Conclusion: This invention has a lifesaving potential at near zero cost. Very simple design solutions according to human factors principles can be very effective.

Disclosure of interest: None declared.

P29

Systematic review and meta-analysis of the predictive value of C-reactive protein in postoperative infections

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Introduction / objectives: Systematic review and meta-analysis on C-reactive protein (CRP) to determine its value in predicting prognosis / diagnosis of infection in surgical patients.

Methods: The sources were searched: Cochrane, Embase, Lilacs, Pubmed/Medline, Ovid, and references of studies found. Was used the PICO strategy for the definition of descriptors. The data of the studies were obtained through a systematic instrument, and the strength of evidence was classified according to the *Center for Evidence Based Medicine*. For the statistical analysis software was used Meta-Disc version beta 1.1.1 (freeware).

Results: 20 studies were included, 18 classified with the highest level of evidence. All reported elevated levels of CRP after surgery and in the presence of postoperative infections (PO), 8 studies a peak CRP between the 2nd and 3rd postoperative day was reported as a normal curve of CRP declined for patients without complications postoperatively, and rising in patients with complications. In four studies it was observed that a value greater than 5 mg /dl in the postoperative CRP is indicative of infection. And the patients with levels above 140 mg/dl in the 4th OP are more likely to develop infections. The meta-analysis revealed a mean of 85% (sensitivity), 86% (specificity), the area under the SROC curve was 0.9060, and odds ratio was 23.56.

Conclusion: CRP, together with other clinical interventions, has high value in the prognosis / diagnosis in the development of postoperative infection.

Disclosure of interest: None declared.

P30

A novel technique of using computer imaging for efficient detection of M. tuberculosis in acid-fast stain procedure

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Introduction / objectives: Tuberculosis is an emerging infectious disease in Taiwan which nearly 15,000 newly diagnosed cases are reported each year. The most economical method for laboratory diagnosis of pulmonary tuberculosis is based on the bacteriological examination of sputum smears stained by the Acid-Fast stain method for acid fast bacilli (AFB). Thus, microscopic examination of specimens for AFB plays a key role in the initial diagnosis, monitoring of treatment, and eligibility for release from isolation. However, laboratory technicians often time are overwhelmed with large quantity of smears and under pressure of limited time allowed to issue the results. In this study, we propose a novel technique to transfer microscopic image of AFB from the eyepiece to a large size computer LCD screen via a digital camera embedded on the microscope.

Methods: We compared the results between Kinyoun acid fast stain smears under computer screen and M. tuberculosis cultures. The microscopic images were digitally stored in computer and shown on the LCD monitor for analysis.

Results: Total 494 sputum specimens were processed for AFB. Using culture as the gold standard, our results show that the accuracy, sensitivity and specificity of our method is 53.0% (262/494), 48.0% (183/375), and 66.3% (179/119), respectively. Although our method is low in accuracy and sensitivity, but our specificity is higher than other commonly used method. The time required for each slide also cut in half.

Conclusion: Our proposed method may combine with computerized pattern recognition software to automatically detect AFB from images which would significantly increase the accuracy and sensitivity. Such digital image automation may be the future for promoting better laboratory quality and efficiency.

Disclosure of interest: None declared.

P31

MSSA Outbreak detected with software combining microbial resistance pattern and location within hospital

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Introduction / objectives: Clinical microbiology laboratories are increasing in size, providing services to several hospitals. Clusters of infections caused by other than readily recognized organisms such as MRSA, might easily go undetected. Dedicated software should overcome this problem.

Methods: A new module in the laboratory information system GLIMS by MIPS Belgium, combines isolate resistance data with patient location data derived from the hospital information system. Antimicrobial resistance patterns of new clinical isolates are compared with previous patterns, and identical resistance patterns are checked at ward level for simultaneous patient stay. If these conditions are met, a report with isolate, details of the two patients and both time and location of possible transfer is generated. Before sending the report to the infection control practitioner, common resistance patterns are filtered to improve the noise to signal ratio.

Results: The microbiology laboratory working for 3 hospitals introduced the system in June 2010. From late January 2011 to early March reports from a surgical ward in the Flevoziekenhuis noted MSSA isolates resistant to ciprofloxacin, fusidic acid, erythromycin and clindamycin. The number of involved patients mounted to 12. Nursing practices were audited, and nurses with skin lesions were cultured. No obvious breach in infection control measures or healthcare worker sources were

detected. Reinforcement of existing hygiene procedures was sufficient to stop the transmission.

Conclusion: As clinical microbiology services tend to be concentrated for efficiency reasons, manual surveillance of resistance patterns becomes less feasible. Our GLIMS module proved useful in detecting a cluster of MSSA transmission in a surgical ward.

Disclosure of interest: None declared.

P32

"BLUE BOARD" – an innovative knowledge management programme for educating health care practitioners using blended learning modules

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Introduction / objectives: Existing infection control(IC) programs in hospitals are not effective due to lack of coordinated educational modules for stake holders in health care environment. We highlight our experience on a new knowledge management program which aims to educate and update information regarding IC practices to all Health Care Practitioners (HCP).

Methods: A working core group was formed comprising of Heads of all clinical departments and Microbiology. Three members of the core group initiated a program at departmental level to identify their needs & issues, and to find out areas of constraints & possible remedial measures. The self generated team (BLUE BOARD) interacted through electronic media. A common platform was created so that different units could revise existing policies considering guidelines & feasibility of implementing the revised ones. Achievements were assessed by indicators viz., infection rate and antimicrobial usage. Data was analysed by simple descriptive statistics.

Results: They met at regular intervals & utilized learning materials, guidelines & other scientific data from authorized resources. They contributed to revise the program based on feedback from members. This continuous on-going education cum training programme blended with computer technology, interactive discussions & role plays brought down infection rates (25%) and reduction in the use of antimicrobials (17%).

Conclusion: "Blue Board" has streamlined IC practices, improved the attitude of HCPs. Based on the confidence gained, BLUE BOARD system extended their services to other hospitals within the locality, disseminated knowledge gained and maintained uniformity in IC practices.

Disclosure of interest: None declared.

P33

Developing proxy indicators of healthcare associated infections to support syndromic surveillance in a UK academic health science centre

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Introduction / objectives: A wealth of disparate data are routinely collected and stored within public hospitals in England, providing a potential source of information for novel surveillance tools for healthcare associated infections (HCAIs). In the absence of a complete electronic patient record, this study aims to utilise these data to predict HCAIs and enhance early identification.

Methods: A systematic literature review was employed to develop an evidence-based inventory of risk factors for HCA *Clostridium difficile*, surgical site infections, urinary tract infections, bloodstream infections and pneumonia.

Data from multiple internal hospital databases were linked, using an encoded patient ID, into a coherent database with information on demographics, admissions, diagnostics, procedures and microbiology. The database was interrogated for the presence of a range of risk factors identified by the literature review, to develop predictive risk models and proxy infection indicators. Cases of HCAIs were extracted from the database for the purpose of risk modelling.

Results: The literature review resulted in 341 papers, providing 293 independent risk factors of HCAIs.

The database contains 370,559 administrative inpatient care records from 2007-10, corresponding to 310,722 microbiology tests, 628,861 diagnostic codes and 367,550 procedure codes. So far, 47 risk factors have been identified and predictive risk models and proxy indicators are being developed to support syndromic surveillance.

Conclusion: Routinely collected hospital data can be used to identify risk factors for HCAIs and develop proxy indicators of infection and risk. This resource has potential for innovative surveillance tools that could be implemented in real time and impact on the incidence of HCAIs within acute care settings.

Disclosure of interest: None declared.

P34

Electronic epidemiological query on admission: 6 clicks for global risk assessment

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Introduction / objectives: Epidemiologically Important Microorganisms (EIM) reduction is a major aim of infection control. EIM are widely spread and shared between patients in several care settings. e-health, defined as intensive use of information and communication technologies, can be a major part of this strategy.

Methods: Aiming both detection of these patients on admission and immediate implementation of procedures, Infection Control Committee (ICC) and Information Technologies team of Hospital da Luz (a high-tech, 280-bed general hospital), created an Electronic Epidemiological Query on Admission (EEQA) on the Electronic Medical Registry (EMR). EEQA comprises 6 Yes/No questions to be fulfilled by the physician in charge of admission. If at least 1 question has a positive answer (positive EEQA), it automatically generates infection control prescriptions on the EMR (specific isolation procedures for contact, airborne, droplets or Cdiff); screening cultures (nasal MRSA, rectal MRSA, VRE and MR *Acinetobacter*) or Cdiff toxin screening; activation of biohazard symbol and ICC information in order to follow-up.

Results: For the first 50 EEQAs (starting on February), 70% were positive, resulting on measures implemented for 35 patients, with 77% global sensitivity. MRSA is the main EIM (67% sensitivity for patients who were admitted with history of health-care or long-term care stay for at least 3 days in the past 3 months).

Conclusion: The implementation of the EEQA is an innovative approach that uses the e-health concept, allowing immediate automatic detection of high risk patients on admission, avoiding the gap of time until release of screening results. With 6 clicks, 6⁶ different protocols can be generated without any additional effort to physicians, improving quality of care.

Disclosure of interest: None declared.

P35

Extremelt low rates of hypoglycemia following transfer of tight glucose control management to ICU nurses

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Introduction / objectives: Tight glucose control (TGC) failed to improve survival and has been associated with high rates (6-18%) of hypoglycemia (< 2.5mmol/l), themselves associated with significant mortality. Blood glucose levels vary largely in critically ill and TGC requires individualized knowledge of the patient condition. Bedside frequent blood glucose measurements are mandatory for continue adaptations of insulin and glucose administration. We progressively transfer TGC to the nursing personal.

Methods: TGC was introduced in 2003 and then progressively transferred from physicians to nurses since 2007. Nurses are specifically trained to

adapt infusion rates of nutrition and insulin according to medically predefined targets (4.5–6.0; 6.0–8.0; >10mmol/l). Glucose levels are determined by the central lab. or by ICU blood gas analyzers. Glycemia (n=809/725) were extracted from our electronic clinical information system (Metavision®) and analyzed with STATA.

Results: A continuous decrease in yearly standard deviations (IQR), suggest that TGC was effectively improved (Table).

We suppressed the lowest target (4.5–6.0 mmol/l) in May 2009 and this may explain the mean increase since then. The rate of hyperglycemia decreases below 10%, with rates of hypoglycemia (<2.5 mmol/l) largely below 0.4%, 50 to 100 fold lower than those reported in the literature.

Conclusion: Implementation and transfer of tight glucose control in a large mixed adult ICU significantly decreases the rate of hyperglycemia to less than 10%, with extremely low rates of hypoglycemia (< 0.1%). These results strongly suggest that transfer of tight glucose control to bedside nursing personal is safe and effective.

Disclosure of interest: None declared.

P36

E-health based solutions for improving quality of antibiotic use in hospitals

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Introduction / objectives: Multidrug resistant microorganisms (MDROs) constitute a serious threat. Strategies to reduce incidence are based on reducing both emergence and transmission. e-health, defined as intensive use of information and communication technologies, can be a major part of strategies to reduce the rate of MDROs.

Methods: Aiming improvement of the quality of antibiotic use based on the e-health concept in a 280-bed, paper-free, general hospital, Infection Control Committee (ICC), along with Quality and Antibiotics Committees (Q&A) and IT team, has been working on implementation of new tools at several levels. On the electronic medical record, a new template for antimicrobial prescription has been created and is in use since January, conditioning automatically the prescription in terms of context (surgical antibiotic prophylaxis in accordance with type of surgery; medical therapy, in accordance with the type of infection) and duration (intra-operative, 1-day or 2-days for antibiotic surgical prophylaxis; 7 days maximum for therapeutics). If there is a disagreement between prescriptions and protocols, physicians may proceed, but an electronic justification must be fulfilled (which is also obligatory for some antimicrobials) and sent to the ICC and Q&A Committees, which, in turn interact with prescribers both by e-mail and phone call, thus building up an antibiotic stewardship. This is complemented by e-pub of antimicrobial protocols on the hospital intranet and by release of data on antibiotic use.

Results: Data analysis is still on process.

Conclusion: The authors hope that the use of e-health on antibiotic management will improve the quality of care and thus reducing MDROs emergence.

Disclosure of interest: None declared.

P37

“Hygienenetzwerk Südostniedersachsen” – a model for hygiene network formation in Germany

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Introduction / objectives: Regional network formation is an integral part of any strategy to combat antimicrobial resistance development, as recommended by the German Antimicrobial Resistance Strategy (DART). But no information about the adequate organization in decentralized health systems such as Germany is given. Here, we report on the

‘Hygienenetzwerk Südostniedersachsen’ (HN-SON), a regional network in Lower Saxony, Germany, with special focus on organizational aspects.

Methods: Starting in 2009, a hygiene network of local health care providers was founded in Brunswick, Germany, moderated by the local health authority and focusing around the City Hospital, a major academic teaching hospital of >1000 beds.

Results: 1. A hygiene network is an important source of information for many academic institutions, who may themselves offer important services free-of-charge in exchange. Thus, HN-SON soon cooperated with several institutions such as eHealth.Braunschweig on e. g. electronic patient admission-discharge management. 2.The majority of patient transferrals takes place within the catchment area of the major regional hospital. With HN-SON, this covers 8 health authority districts which soon cooperated in HN-SON. 3. HN-SON started as an informal association, an organization prohibitive to many activities, such as clinical studies, acceptance of donations and the cooperation with companies. We are currently founding a registered society which shall subsequently be incorporated into HN-SON.

Conclusion: These developments will hopefully expand our possibilities (as a juristic person) to offer better regional hygiene services, such as specialized training courses or a central help desk.

Disclosure of interest: None declared.

P38

Reusable tourniquets. An underestimated means for patient transfer of multi-resistant bacteria

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Introduction / objectives: We sought to investigate the use of reusable tourniquets as potential sources of MRO transmission.

Methods: 100 reusable tourniquets were collected over 10 weeks in a 503-bed Sydney teaching hospital. Tourniquets were incubated overnight in BHI enrichment broth and subcultured.

Results: The colonisation rate was 78% (78/100). Ten grew non multi-resistant Gram- positives - MSSA (1) and Enterococcus species (9), 17 grew commensals. Non multi-resistant Gram-negatives grew in 38 specimens: Pseudomonas species (13) and ‘coliforms’ (26). MROs were found on 25% of tourniquets, including 3 from MRO isolation rooms. An IMP-4 positive *E. cloacae* and an ESBL *E. cloacae* were isolated from a single tourniquet each. MRSA was isolated from 14; vanB *E. faecium* was isolated from 18 and vanA *E. faecalis* from a single tourniquet. MRSA and VRE were isolated together from nine tourniquets, and 24 tourniquets grew either one. Van B positive *E. faecium* were typed using DiversiLab rep-PCR system This revealed five clusters without adominant clone. Six of 9 tourniquets from ICU grew at least one MRO. MROs were isolated throughout the 10 week period from a wide variety of locations including general wards, ICU, Burns, theatre anaesthetic bay and the blood collection unit.

Conclusion: Reusable tourniquets are frequently colonised with MROs and may be a potential source of cross-transmission. Using broth enrichment, 24% harboured either MRSA or VRE. Astourniquets are carried from ward to ward by hospital staff and used repeatedly, they may become a ‘sleeping’ mechanism for unrecognised hospital MRO transmission. They are also a surrogate marker for environmental colonisation and deficiencies in hospital cleaning. Continued use of reusable tourniquets may not be justified in the current hospital setting.

Disclosure of interest: None declared.

P39

New insights into the antimicrobial mechanisms of copper touch surfaces

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Introduction / objectives: Survival of pathogens on touch surfaces contributes to increasing incidence and spread of antibiotic resistance and

infection in hospitals. One way to address this could be to use biocidal surfaces in conjunction with improved cleaning regimes. Exposure to moist copper alloy surfaces, to simulate fomite contamination, resulted in a rapid kill of significant bacterial, viral and fungal pathogens. We now report studies on dry surfaces with a range of pathogens to elucidate the antimicrobial mechanism.

Methods: Clinical isolates of VRE, MRSA, *E. coli* O157, *A. baumannii* and *Salmonella* were inoculated onto copper alloy and stainless steel surfaces. Survivors were assessed by culture on agar media, respiration using CTC reduction, membrane potential using Rhodamine 123 and cell membrane integrity using BacLight stain. Genomic and plasmid DNA integrity was determined using gel electrophoresis and a sensitive genomic fragmentation assay. Contribution of Cu(I) or Cu(II) ions, and superoxide or hydroxyl free radical to the antimicrobial effect was determined by the protective effect of copper chelators and reactive oxygen species quenchers.

Results: Copper surface toxicity in enterococci and MRSA involved Cu(I) and Cu(II) ion release and generation of superoxide, resulting in rapid collapse of membrane potential, arrested respiration and DNA breakdown. Fenton reaction generation of hydroxyl radicals was more important in Gram-negative bacteria and this was also accompanied by a compromised cell membrane.

Conclusion: Contact surfaces containing copper could be useful to help prevent spread of viable pathogens. The rapid destruction of genomic and plasmid nucleic acid could prevent mutational resistance developing and also help reduce the spread of antibiotic resistance genes to receptive and potentially more virulent organisms, as well as genes responsible for virulence.

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P40

4kg solid replaces 80L liquid cleaner – innovative cleaner system for automated instrument reprocessing

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Introduction / objectives: SolidSafe System, an innovative cleaner system, has been developed for automated instrument reprocessing, consisting of cleaning and neutralisation products to be operated with a dispenser. Sustainability, easy and safe handling are core system benefits in addition to necessary application features a cleaning agent should have.

The environmental footprint is strongly influenced by offering water-free solid chemistry in 4 kg capsules. This solid chemistry is diluted to a liquid concentrate on site which is dosed from washer-disinfectors (WDs) for the reprocessing of medical instruments. The waste of empty plastic is reduced by 96%. This system offers a 28 fold reduction of energy for transportation as water based products no longer have to be shipped to the customer site.

Methods: From an ergonomic perspective, chemicals in concentrated and solidified form are preferred to the current liquid system in the central sterile department (CSD) of hospitals as evidenced by a study by the German Institute for Occupational Health and Safety (IFA). With current liquid products supplied in 5 to 200L cans, the system minimizes change intervals as 1 solid capsule (4 kg) equals up to 80L of liquid concentrate.

Results: Easily installed in different CSD set ups, the dispenser measures and monitors the concentration via conductivity device and ensures that the product is only released for use in the WDs when the defined concentration is reached. Data on the batch productions of liquid concentrate is saved in the dispenser system and can be down loaded as needed.

Conclusion: The SolidSafe System is the first in Europe to offer a dispenser with high accuracy and reliability in combination with the solid and high concentrated cleaning products MetalClean and AlkalineClean and the neutralisation product NeutraPlus.

Disclosure of interest: None declared.

P41

Prioritizing simple administrative measures to ensure appropriate tuberculosis infection control

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BMC Proceedings 2011, 5(Suppl 6):P41

Introduction / objectives: For reducing Tuberculosis (TB) transmission, early diagnosis and prompt treatment of TB patients should be completed by implementing TB Infection Control (TB-IC) measures. Our objective is to analyze the TB-IC Global Policy, its current implementation status and strategies to scale-up TB-IC measures at country level.

Methods: Analysis of the TB-IC Global Policy, and description of strategies and challenges for scaling-up TB-IC measures at country level.

Results: "WHO Policy on TB-IC in Health-Care Facilities, Congregate Settings and Households" (2009) recommended the implementation of a set of measures (administrative, personal protection, environmental). Since, WHO and other partners have been engaged in a series of actions, including Regional/National trainings of hundreds of professionals and Technical Assistance to countries. A new indicator for monitoring TB-IC and the cost analysis for a worldwide implementation have also been integrated into the "Global Plan to Stop TB 2011-2015". However, TB-IC is still in a preliminary implementation phase in most of the countries. Scaling-up should therefore prioritize the implementation of simple and economical administrative measures; e.g. identifying potentially infectious cases (triage), separating them, and assuring health care worker protection. By embedding TB-IC plans into broader ones (i.e. MDR-TB, HIV, Health System Strengthening, general IC), TB-IC measures should progressively be incorporated into national plans funded by major donors. Preliminary data on country implementation, opportunities and bottle-necks will be presented.

Conclusion: Using first simple and economical TB-IC measures, together with embedding TB-IC within broader plans, should contribute to their step-wise implementation. This should also ultimately impact positively the country TB burden.

Disclosure of interest: None declared.

P42

In vitro evaluation of the tuberculocidal property of essential oils

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BMC Proceedings 2011, 5(Suppl 6):P42

Introduction / objectives: The re-emergence of tuberculosis on a global scale, together with the emergence and spread of *Mycobacterium tuberculosis* multidrug-resistant strains, is a worldwide public health problem that places a heavy burden on resource-poor countries. We investigated the antibacterial properties of certain essential oils against *M. tuberculosis*.

Methods: Laboratory tests were carried out in two phases. Phase I was conducted at the Sultanah Aminah Hospital, Malaysia, and phase II at the University of Geneva Hospitals. In phase I, 100 µl of different essential oils were run down the middle of freshly inoculated L-J slants with *M. tuberculosis* to test for growth inhibition by direct contact with the oils. In phase II, we prepared two formulations from the essential oils showing tuberculocidal properties. Actively-growing *M. tuberculosis* cultures were exposed to aerosols with different concentrations of the formulations. After exposure of 5 min daily for 10 days, cultures were incubated for a further 10 days for visual observation of colony growth, followed by subcultures incubated for 6 weeks to evaluate the bactericidal effect.

Results: Phase I identified 3 oils with a cidal effect on direct contact. In phase II, we identified that a 20% mixture of essential oils in 30% ethanol was tuberculocidal. Subcultures showed no growth up to 3 weeks compared to controls, but showed growth of a few colonies at 6 weeks.

Conclusions: In vitro testing allowed to confirm that certain essential oils have tuberculocidal properties. Inhalation therapy with essential oils

could be used as an adjunctive low-cost therapy to directly observed therapy and should be evaluated in controlled clinical trials.

Disclosure of interest: None declared.

P43

In vitro evaluation of antimicrobial activity of essential oils with potential application in biomaterial (castor oil based polyurethane)

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BMC Proceedings 2011, 5(Suppl 6):P43

Introduction / objectives: Nowadays, with the multiresistant microorganisms and biofilm-related infections, diverse biomaterials with antimicrobial activity have been developed. The aim of this study was to evaluate the in vitro antimicrobial activity of essential oils with potential application in biomaterial made of the castor oil based polyurethane in this study supported by FAPESP (2010/50090-8) against reference microorganisms: *S. aureus* (ATCC 25923), MRSA (ATCC 43300), *S. epidermidis* (ATCC 14990), *E. coli* (ATCC 25922), *P. aeruginosa* (ATCC 27853) and *C. albicans* (ATCC 10231).

Methods: The culture medium was distributed in Petri plates (20x100mm) forming a base layer of 12ml. After solidification of the medium, 8ml of medium containing microbial inoculum 1% in the range of 0.5 McFarland was distributed over the base layer to form the seed layer (seeded). On each plate were made five wells with diameters of 5mm. Aliquots of 20µl of the different essential oils were applied to each well. After the pre-incubation, the plates were incubated and the reading of the diameters of inhibition zones (mm) performed.

Results: Essential oils with improved antimicrobial activity, in descending order, were those of the melaleuca, clove and rosemary. Moreover, the essential oils of the cedar and copaiba presented only antimicrobial activity against Gram-positive and the essential oil of the clove showed the best antimicrobial activity against *C. albicans*.

Conclusion: In conclusion, all essential oils showed antimicrobial activity and they could be used in biomaterial to infection control, highlighting the melaleuca, clove and rosemary. In addition, *P. aeruginosa* was the most resistant microorganism and MRSA the most sensitive to essential oils.

Disclosure of interest: None declared.

P44

The fate of orally available antimicrobials

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BMC Proceedings 2011, 5(Suppl 6):P44

Introduction / objectives: Changing an antimicrobial treatment regimen has shown to influence the occurrence of antimicrobial resistance, with regimen consisting of the dose, the treatment interval, the duration of therapy, and the route of administration of the drug. For concentration dependent antimicrobials there is substantial evidence to encourage the use of a high dose, with regular treatment interval and short course to minimise the risk for the selection of resistant mutants. However, in contrast with these first three aspects of the antimicrobial treatment regimen, little attention is currently paid to the influence of route of administration for the probability of selection and spread of resistant strains.

Methods: By comparing data from different animal species, the purpose is to explore the different routes of administration with regard to the stimulation of antimicrobial resistance.

Results: A historical review on the emergence of resistance to beta-lactams and tetracycline in *Staphylococcus aureus* and *Escherichia coli* in different animal species and humans will be provided. Data on commonly used treatment regimens for humans and animal will be compared and the potential impact on selection, co-selection and spread of resistance will be discussed descriptively. Special attention will be given to the

difference in resistance development between topical, oral, and parenteral administration of antimicrobial agents.

Conclusion: Attention to the route of administration might be an underestimated approach to mitigate the risk of selection for pathogens resistant to antimicrobials in both human and veterinary medicine.

Disclosure of interest: None declared.

INFECTIONS AND INFECTION PREVENTION IN PAEDIATRIC POPULATIONS

P45

Innate antiviral immunity is impaired in young patients with hand foot and mouth diseases

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BMC Proceedings 2011, 5(Suppl 6):P45

Introduction / objectives: This study was designed to explore the expressions of three pattern-recognition receptors (Toll-like receptor 3, retinoic acid inducible gene-I and melanoma differentiation-associated gene 5) and components of their signaling pathways in the peripheral blood mononuclear cells of children patient with Hand, foot and mouth disease.

Methods: 98 HFMD patients (aged of 1-5 years) and 55 age-matched non-infection children were enrolled in this study; the patients were divided into two groups according to clinical characteristics - with or without complications. The expressions of TLR3, RIG-I, MDA5, IRF-1 and IFN-alpha mRNA were detected by Real-Time PCR.

Results: The expression levels of TLR3 mRNA in HFMD patients were significantly reduced (6.05±1.26) compared with the non-infection children (7.05±0.96), P<0.001, and the furthermore decreased was found in the patients with complications (5.79±1.15). While, the expressions of MDA5 mRNA in all patients including without complications (4.64±0.49) and with complications (4.60±0.48) were markedly higher than the non-infection children (4.16±0.35), P<0.001. However, RIG-I mRNA was detected only in 72/98 patients, which was not found in the non-infection children. IFN-alpha was lower in the patients without complications (5.71±1.26) than the non-infection children (6.19±0.86), and significantly decreased IFN-alpha mRNA transcriptions were found in the patients with complications (5.54±1.18), compared with the non-infection children P<0.05. Moreover, the changes of IRF-1 mRNA were similar with IFN-alpha, an evidently reduced level of IRF-1 was in the patient with complications (4.89±0.66) compared with the non-infection children (5.32±0.64), P=0.001.

Conclusion: It is suggested that innate antiviral immunity is impaired in patients and is possibly correlated with the severity of illness.

Disclosure of interest: None declared.

P46

Clinical epidemiology and molecular analysis of hospitalized children with hand-foot and mouth disease during 2009 in Shanghai

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BMC Proceedings 2011, 5(Suppl 6):P46

Introduction / objectives: We retrospectively analyzed the clinical features and epidemiology of 1386 children with hand-foot and mouth disease during 2009 at Children's Hospital of Fudan University and investigated some risk factors with fatal cases. Besides, we also identified the pathogen of 116 patients.

Methods: All the clinical records and laboratory results were collected. A retrospective study was performed and reverse transcriptase-polymerase chain reaction (PCR) assay was used to identify the pathogen.

Results: A total of 1386 patients were enrolled in this report, with onset median age 25 months. Among them, 62.4% patients aged between 1 to 3 years and 67% patients came from rural area. Fever (88.3%), rashes

(99.2%), cough (22.5%), vomiting (25.4%) were the most frequent symptoms while myoclonus jerk, hypertension and tachycardia mainly occurred in those fatal cases. Fatal patients had higher fever, white-blood-cell counts and blood glucose compared to those in stage 1 and 2 ($P < 0.05$), but not in C-reaction protein or cerebrospinal fluid white-blood-cell counts. Besides these, we also made etiologic analysis of 116 patients to identify 76 cases of enterovirus 71 infection, 4 cases of CA16 infection and 8 cases of other enterovirus infection. And we found the Shanghai EV71 belonged to subgenotype C4 by the phylogenetic analysis.

Conclusion: The children under 3 years especially from rural area are susceptible to the HFMD infection. Persistent high fever and frequent vomiting, or myoclonus jerk, hypertension and tachycardia may indicate severe tendency. Some laboratory examinations can help us find the fatal cases earlier. But a early pathogen identification especially enterovirus 71 is so important.

Disclosure of interest: None declared.

P47

Human parechovirus infection in central nervous system related diseases and sepsis in children in Shanghai, China

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BMC Proceedings 2011, 5(Suppl 6):P47

Introduction / objectives: Human parechovirus (HPeVs) are prevalent in young children and have been associated with mild gastroenteritis, respiratory diseases, meningitis/encephalitis, myocarditis and sepsis. In this study we determined the relative importance of HPeV involved in the development of central nervous system-associated disease and sepsis.

Methods: A total of 1225 enterovirus-negative specimens including 674 cerebrospinal fluid (CSF), 550 blood samples and one ascitic fluid sample from 1131 children <14 years of age obtained in the year of 2008 to 2010 were screened for HPeV by nested PCR. All positive samples were genotyped by sequencing of VP3/VP1 genes.

Results: HPeV was detected in 96 samples from 92 (8.1%) of the children. Yearly prevalence of HPeV in CSF and blood varied remarkably: 1.3% (2/153) in 2008, 7.4% (27/328) in 2009 and 10.0% (63/631) in 2010. In 2008, HPeV infections were observed only in December. HPeV was detected mainly in autumn and winter, with the peak in December (18.8%) in the year of 2009. In 2010, HPeV could be found throughout the year with the highest prevalence in January (24.2%). HPeV infections were only found in infants less than 1 year old in 2008. However, HPeV infections can be detected in all age groups of children during the year of 2009 and 2010. Of all the 49 strains genotyped successfully, 48 were identified to be HPeV1 and the other one was HPeV 3 which was detected in 2010. Of the 92 Children with HPeV infections, 86 had clinical symptoms of central nervous infections, 33 were diagnosed to be sepsis. 4 patients were dead and 2 refused further treatment because of severe meningitis.

Conclusion: HPeV was a significant cause of central nervous system infections and sepsis in children in Shanghai, China. HPeV 1 was identified to be the most predominant type during 2008 to 2010.

Disclosure of interest: None declared.

P48

Increased prevalence of rotavirus gastroenteritis among children in Riyadh Saudi Arabia

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BMC Proceedings 2011, 5(Suppl 6):P48

Introduction / objectives: This research aims to study the epidemiology of human rotavirus (HRV) in pediatric patients at a tertiary care hospital in Riyadh, KSA.

Methods: One thousand and seven diarrheal stool samples had been prospectively collected Between Jan 1st, 2008 and OCT 31st, 2010 period from hospitalized patients below the age of 5 year with none bloody,

none chronic diarrhea. Samples were examined using ELISA for rotavirus. Demographic data were collected.

Results: HRV was detected in 65.5% (660/1007). There was a significant difference between males and females acquiring the disease (57.5%, 380/660 vs 42.4%, 280/660, respectively. P value <0.05). Children who were 1 year of age or less had more infection than those who were over 1 year of age (81%, 534/660 vs. 19%, 126/660, respectively; $P=0.0005$). Infections occurred throughout the year with no clear significant seasonal peaks, figure 1.

Conclusion: The high rate of positivity, are at variance with previously published reports of rotavirus infection in Saudi Arabia, since 2005. This may be explained by improvements in public health introduced over the past 20 years. Our increasing rate however, of 65.5% may suggest the emergence of new serotypes, not present in our populations in earlier reports. Further molecular testing is needed to prove such hypothesis.

Disclosure of interest: None declared.

INFECTIONS AND INFECTION CONTROL IN NEUTROPENIC PATIENTS

P49

Algorithm for empirical glycopeptide treatment in patients with hematologic malignancies and enterococcus faecium blood stream infection

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BMC Proceedings 2011, 5(Suppl 6):P49

Introduction / objectives: *Enterococcus faecium* has become a major cause of nosocomial infections especially in patients with hematologic malignancies. The aim of this study was to determine risk factors in those patients who are at risk of *Enterococcus faecium* blood stream infection (BSI) and should be considered for empirical treatment.

Methods: Retrospectively demographic, clinical and microbiological data in 33 patients with an *E. faecium* BSI were compared to 66 control patients during a 5-year period at the hematology ward. Multivariate logistic regression was used to explore the independent risk factors in order to develop a prognostic model to determine the risk of *E. faecium* BSI.

Results: Significant associations of *E. faecium* BSI were found with age, hospital stay prior to blood culture, duration of hospitalization 1 year before admission, fever prior to blood culture, severity and duration of neutropenia, CRP (C-reactive protein) at time of blood culture withdrawal, colonization with *E. faecium* prior to blood culture and diarrhea. *E. faecium* BSIs were found associated with more severe disease and higher mortality rates. Independent risk factors for *E. faecium* BSI were colonization with *E. faecium* 30 days prior to blood culture (OR 3.83; CI 1.1-12.8), fever > 1 day (4.02; 1.3-12.8), hospital stay prior to blood culture > 14 days (4.78; 1.3 -18.0), age > 59 years (5.47; 1.6-18.2) and abdominal pain, diarrhea or neutropenia (5.95; 1.1-31.4).

Conclusion: Using prognostic modeling, risk stratification is possible for development of *E. faecium* BSI in patients with hematological malignancies. Empirical treatment should be considered in patients who are at high risk.

Disclosure of interest: None declared.

P50

Pattern of bacterial infection in liver transplantation

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BMC Proceedings 2011, 5(Suppl 6):P50

Introduction / objectives: Bacterial infection frequently occurs early after liver transplantation. It is recognized as important complication which might interfere with the outcome of such life saving operations. Various studies have characterized the pathogens, times of onset and sites of infection, however risk factors interacting together to end with bacterial infections have not fully defined and important issues remain unsettled.

Methods: In Ain Shams University Specialized Hospital (ASUSH), a descriptive epidemiologic study was conducted over two year's period, from March 2008 through February 2010. The study included 64 patients divided equally into 32 donors and 32 recipients. The infections were in different sites and the most predominant microorganisms were the gram-negative. Investigation of probable leading factors for post operative infections was done and an intervention protocol was formulated and implemented. It included preoperative bacterial screening of recipient and a bundle of measures for SSI prevention.

Results: The total infection rates in recipients was 40.6% and in donors 18.75%. The most common type of infection was the surgical drain followed by the bile drain, which are also risk factors for infections. Infections with gram negative bacteria were more prevalent (66.6%) with predominance of *Pseudomonas* spp (37.5%). The rate of Gram positive bacteria was 33.3% and MRS was the predominant type of bacteria (53.57%).

Conclusion: The high incidence of gram negative bacterial infections encountered in the actual study could be referred to the underlined clinical condition of cirrhosis on top of hepatitis "C" (HCV) chronic infections; which favors the colonization of this type of bacteria in abdominal lymphatic. A bundle of SSI prevention will be of value for those patients.

Disclosure of interest: None declared.

P51

Economic impact of an increased incidence of invasive mold infections (IMI)

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BMC Proceedings 2011, 5(Suppl 6):P51

Introduction / objectives: In July 2010, an increase of IMI was observed in patients with leukemia and bone marrow transplantation admitted to the hematology wards at the University of Geneva Hospitals.

Methods: We conducted a retrospective survey which identified 6 cases of IMI (3 possible and 3 probable) in 2009 and 18 (9 possible, 7 probable and 2 proven) in 2010. All cases occurred during chemotherapy for acute leukemia, allogeneic hematopoietic stem cell transplantation or graft versus host disease. The incidence of nosocomial IMI among the at risk population was 3.6 fold higher in 2010 than in 2009.

We aimed to identify any potential failures in the care of at-risk patients. Additional preventive measures were set up for isolation rooms and their cleansing, and also their computer equipment. Protective measures were instituted for the patients (masks, gowns, caps, food, objects made available for the patients, transportation). Standard antifungal prophylaxis was changed from fluconazole 100 mg/d to voriconazole 400 mg/d.

Results: The costs of the various preventive measures to stop the occurrence of new fungal infections were estimated at 2'500'000 CHF (1'900'000 Euros) covering the period from June, 2010 to June, 2011. This represented an average of 22'600 CHF (17'176 Euros) per patient admitted. Of note, 31% of the costs were associated with the change in antifungal prophylaxis.

To date no new cases have been reported since the introduction of these measures.

Conclusion: A supplementary review is in progress in order to quantify the overall impact of the preventive measures taken and to decide which measures should be continued.

Disclosure of interest: None declared.

P52

Perils of inappropriate antibiotic exposure in cancer patients. A call to fast-acting synergy

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BMC Proceedings 2011, 5(Suppl 6):P52

Introduction / objectives: Use and overuse of antibiotics are among the main driving factors for the emergence of antimicrobial resistance (AMR).

However, oncology patients often require prolonged administration of broad spectrum antimicrobials.

Methods: A literature search was performed through PubMed from 1 January 2006 to 31 December 2010 to identify review papers, international guidelines, and standardised protocols for infection prophylaxis and therapy in oncology patients. Keywords used were: "cancer", "infection", "febrile neutropenia", and "antimicrobial resistance".

Results: The search yielded 309 papers; 60 were selected according to the above-mentioned criteria. The main gaps identified in all retrieved papers were: limited relevance of both updated local patterns of AMR and antimicrobial pharmacokinetics and pharmacodynamics; and no integration with infection control policies to prevent transmission of multidrug-resistant organisms (MDRO). Monitoring and feedback of AMR data are not only the hallmark of infection control — they are also necessary to tailor subsequent empirical regimens; pharmacokinetics and pharmacodynamics can optimize drug choice and daily dosing, according to the target site of infection. Although antimicrobial stewardship programmes (ASP) are recognized as effective tools to optimize antimicrobial usage, tackle AMR, and improve clinical outcomes on an institutional basis, none has been implemented in oncology settings as yet, and the concept itself of ASP is lacking for this patient population.

Conclusion: Oncology patients would benefit from a multidisciplinary approach integrating local AMR patterns, pharmacokinetics and pharmacodynamics, strict infection control policies, and reliable diagnosis through novel technologies. At last, they should not be excluded from the assets that targeted interventions provided by ASP can offer.

Disclosure of interest: None declared.

CATHETER-ASSOCIATED BLOODSTREAM INFECTION: RISK AND PREVENTION I

P53

Assessment practices of peripheral venous catheters use: results of a multicentre observational study in France in 2010

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BMC Proceedings 2011, 5(Suppl 6):P53

Introduction / objectives: The frequent use of peripheral venous catheters (PVC) generate a significant number of infections. Since 2005, a standard recommendation edited by the French Society for Hospital Hygiene has been promoted in healthcare facilities (HCF). In 2009, the French Group for Evaluation of Practices concerning Hospital Hygiene (GREPHH) has provided an evaluation tool for PVC practices.

The objective was to evaluate practices during utilisation of PVC in healthcare facilities (HCF).

Methods: In 2009, the five regional coordinating centres for nosocomial infection control (CCLIN) launched an observational practice study based on the GREPHH evaluation tool in all volunteer HCF in France. Evaluation criteria included protocol of cares, practices of insertion and handling of venous lines, traceability and duration of the device. Proportion of practice breaches were analyzed considering category of hospital and speciality.

Results: The study was conducted in 920 HCF and 8254 clinical wards. Standard protocols were present in 98% of the HCF: 34% of them complied with the 10 quality standards defined. The recommended "4 times" procedure represents 46% of adult skin preparation. Gloves were used just before insertion in 63% of PVC. The injection site was correctly disinfected in 60% of venous lines handlings. The insertion date was traced for 79% of the PVC, better than the daily clinical monitoring (70%). The duration period was maximum 4 days for 92% of the adult PVC.

Conclusion: This study highlighted conformity to standard practices of PVC utilization is still poor and should merit more promotion efforts, especially for skin disinfection.

Disclosure of interest: None declared.

P54

Assessment of corrective actions implemented by healthcare facilities following a multicentre observational study on peripheral intravenous catheters

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BMC Proceedings 2011, **5(Suppl 6)**:P54

Introduction / objectives: A multicentre practice assessment study on peripheral intravenous catheters (PVC) utilization was carried out in 920 healthcare facilities (HCF) in France in 2010. Breaches in practices were observed particularly for insertion and maintenance of PVC.

The objective was to evaluate the impact of the study practices on implementation of corrective measures.

Methods: All HCF in Northern France participating in the practices study were requested by electronic way to answer an on-line questionnaire with the following items: protocol of care (creation, reactualization, diffusion, accessibility), organization and practices (formations, working groups, traceability documents, data transmission, monitoring), change of material or products (catheters, gloves, collectors, handrub products, disinfectants, bandages, compresses).

Results: Overall, 125 HCF of 280 participating in the practices study responded to the questionnaire (45%). They were mainly public hospitals and private clinics (89%). Actualization of care protocols (81%), traceability (59%), and training programs on the insertion and maintenance of the PVC (54%) were the most frequent reported corrective actions. One third of HCF modified disinfectant product or PVC type according to standard recommendations.

Conclusion: This study showed that direct observation of clinical practices could have a significant impact on safety and quality of PVC use and may reduce infectious risk.

Disclosure of interest: None declared.

P55

Assessment of the practices of prevention and bloodstream infection control associated to a central venous catheter of short permanence where of clinical indicators

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BMC Proceedings 2011, **5(Suppl 6)**:P55

Introduction / objectives: The aim of this study was to evaluate the conformity of the prevention practices and the bloodstream infection control associated to central venous catheter of short permanence.

Methods: Control, prospective and observational study, with the aim to evaluate the program, practices and procedures performance related to an insertion and maintenance of central venous catheter. This study was realized in the surgical intensive care unit and in surgical center of a Public Teaching Hospital, in São Paulo, Brazil and was between August and November of 2010. The data collection used direct observation and analysis of registration records. The professionals involved were doctors and nurses.

Results: Were realized 4719 observations. The results show: a) absence of conformity (0,0%) during the evaluation of the adherence to specific measures of prevention and control of bloodstream infection associated to a central venous catheter, the most responsible for the not using the occlusive dressing at the end of the insertion of central venous catheter; b) 45,6% of conformity in hubs disinfection and connectors before the manipulation with alcoholic chlorhexidine; c) 110% of agreement in change of equipments and transducers with the manufactures instructions; d) 8,1% of hit when were evaluated the opportunities of hand hygiene before and after the manipulation venous central catheter.

Conclusion: New educational and training programs need to be realized to improve the practices and bloodstream infection control associated to venous central catheter in this surgical intensive care unit.

Disclosure of interest: None declared.

P56

Use of educational intervention in reduction of the rate of bloodstream infection associated with the central venous catheter in intensive care unit of adults: integrative review

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BMC Proceedings 2011, **5(Suppl 6)**:P56

Introduction / objectives: Integrative review with the aim to identify which the educational programs are more effective in reduction of rate in bloodstream infection associated to central venous catheter in intensive care unit of adults.

Methods: The study was realized using DeCs (Descriptors in Health Science) and MeSH (Medical Subject Headings): Catheter-Related Infections, Hospital Infection's, Intensive Care Units and Education Continuing. The theoretical-practical reason was developed in researches on database *Scielo-Scientific*, *Eletronic Library Online*, *Embase*, *Cochrane*, *PubMed*, *LILACS* - Latin American literature and Carribean in Health Science, that was realized a data collection between 2001 and 2010, in indexed journals.

Results: The search identified 156 abstracts, but with the inclusion and exclusion criteria, only 13 articles were selected. The hand hygiene was part of the educational program in the most studies, as the adequate use the maximum barrier of protection, preference for access to subclavian vein, dressing impregnated with chlorhexidine, impregnated catheter, unnecessary catheter removal and skin antiseptis with chlorhexidine. The total of this measures was effective in reduction the rates of bloodstream infection associated with central venous catheter (BI-ACVC).

Conclusion: An educational program implementation to the control of the bloodstream infection associated with central venous catheter was effective in the intensive care unit of adults.

Disclosure of interest: None declared.

P57

The impact of a set of measures on the incidence of central line-associated bloodstream infection in intensive care units

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BMC Proceedings 2011, **5(Suppl 6)**:P57

Introduction / objectives: Intravascular catheters are necessary in health care practice, particularly in Intensive Care Units (ICU). However, central line-associated bloodstream infection (CLABSI) is related to prolonged hospitalization, increase of mortality and costs.

Aim: To analyze the impact of the implementation of a set of measures on the incidence of CLABSI.

Methods: The study was conducted during 2010 in a general ICU and in a Cardiology ICU of a medium sized hospital in Sao Paulo, Brazil. CLABSI was defined according to the National Healthcare Safety Network definition. The set of measures was introduced in July 2010 and included reinforcement of prevention measures, switching opaque valve connectors to a transparent version, introduction of chlorhexidine gluconate transparent dressing, and weekly audits with feedback to the healthcare team on CLABSI prevention measures.

Results: Analysis between January and July indicated development of infection related to the catheter's maintenance and not to its placement, which directed the set of measures. Incidences of CLABSI before and after measures implementation were 5.1 and 3.8 per 1,000 catheters-day. The highest value was observed in July, 8,7, and a reduction occurred over the following 3 months: 4.0, 3,3 and 2.0. In November, an increase was noted (6.5) and observational audits of hand hygiene adherence were performed, leading to a reduction to 3.0 in December.

Conclusion: The measures implementation contributed on the decrease of the incidence of CLABSI. However, to maintain low rates, continuous and multidisciplinary strategies need to be implemented focusing on motivation, education, monitoring, and dissemination of information. Furthermore, responsibilities need to be shared with local leaders.

Disclosure of interest: None declared.

P58

Reducing central line associated bacteraemia in intensive care units using low cost strategies

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BMC Proceedings 2011, **5(Suppl 6)**:P58

Introduction / objectives: Aseptic insertion technique of central lines has reduced Central line associated bacteremia (CLAB) using bundling of low cost patient and physician preparation strategies. Bundle compliance rates and survival analysis were used to illustrate improvements and gains in risk-free line-days.

Methods: 36 adult ICUs in New South Wales, Australia implemented *aseptic insertion bundles* over 18-months. Patient bundle included 2% alcoholic chlorhexidine preparation of insertion site, full sterile sheet drape, line position checked with x-ray and/or transducer. Physician bundle included hand hygiene, hat, mask, eyewear, sterile gloves/gown, maintain sterile technique. The first 12-month roll-out period was used to train all ICU physicians to implement the bundles and collect data. 10,575 lines inserted were followed until discharged from ICU. CLAB rates and bundle compliance rates were calculated quarterly and survival analysis established the CLAB-free line-day period.

Results: The CLAB rate was significantly reduced from 3.0/1000 line-days in the first 12-months to 1.2/1000 line-days in the last 6-months ($P=0.0006$). Compliance with both physician and patient bundles reduced CLAB (RR 0.5, 95%CI 0.4-0.8, $P=0.004$) compared with non compliance while non compliance with the physician bundle increased the risk of CLAB (RR 1.62, 95%CI 1.1-2.4, $P=0.0178$). The CLAB rate was 3.8/1000 (95%CI 2.5-5.5) line-days in the first 12-months and was significantly reduced by the last 6 months (1.6/1000 line-days, 95%CI 1.0-2.4). CLAB commenced at day-7 (1.8/1000 line days) in the first 12-months but did not occur until day-9 (0.9/1000 line-days) by the last 6 months.

Conclusion: CLAB is essentially preventable with a highly effective low cost aseptic insertion technique that enables patients to remain risk-free for the first 9 line-days.

Disclosure of interest: None declared.

P59

Mlti-faceted interventions to prevent bloodstream MRSA infections

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BMC Proceedings 2011, **5(Suppl 6)**:P59

Introduction / objectives: From 1st January until 31st December 2007, there were 31 MRSA bacteraemias at our NHS Trust. 22 were defined as HAI. It was discovered that the source of the MRSA bacteraemias in 12 (54%) of the patients was due to PIVD (Peripheral Intravascular Devices).

Methods: The introduction of a sequence of interventions targeted at reducing MRSA bacteraemias by a newly expanded infection control team, after analysis of existing policies and procedures.

The use of MRSA antimicrobials in the Trust's formulary was optimised. Teicoplanin was substituted with daptomycin in medical and surgical wards. In Intensive Care vancomycin by continuous infusion was introduced.

Introduction of MRSA screening of all adult emergency admissions and subsequent decolonisation of patients of patients found to be positive.

A new PIVD policy, insertion record and on-going care tool was launched. Skin preparation was changed from a non-sterile 70% alcohol and 0.5% chlorhexidine swab, to a sterile pre packaged application device containing 70% alcohol and 2% chlorhexidine.

Mechanical Needle-free connectors were replaced with split septum connectors.

Results: Introduction of these 4 interventions were plotted chronologically against the cumulative MRSA bacteraemia rates and calculated per 10,000

bed days. The implementation of the 4 interventions were successful in controlling the cumulative rate of MRSA bacteraemia.

Conclusion: The expansion of the infection control team triggered a review of procedures in our Trust. 4 Interventions were instituted to comply with best practice. Each intervention could not be shown to be effective individually, partly as the monthly rates of bacteraemias were consistently low and partly as each new intervention was introduced in quick succession.

Disclosure of interest: None declared.

P60

Successful reduction in contamination and an increase in blood culture collection rates, following introduction of adult blood culture packs

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BMC Proceedings 2011, **5(Suppl 6)**:P60

Introduction / objectives: Our hospital's blood culture contamination rate within adult wards reached 5.2% prior to the introduction of adult blood culture packs. In addition, during 2009 the hospital's blood culture collection rate was 31 blood culture bottles per 1000 patient days.

The aim of the study was to assess the impact of introducing a blood culture collection pack on the rate of blood culture collection and contamination.

Methods: Standard in-house tailor made blood culture packs were devised and introduced across all 39 adult wards and units in hospital using a step wise approach in July 2010. The pack promoted the use of a closed blood culturing system using a vacutainer, and skin preparation using 2% chlorhexidine in 70% alcohol. The pack also included step by step photo instructions on how to take a blood culture from an adult using this new system. All junior doctors were given hands on training on how to use the pack and on basic principles of blood culturing.

Data obtained from laboratory information system were analysed to determine the contamination rates from 1st January 2010 till 31st December 2010. Blood culture contamination and collection rates before and after introduction of the packs were compared.

Results: Over a 6 month period, the blood culture contamination rate was reduced from an average of 5.2% (235 of 4451 blood culture bottles) to 4.6% (280 of 6073 blood culture bottles) ($p=0.038$). The rate of blood culture collection was improved from 37.6 to 50.4 blood culture bottles per 1000 occupied bed days.

Conclusion: The introduction of blood culture packs and appropriate training on blood culture collection are effective measures that increase blood culture collection and reduce contamination rates.

Disclosure of interest: None declared.

P61

Use of chlorhexidine-impregnated dressing in neonates

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BMC Proceedings 2011, **5(Suppl 6)**:P61

Introduction: Catheter-related bloodstream infection (CR-BSI) is a significant cause of morbidity and mortality in the NICU. The chlorhexidine-impregnated dressing (CHID) has proven effective in reducing the colonization catheter tip and CR-BSI.

Objectives: Describe the experience on using CHID (Biopatch[®]) on the central venous catheter (CVC) in neonates at a 70 beds NICU.

Methods: The NICU has a group responsible for the insertion and maintenance of CVC according to the standards recommendation from CDC. In May 2010 we started using the CHID in all neonates weighing > 1500g and gestational age > 34 weeks. The dressing was replaced weekly. The observation was conducted from May to December 2010. Besides the new dressing, we also changed from 70% alcohol to alcoholic chlorhexidine solution for disinfection of the CVC hub.

Results: Sixty-four neonates were enrolled in the trial. There was no CR-BSI in neonates weighing > 1500g after the introduction of the CHID (0 / 1089 cvc/day). Compared to the same period in 2009 (without Biopatch), the

rate of CR-BSI was 3.2 (6 / 1833 cvc/day). One neonate developed localized contact dermatitis with absolute regression after removal of the dressing.

Conclusion: We are not able to affirm that this intervention was responsible for the decrease of CR_BSI rate, but these data are encouraging. Local contact dermatitis was not a problem. There was a good acceptance of the new dressing by the nursing staff. Apparently the CHID is safe and significantly reduces the rates of CR-BSI in neonates.

Disclosure of interest: None declared.

P62

An active dressing prevents formation of *Staphylococcus aureus* biofilm on a mucosal surface

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BMC Proceedings 2011, 5(Suppl 6):P62

Introduction / objectives: An antiseptic containing dressing is used to minimize the risk of nosocomial infections including *Staphylococcus aureus*, which can invade via skin or mucosal surfaces. This study developed a mucosal model of *S. aureus* biofilm formation and determined the effect of the active dressing (Tegaderm™ CHG) on biofilm formation and mucosal integrity.

Methods: Explants of normal porcine vaginal mucosa (full-thickness) were infected with biofilm-producing methicillin-resistant *S. aureus* (MRSA) (3.2×10^5 CFU) for 2h – 48h. Following infection (2h), explants were treated with the active dressing (Tegaderm™ CHG) for 22-46h or left untreated (controls). Formation of MRSA biofilm was evaluated by scanning electron microscopy. Also, bacteria were enumerated from infected explants, which were washed 3x in PBS by vortex mixing and compared to unwashed explants, to determine the effects of the active dressing (Tegaderm™ CHG) on MRSA growth.

Results: MRSA exhibited typical growth on porcine vaginal mucosa. MRSA recovered from infected mucosa at 24h were mainly adherent [washed (adherent): 6.71 ± 0.07 ; vs. total (planktonic + adherent) 8.27 ± 0.06 log₁₀ CFU/explant]. Biofilm was evident on MRSA-infected vaginal mucosa at 24 h via SEM, and MRSA disrupted the integrity of the mucosal surface. Active dressing (Tegaderm™ CHG) exposures for 24h reduced the number of MRSA to 3.44 ± 1.00 vs. untreated controls 7.90 ± 0.00 log₁₀ CFU/explant. At 48h, no bacteria were detected in the active dressing (Tegaderm™ CHG) treated group compared to untreated controls 7.96 ± 0.15 log₁₀ CFU/explant.

Conclusion: MRSA biofilms can form on normal healthy mucosal tissue. An antiseptic containing active dressing (Tegaderm™ CHG) prevented MRSA biofilm formation.

Disclosure of interest: None declared.

P63

Healthcare-associated (HA) bloodstream infections (BSI) secondary top surgical site infections: surveillance program across Quebec hospitals (2007 to 2010)

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BMC Proceedings 2011, 5(Suppl 6):P63

Introduction / objectives: To describe HA-BSI secondary to surgical site infections (SSI) in Quebec hospitals.

Methods: Acute care centers with ≥ 1000 admissions/year were invited to participate voluntarily and declare via a web portal all HA-BSIs secondary to a SSI between 2007 and 2010. The surveillance program also included outpatients and paediatric patients.

Results: 56 of the 89 eligible centers participated (67% of short-term hospital beds), 64 % of those beds were in teaching hospitals. Of the 7709 episodes of HA-BSIs, 874 (11%) were secondary to a SSI. Gastrointestinal surgeries were, by far, the leading cause of BSIs (244 – 28%) followed by cardiac surgery (132 – 15%), and orthopaedic surgery (98 – 11%). Implants were present in 25 cases (19%). The majority of SSIs (496 – 57%) were organ space infections. *S. aureus* was the organism most

often isolated in 28% (274), followed by *E. coli* in 13% (130) of patients. Overall, 79% of patients were admitted on a general/specialised ward upon onset, compared to 15% in ICU, and 6% in ambulatory care. The mean time to infection was 21 days with a median of 10 days (median time to infection for cardiac compared to gastrointestinal surgery: 11 and 8 days respectively). 75% of BSIs occurred in teaching hospitals.

Conclusion: The Quebec surveillance program for HA-BSIs is a convenient way to survey the most severe SSIs, awaiting the development of a complete SSI surveillance program. Further analyses are needed to better understand the correlation between this targeted program and a complete SSI surveillance program.

Disclosure of interest: None declared.

P64

Continous surveillance of bloodstream infections across departments at a Danish University Hospital

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BMC Proceedings 2011, 5(Suppl 6):P64

Introduction / objectives: The rate of bloodstream infections has been monitored monthly since 2004 at Aarhus University Hospital, Skejby. The hospital is a tertiary referral hospital with 400 beds specialising in paediatrics, gynaecology & obstetrics, urology, thoracic and vascular surgery, renal medicine, cardiology, infectious diseases and intensive care. The aim of this study was to identify variations in bloodstream infection rates across departments.

Methods: Monthly all patients with positive blood cultures are monitored concerning true infection or contamination and if the infection is community- or hospital/healthcare-acquired. The bloodstream infection rates are presented as number of episodes per 1000 beddays. The infection rates are sent to each department quarterly followed by staff-meetings. To identify trends in bloodstream infection rates we also perform six-month moving averages.

Results: In the years 2007 - 2010 the total bloodstream infection rates for the hospital were 3.0, 3.1, 2.9, and 2.6 episodes per 1000 beddays. Hospital-acquired infections accounted for 2.2, 2.0, 2.0, and 2.0 episodes per 1000 bed-days. There were great differences in hospital-acquired bloodstream infection rates across departments ranging from 0.5 episodes per 1000 beddays in gynaecology & obstetrics to 5.3 episodes per 1000 beddays in urology in 2010.

Conclusion: The overall rate of hospital-acquired bloodstream infections has remained at the same level in the past four years at our hospital. However, some departments have a high rate constituting a continuous challenge for improvement.

Disclosure of interest: None declared.

VAP AND ICU ACQUIRED INFECTIONS

P65

Economic burden of ventilator associated pneumonia in a developing country

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BMC Proceedings 2011, 5(Suppl 6):P65

Introduction / objectives: There is limited data about the economic burden of ventilator associated pneumonia (VAP) in developing countries. To investigate incidence, risk factors, etiological agents, antimicrobial susceptibility rates and economic burden of VAP in a medical intensive care unit (MICU) of a developing country.

Methods: All patients on mechanical ventilation were followed up during one year in MICU.

Results: During the one-year period, 159 patients were followed up. Mean age was 61.82 ± 16.81 . VAP developed in 96 (60%) patients with 37.2/1000 ventilation days. The mean APCAHE II score was 24.32 ± 5.94 , and there was no difference between VAP and non-VAP patients. Median mechanical ventilation days for non-VAP patients were 3 days (1-15 days).

Mortality rate for non-VAP patients was 88.5%, and the median time for death was 4th day of hospitalization. Median time for VAP development was 5.5 days (2-25 days). *Acinetobacter baumannii* (42%) and *Pseudomonas aeruginosa* (20%) were the most common pathogens. All microorganisms were multi-resistant. Imipenem resistance of *A.baumannii* and *P. aeruginosa* was 92% and 71%, respectively. The most significant risk factors for VAP were stay in hospital before MICU (OR:3.11) and length of stay in MICU (1.47). Mortality rate for VAP-patients was 80% and there was no statistically difference between the mortality rates of VAP and non-VAP patients. Median total cost of non-VAP patients in ICU was 2315 Euro, whereas it was 6308 Euro in VAP patients. Also, cost of ICU (253&908 Euro), antibiotics (230&810 Euro), laboratory (370&979 Euro) and clinical (371&878 Euro) were higher in VAP patients.

Conclusion: The cost of VAP is approximately three-fold higher than non-VAP patients. Infection control standards should be assessed and rigorously reinforced in "limited-resources" countries.

Disclosure of interest: None declared.

P66

Quantitative PCR for etiologic diagnosis of methicillin-resistant *Staphylococcus aureus* pneumonia in intensive care unit

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BMC Proceedings 2011, 5(Suppl 6):P66

Introduction / objectives: Because methicillin-resistant *Staphylococcus aureus* (MRSA) was frequent pathogen in ventilator-associated pneumonia (VAP), the rapid identification of it from respiratory samples was important. Therefore, our aim was to evaluate the utility of qPCR as a useful method for etiologic diagnoses of MRSA-based pneumonia.

Methods: We performed qPCR for *mecA*, *S. aureus*-specific *femA-SA* and *S. epidermidis*-specific *femA-SE* genes from bronchoalveolar lavage (BAL) or bronchial washing samples obtained from clinical suspected VAP. We spiked an internal control (SPUD) at in the course of DNA extraction. We estimated colony forming units (CFU/ml) of MRSA samples through a standard curve of a serially diluted reference MRSA strain. We compared threshold cycle (Ct) value of MRSA of clinical samples with the microbiologic culture results of that.

Results: We examined 72 samples of 64 patients with clinical suspected VAP. We obtained the *mecA* gene standard curve. It showed that the detection limit of the *mecA* gene was 100fg, which corresponded to a copy number of 30. We chose cut-off Ct values of 27.94 (equivalent to 1×10^4 CFU/ml) and 21.78 (equivalent to 1×10^5 CFU/ml). Using these cut-off values, the sensitivity and specificity of our assay was 88.9% and 88.9%, respectively, when compared with quantitative cultures.

Conclusion: Our results were valuable for diagnosing and identifying pathogen for VAP. We suggest that our modified qPCR method is an appropriate and rapid tool for diagnosing of clinical pathogens in intensive care unit (ICU) patients.

Disclosure of interest: None declared.

P67

Tracheobronchial colonization in coronary care unit intubated patients

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Introduction / objectives: Tracheobronchial tree colonization is considered an important risk factor for the development of ventilator-associated pneumonia (VAP). The aim of the present study was to examine microbiologically the respiratory tract flora of mechanically ventilated patients hospitalized in the Coronary Care Unit (CCU) of our institution for the detection of colonization with important bacterial pathogens.

Methods: Cultures of bronchial excretions were taken the first 24h of intubation and before extubation, in a total of 39 CCU patients (mean age 68.7 ± 11.9 yrs, 79,6% men). Risk factors for colonization, including APACHE II score, Clinical Pulmonary Infection Score (CPIS), placement of an invasive device as well as the duration of mechanical ventilation (MV), were recorded.

Results: 46% of the participants with normal flora in the first 24 hours of intubation, were colonized with potential pathogens by the day of extubation. The most frequently isolated colonizers were *Acinetobacter* spp, MRSA, MSSA, *Escherichia coli*, *Candida albicans*, *Enterobacter* spp and *Serratia marcescens*. Patients who were colonized by potential pathogens had higher CPIS compared to those who were not ($p < .001$). Colonization with a potential pathogen was associated with placement of a nasogastric catheter ($p=.048$) or a central vein catheter ($p=.004$), with the duration of MV ($p=.010$) and placement of an Intra-Aortic Balloon Pump ($p=.009$) for a prolonged period.

Conclusion: High rates of bacterial colonization were identified in this cohort of CCU patients. The risk factors identified will assist in the establishment of a better infection control protocol in the future.

Disclosure of interest: None declared.

P68

Application of VAP bundles resulting in low incidence of VAP in ICU

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BMC Proceedings 2011, 5(Suppl 6):P68

Introduction / objectives: Ventilator-associated pneumonia (VAP) is an airways infection that must have developed more than 48 hours after the patient was intubated. Reducing mortality due to ventilator-associated pneumonia requires an organized process that guarantees early recognition of pneumonia and consistent application of the best evidence-based practices. The Ventilator Bundle is a series of interventions developed by IHI related to ventilator care that, when implemented together, will achieve significantly better outcomes than when implemented individually.

Methods: This study was conducted in our 24 bedded Adult Medical Surgical ICU. VAP Bundle Program was implemented by our multidisciplinary Team, the VAP Bundle Team and implemented in July 2009. Surveillance reports from ICU for the year 2009-2010 were reviewed. Data collected and analyzed for ventilated-associated pneumonia (VAP) for the same period of time and compared before and after intervention.

Results: There were a total of 5612 patients admitted to ICU in 2010 and out of that 345 patients required mechanical ventilation for the year 2010. The data was analyzed and compared on quarterly basis based on 100 ventilator days. Fifteen patients developed VAP during the above period. The results shows a gradual decline in the VAP rate towards the end of the 4th quarter in 2010. The results clearly shows the difference between pre and post-intervention period and lower VAP rate in 2010.

Conclusion: VAP is a patient safety concern that can be prevented with evidence-based interventions. Lessening VAP rates will shorten hospitalization and reduce morbidity, saving lives as well as money. Many hospitals have since implemented the Ventilator Bundle in their ICUs and have reported significant decreases in VAPs or long periods of time (one year or longer) with no VAPs in their patients.

Disclosure of interest: None declared.

P69

Reduction in ventilator associated pneumonia rates in an Indian ICU as an outcome of prevention bundle implementation

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BMC Proceedings 2011, 5(Suppl 6):P69

Introduction / objectives: The impact of bundled infection control practices introduced in the Intensive care units (ICU) is analyzed to identify the most effective infection control practice in reducing Ventilator Associated Pneumonia (VAP) rates.

Methods: VAP data over a period of 24 months (Jan'09 to Dec'10) in a Tertiary care Indian ICU was retrospectively analyzed. The impact of each intervention of prevention bundle introduced in Dec'09 was critically evaluated on VAP rates in the subsequent year 2010.

Results: The VAP rates over the entire study period varied between 0 and 30.9/1000 ventilator days. The VAP rate for the year 2009 was 9.72 (22 VAP infections in 2263 ventilator days) which reduced to 3.43 (11 VAP infections in 3202 ventilator days) in the following year 2010 as a result of the interventions. The study showed hand hygiene compliance of the healthcare workers and length of stay of patient as the major risk factors associated with VAP. The most effective intervention strategies analyzed were head of bed elevation ($p < 0.0001$), sub glottic suction ($p < 0.0001$), hand hygiene compliance of healthcare workers ($p < 0.0001$) and daily assessment of weaning and extubation for ventilated patients ($p < 0.0001$). The other measures like closed endotracheal suctioning ($p=0.257$), humidification with heat and moisture exchangers ($p=0.091$), chlorhexidine mouthcare every 2 hours ($p=0.002$) and routine drainage of ventilator circuit condensate ($p=0.0112$) proved to be less significant.

Conclusion: Head of bed elevation, hand hygiene compliance of healthcare workers, sub glottic suction and daily assessment of weaning and extubation for ventilated patients contributed as the most effective infection control practices in VAP prevention.

Disclosure of interest: None declared.

P70

The impact of the implementation of bundle in the prevention of ventilator-associated pneumonia in intensive care units

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BMC Proceedings 2011, 5(Suppl 6):P70

Introduction / objectives: Ventilator-associated pneumonias (VAP) are the most prevalent infections in intensive care units (ICU). To reduce this rate, it is recommended the application of bundles - groups of individual practices that result in substantial improved care.

Aim: To measure the adherence to VAP bundle, correlating with the incidence of VAP per 1000 days of mechanical ventilation (MV).

Methods: The study was conducted in three general ICU (adult, cardiology and pediatric) of a medium sized hospital in Sao Paulo (Brazil) from June/2009 to April/2010. All patients on MV were assessed using a check list with five key measures: physiotherapy, presence of condensate in the circuit, a high head >30°, oral hygiene with chlorhexidine and manual resuscitator individual. The visits were carried out fortnightly, without notice, by the same researcher, with subsequent calculation of compliance.

Results: At the beginning, the incidence of VAP was 20/1000 days of MV and the adherence to the measures was 15%. In the second month, the membership had increased gradually, inversely proportional to the rate of VAP. From September to December, adherence ranged from 40 to 70%, with rates of VAP from 5 to 15/1000 days of MV. In February, there was a peak (30/1000 days of MV) and good adherence to the bundle (70%), which may reflect the increase of patient severity. Later, the Infection Control Team developed an educational work, resulting in significant decrease in VAP rate (8/1000 days of MV) and 90% adherence to the bundle.

Conclusion: The application bundle is a feasible reality that produces good results in nosocomial infection rates. However, education and periodic training remain a fundamental process of improving health services.

Disclosure of interest: None declared.

P71

Implementation of a ventilator care bundle to reduce the incidence of ventilator acquired pneumonia

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BMC Proceedings 2011, 5(Suppl 6):P71

Introduction / objectives: Ventilator acquired pneumonia (VAP) is a nosocomial infection that occurs in patients receiving mechanical ventilation for at least 48 hrs. We observed a high rate of VAP of 18.3 per

1000 ventilator days in 2008 and 8.6 per thousand ventilator days in 2009 in one of our intensive care units at Fortis Hospital. Reduction of VAP through the implementation of Ventilator care bundles was taken as one of the quality improvement initiative for the unit.

Methods: The study was divided into preintervention, intervention and postintervention phases. Data was collected on the VAP rates, hand hygiene and ventilator care bundle practices of the team during preintervention and postintervention phase through knowledge surveys and observational surveys of the team. A workshop on care bundles supported by introduction of an insertion and maintenance tool for Ventilators and oral care were the interventions adopted.

Results: The surveillance of ventilator bundle showed an improvement of 64% in the postintervention phase as compared to zero percent in the pre-intervention phase. The VAP rates in 2010 after the introduction of the bundle towards the end of 2009 were observed to be significantly lower than those in 2008 and 2009. The average (mean) VAP rates over 12 months dropped from 8.6 per 1000 ventilator days in 2009 to 2.1 per 1000 ventilator days in 2010 over a span of one year.

Conclusion: Implementation of ventilator care bundle resulted in decrease in VAP in the unit over a period of one year in 2010. A lot of other supporting activities like oral care, cleaning and disinfection of ventilator parts were improved upon simultaneously and it would have also played a role in the reduced VAP rates.

Disclosure of interest: None declared.

P72

Evidence on the best way to perform oral hygiene with chlorhexidine in critically ill patients: systematic review and meta-analysis

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BMC Proceedings 2011, 5(Suppl 6):P72

Introduction / objectives: Although the scientific literature has demonstrated the relevance of oral hygiene with chlorhexidine (CHX) in the prevention of pneumonia, there is wide variation in the product, concentration, frequency, duration and technique application.

Methods: Systematic review and meta-analysis of articles in English, Spanish or Portuguese. Bases: Cochrane, EMBASE, Lilacs, PubMed/Medline, Ovid. Search: October to November 2010 using descriptors indexed. Question: *are there evidence about the best way to perform oral hygiene with chlorhexidine for prevention of respiratory infection in critically ill patients on mechanical ventilation?*

Results: 10 primary studies were grouped in 4 groups (G1-4) based in criteria of concentration of CHX. G1 (10 primary studies with different concentrations of CHX) studies were homogeneous (Cochrane Q het $p=0.35$) and the common RR was significant ($p<0.001$ and $CI=95\%$); G2 (5 primary studies CHX 0.12%) showed homogeneity (Cochrane Q het $p=0.67$) and the use of CHX represented protection ($p<0.05$); The G3 (3 primary studies CHX 0.2%) there was heterogeneity between studies ($p=0.037$) and CHX not represent a protective factor ($p>0.05$), G4 (2 primary studies CHX 2%) homogeneous studies (Cochran Q het $p=0.62$) and use of CHX was significant ($p=0.021<0.05$).

Conclusion: If seems no doubt about the protective effect of oral hygiene with CHX in preventing pneumonia in critically ill patients, there is no evidence for adoption of protocols to guide the CHX concentration, as well as duration, frequency and application technique.

Disclosure of interest: None declared.

P73

Bedside bronchoscopy a concern

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BMC Proceedings 2011, 5(Suppl 6):P73

Introduction / objectives: Bedside bronchoscopy has become a common procedure for the increasing number of patients getting admitted to intensive care. Process flow for the bronchoscope is a concern when it's done away from its workstation. We describe here an easy to follow methodology for this bedside procedure.

Methods: All requests for the procedure were routed to the bronchoscope unit. The bronchoscopes (consultant's personal device) had to be submitted to the unit two hours before the procedure. A written protocol for its processing, disinfecting and transported (in sterile covers) to the bedside was documented. Training was imparted to all the related personnel. Check list was created for the same. Compliance study for the process flow was carried out regularly. All bedside bronchoscopy specimens were cultured, monitored, clinically correlated and analyzed.

Results: Rate of isolation pseudomonas and acinetobacter came done drastically. Pre wash of the scopes before the procedure were negative for acid fast bacilli in all the samples. Compliance to adherence to protocol was 99%.

Conclusion: Iatrogenic infections with resistant organisms can be reduced markedly if simple clear protocols are documented, monitored and analyzed. Regular follow up is required to sustain the compliance.

Disclosure of interest: None declared.

P74

McCabe score as a strong determinant of septic shock-related mortality

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BMC Proceedings 2011, 5(Suppl 6):P74

Introduction / objectives: Septic shock is associated with a high mortality. However, we suspected that hospital mortality may be influenced by the predicted outcome of comorbidities and by the origin of the infection.

Methods: We analysed hospital-related mortality of all patients with a septic shock consecutively admitted in our 32-beds mixed university ICU from 2005 to 2008, according to both the origin (community-acquired or nosocomial) and to the underlying McCabe and Johnson score (non fatal, fatal within 5 years, fatal within 6 months). Data are extracted from the clinical information system and combined with a database on case-mix used Following discharge, diagnostic are prospectively validated by the attending physician and further imported in the institution datawarehouse after final crosschecking.

Results: A total of 8979 patients, accounting for 9641 stays were admitted from January 2005 to December 2008. A septic shock was diagnosed in 910 cases, community-acquired and nosocomial in 551 and 358 cases (39.3%), respectively. The McCabe score was nonfatal, fatal within 5 years and fatal within 6 months, in 44.6%, 38.5% and 16.9% of stays, respectively. Overall hospital mortality was 37.0%, 31.1% and 46.0% for all episodes, for community-acquired and nosocomial septic shock, respectively. It was 23.9%, 36.9% and 73.1% for McCabe nonfatal, fatal within 5 years and fatal within 6 months, respectively. Mortality decreased significantly from 73% if nosocomial in patients with an underlying condition scored as potentially fatal within the next 6 months to 20% when community-acquired in a patient with non fatal underlying disease.

Conclusion: The McCabe/Johnson score and the origin (community-acquired or nosocomial) are strong determinant of the outcome of septic shock.

Disclosure of interest: None declared.

P75

Incidence of microbial colonization in coronary care unit

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BMC Proceedings 2011, 5(Suppl 6):P75

Introduction / objectives: Nosocomial infections in patients admitted in coronary intensive care unit (CCU) are frequently caused by potentially pathogen microorganism (PPM). The aim of the present study is 1) to determine the incidence of PPM in patients admitted in our CCU the last year 2) to identify the risk factors for colonization with PPM.

Methods: Electronic medical records of all patients without previous infection who hospitalized in CCU unit from January since December

2010 were reviewed. During hospitalization, specimens were taken from the nasopharynx, blood and urine cultures and if applicable from the central or peripherals lines.

Results: 49 patients were included in the study with mean age 63,73yrs (SD=15.45). 64% of the participants were colonized with PPM. The most common isolated pathogens were Staph.Epidermidis (36.7%), Klebsiella Pneumoniae (32.6%), Pseudomonas Aeruginosa (10.2%), Candida Albicans (8.2%) και MRSA (4.1%). Risk factors for colonization with PPM were found the duration of stay in CCU (Anova test, F=5.008, p=.004) and the high levels of urea and creatinine (Anova test, F=4.502, p=.039).

Conclusion: The rates of PPM were significant high. Proper attention should be given in the risk factors that were found to be correlated.

Disclosure of interest: None declared.

P76

Comparison of bacterial isolated from burn wounds in ICU and burn ward patients

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BMC Proceedings 2011, 5(Suppl 6):P76

Introduction / objectives: Bacterial infection is of great importance in the course and prognose of burns. Thermal injury creates conditions for the growth of bacteria from the patients own body as well as environmental flora and also depresses host defence mechanisms.

We present the results of isolates from wounds in ICU and burn ward patients.

Methods: We collected swabs from wounds in 16 ICU patients and 58 of burn ward patients during a two month period Jan.-March 2011. Clinical samples were inoculated on Blood agar and Mac- Conkey agar. The isolates were identified with Gram stain, oxydase test and Enterosystem 18R for the gram negatives and Staphy slide test for the staphylococci. The antibiogram was performed by the disc-diffusion method, (according to the NCCLS standards).

Results: 85% of the patients in the ICU carried Acinetobacter baumannii, 76% carried both Acinetobacter baumannii and Staphylococcus aureus, both of them very resistant strains. Two patients carried even a third strain, that of Proteus mirabilis which was partly resistant to antibiotics. While the strains isolated from the burn ward consisted of 42,2 % Pseudomonas aeruginosa, 33,7% of S. aureus, 8% Acinetobacter baumannii. The remaining part consisted of Proteus mirabilis, Escherichia coli, Citrobacter freundii, Enterobacter sp.

Acinetobacter was resistant to: Gentamycin, Amikacin, Piperacillin, Ampicillin, Cefotaxim, Cefuroxim, and Ciprofloxacin. All Acinetobacter isolates were susceptible to Piperacillin + Tazobactam and Doripenem.

While S.aureus was susceptible to Eritromicin and Vancomicin and resistant to others.

Conclusion: We found that Acinetobacter baumannii was the dominant strain in the ICU of burn ward and it has a positive relation to the length of hospitalization in ICU.

Disclosure of interest: None declared.

P77

Incidences of nosocomial infection in Uruguayan adult intensive care unit 2010

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BMC Proceedings 2011, 5(Suppl 6):P77

Introduction / objectives: ICU patients (ptes) account for a large proportion of HI. Its epidemiology allow us to identify key issues and prioritize interventions. We determined the incidence of HI in ICU in Uruguay and described specific locations, dispositive-associated rates and microorganisms.

Methods: A national surveillance system for HI was implemented in 2006; prospective surveillance was performed using NNISS criteria. It is

mandatory, to record online and send their data to the Ministry of Health. Data are audited and results published annually.

Results: We present 2010 results of medical-surgical ICUs. 53 hospitals reported. 13611 ptes were surveyed (99541 ptes-days). 2340 HI episodes were reported (density of incidence rate (ID) 23.5/1000 ptes-days and cumulative incidence 17.2%). Ventilator-associated pneumonia (VAP) (34%), bronchitis (B) (28%), catheter-associated urinary tract infection (CAUTI) (21%) and central-line associated bacteremia (CLAB) (8%) were the main infectious sites. VAP ID was 14.2/1000 ventilator-days (dispositive utilization (DU) 0.5, secondary bacteremia (SB) 5.3% and contributor mortality (CM) 19.7%), CLAB ID was 1.9/1000 catheter-days (DU 0.7, (CM) 17.7%) and CAUTI ID was 5.8/1000 catheter-days (DU 0.8, (SB) 3.7%, (CM) 5.1%). Microorganisms were *S. aureus* (19, 17, and 11.4% in VAP, B and CLAB), *A. baumannii* (VAP 22%, B 18%), *Ps. aeruginosa* (16, 19, 6.4 and 10% in VAP, B, CLAB and CAUTI) and *K. pneumoniae* (12, 13, 14.9 and 14% in VAP, B, CLAB and CAUTI).

Conclusion: Respiratory tract infections are the main problem. ICUs predominance of Gram Negative Bacilli in these infections may suggest the importance of exogenous sources. VAP and CAUTI rates are also high, diminish its incidence is priority for the national program.

Disclosure of interest: None declared.

P78

Nosocomial infections in ICU comparing HIV infected and not infected patients

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BMC Proceedings 2011, 5(Suppl 6):P78

Introduction / objectives: This study describe the epidemiology of nosocomial (NI) notified at ICU in a tertiary level teaching hospital specialized in infectious diseases comparing adults patients HIV infected and not infected.

Methods: From January to December/2009 all patients admitted for more than 48hours at our 17 beds ICU were included. NI definitions were based on the CDC criteria.

Results: 119 NI were notified among 486 patients; the most frequent NI was pneumonia ($n=53$; 44.5%), followed by primary bloodstream infection (BSI) in 27(22.7%), cardiovascular system – arterial or venous infection (CVS-VASC)($n=16$;13.4%), urinary tract infection ($n=12$; 10.1%), intra-abdominal infections ($n=6$; 5%), soft tissue/skin infections ($n=4$; 3.5%), and surgical site infection ($n=1$;0.8%). Among pneumonias, ventilator-associated pneumonia were seen in 42 cases (79.2%). Comparing HIV infected and not infected patients, the incidence of VAP in HIV+ was 38.6% X 30.6% HIV-; primary BSI in HIV+ was 22.8% X 22.4% in HIV-; CVS-VASC in HIV+ was 10% X 18.3% in HIV-; urinary tract infection in HIV+ was 12.8% X 6.1% in HIV-; lower respiratory tract infection (non-VAP) in HIV+ was 5.7% X 14.3% in HIV-; intraabdominal infections in HIV+ was 7.1% X 2% in HIV-; soft tissue/ skin infections in HIV+ was 1.4% X 6.1% in HIV-; and surgical site infections in HIV+ was 1.4% X zero in HIV-. There was no significant difference comparing groups.

Conclusion: There were no statistical difference in the topography of NI in HIV infected or not infected at ICU.

Disclosure of interest: None declared.

P79

Evaluation of *Acinetobacter baumannii* infections in intensive care units of a training and research hospital

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BMC Proceedings 2011, 5(Suppl 6):P79

Introduction / objectives: The aim of this study was to identify the types of hospital-acquired *A. baumannii* infections detected in five

intensive care units at GATA Training and Research Hospital between 2008-2010 and to make comparison between years.

Methods: In this study, patients diagnosed with hospital-acquired infection were evaluated according to the definition by the Center for Disease Control and Prevention (CDC) at a regular surveillance in patients receiving inpatient treatment between 2008-2010 at GATA Training and Research Hospital.

Results: During this period, patients in five intensive care units were followed up with a regular surveillance. The comparison of the most common types of *Acinetobacter baumannii* infections between years revealed that the most common type of infection was blood stream infections with incidence rates of 66.6% in 2008, 72.0% in 2009 and 54.7% in 2010.

Conclusion: Of all infections detected in the five intensive care units included in this study, the incidence of *Acinetobacter baumannii* was found to be 17.1% in 2008, 18.8% in 2009 and 22.6% in 2010. The incidence rate increased over the years in our hospital, which however did not reach statistical significance. ($P=0.437$) Concerning the intensive care units, a statistically significant decrease was found in the burn center in the last three years. ($P=0.033$) We believe that this decrease results from the decreased number of the inpatients and the education on hand hygiene and isolation precautions provided by the Infection Control Committee during that period.

Disclosure of interest: None declared.

INFLUENZA, H1N1, SARS AND "AEROSOL TRANSMISSION RISK"

P80

Clinical and non-clinical healthcare workers faced similar risk of acquiring 2009 pandemic H1N1 infection

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BMC Proceedings 2011, 5(Suppl 6):P80

Introduction / objectives: In the 2009 H1N1 pandemic, the Hospital Authority managing >90% of hospital beds and 74 outpatient clinics in Hong Kong implemented mandatory reporting for healthcare workers (HCWs) with confirmed pH1N1 and collected detailed data on infected HCWs.

Methods: Under mandatory reporting, HCWs with influenza-like illness must present themselves to staff clinic and tested for pH1N1 by RT-PCR and viral culture. A confirmed case was defined as positive on either test. A standard questionnaire was used to assess clinical presentation and nature of exposure. Clinical staff were defined as HCWs involved in direct patient care and non-clinical staff are those without. The reporting for all staff began on 17 June until 31 August 2009. From 1 September 2009, it was mandatory only for clinical staff until 31 May 2010 when the pandemic was downgraded Infection control guidelines were issued on 29 April 2009 and education sessions were attended by >39,000 staff.

Results: During staff mandatory reporting, there were 249 confirmed pH1N1 cases among 40,511 clinical staff (0.62%) and 119 among 18,759 non-clinical staff (0.63%; $p=0.82$). The relative risk for clinical versus non-clinical staff was 0.98 (95% CI, 0.78-1.20). In the entire reporting period, a total of 1039 (2.6%) clinical staff had pH1N1 infection. Among clinical staff, 212/1039 (20%) cases reported contact with a confirmed pH1N1 infection, similar to the 24/119 (20%) from non-clinical staff. Importantly, unprotected exposure to a colleague confirmed with pH1N1 were 10-fold higher than exposure to infected patients, similar for clinical (9%) and non-clinical (8.4%) staff ($p=0.97$).

Conclusion: Attack rate was similar for clinical and non-clinical staff showing no increased risk in clinical care.

Disclosure of interest: P. Ching: None declared, C. Lam: None declared, B. Cowling Grant/Research support from MedImmune Inc., W. H. Seto Other Presented in anti infective meeting 2010 by Pfizer.

P81

Laboratory-confirmed pandemic H1N1 influenza in hospitalized adults – findings from the Canadian Nosocomial Infection Surveillance Program (CNISP), 2009-10

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BMC Proceedings 2011, **5(Suppl 6)**:P81

Introduction / objectives: To describe laboratory-confirmed pandemic H1N1 (pH1N1) influenza in adult inpatients at participating Canadian hospitals between June 2009 and May 2010 and compare to previous years' seasonal surveillance.

Methods: Adult inpatients (>=16 years) with lab confirmed influenza were enrolled. Variables collected included ICU admissions and death attributed to influenza assessed 30 days after initial diagnosis.

Results: Thirty-seven hospitals submitted data on 701 cases. The median age of was 49 years (range 16 - 94). Vaccine history was available for 314 cases, and 21% (n=65) reported receiving vaccine. Oseltamivir was given to 90% of the cases a median of 3 days after symptom onset (range 0 - 24). Influenza-associated admission to ICU was required for 28% (n=197). The 30 day all-cause mortality was 7%; influenza was the primary cause of 20 deaths and contributed to death in a further 22 cases for an influenza-attributed mortality of 6%. The mean age at death was 50 years (SD 13.8).

Conclusion: The ICU admission rate and influenza-attributed mortality were similar to three preceding influenza years, but mean age at death was significantly younger (p<0.01). Antivirals were prescribed for more patients with influenza (90%) than in previous seasons (35-47%). The pH1N1 virus appeared outside the traditional influenza season and impacted a different age group than seasonal viruses circulating in previous years, highlighting the importance of ongoing influenza surveillance.

Disclosure of interest: None declared.

P82

Knowledge, attitude, behavior and practices on H1N1 among the heterogenous population of Tamil Nadu, India

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BMC Proceedings 2011, **5(Suppl 6)**:P82

Introduction / objectives: Audio visual media (AVM) have disseminated abundant information on Swine flu (H1N1) during the 2009 pandemic. Hence it was decided to find out the Knowledge, Attitude, Behavior and Practices regarding Swine flu and to elicit the influence of AVM on the general public regarding preventive measures.

Methods: Population sampling was carried out taking into account that sizeable numbers represented different population groups. An anonymous pre tested questionnaire (closed 16, open 1) was given to 2193 participants. Voluntary participation was encouraged. Data were analyzed using SPSS17.0 software.

Results: Response rate was 98%. The Urban to Rural Population ratio in the survey was 1:1.2. Television (86%) was the main source of information. Knowledge on pandemic nature, symptoms, personal protective measures, treatment and preventive strategies were acceptable among 90.2, 96, 36, 12 & 31% respectively. None of them used face mask or hand wash, though known to 78 & 20% respectively. Literacy level was directly proportional to knowledge gained and retained. However, there was no statistical difference among gender or domicile status.

Conclusion: AVM have sensitized the public on symptomatology and enhanced health seeking behavior but not stressed effectively on preventive measures. AVM disseminated information during an outbreak,

but lacked reinforcement during quiescent period. So it is suggested that health authorities should constantly provide information choosing the right media to the right population group towards preparing them for similar outbreaks.

Disclosure of interest: None declared.

P83

Acceptance of pandemic influenza A (H1N1) 2009 vaccine among health care workers, Thailand

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BMC Proceedings 2011, **5(Suppl 6)**:P83

Introduction / objectives: To identify factors associated with the acceptance of the pandemic influenza A (H1N1) 2009 vaccine among health care workers (HCWs).

Methods: From March 1 to 31, 2009, a self-administered structured questionnaire survey was conducted among 700 HCWs to examine their knowledge, attitudes and practices toward the pandemic influenza vaccination.

Results: The surveyed participants were composed of physician 8.5%, nurse 35%, and paramedic staff 56.5%. The response rate was 97.6%. Although 84% of the respondents regarded this vaccine as being beneficial, only 60.1% were willing to be vaccinated. The most common reason for refusal of vaccination was concern about the potential side effects of vaccine (29%). The most common source of vaccine information was broadcast media (67.8%), mainly TV and radio. Most respondents (72%) considered vaccination as the most important means for influenza control and prevention. Univariate analysis indicated that HCWs who regarded this vaccine as being safe and/or beneficial were 7 times more likely to agree to vaccinate compared to those who believed otherwise (RR: 7.08; 95% CI : 4.70-10.67). In contrast, those who had heard about vaccine adverse event from broadcast media were less likely to do so (RR: 0.77; 95% CI: 0.66-0.89). Furthermore, receiving vaccine safety information from health personnel was significantly associated with increased vaccine acceptance (RR: 2.07; 95% CI: 1.68-2.54).

Conclusion: Effective control and prevention of disease faces a major challenge posed by the nominal level of influenza vaccine acceptance among HCWs. In order to achieve an enhanced level of influenza vaccination acceptance, the provision of up-to-date and correct vaccine information to both HCWs and the mass media is of essentiality.

Disclosure of interest: None declared.

P84

Influenza vaccination among health care workers in Thailand

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BMC Proceedings 2011, **5(Suppl 6)**:P84

Introduction / objectives: To determine the knowledge, attitudes, and practice related to influenza vaccinations of health care workers (HCWs).

Methods: Between May 2008 and December 2009, a self-administered questionnaire was distributed to HCWs participating in one of the 5 two-day training courses for emerging infectious diseases in several regional health jurisdictions of Thailand.

Results: Of 1466 participants, the response rate of questionnaire was 53.8%. The respondents were physicians (14.8%), nurses (60.2%), and other groups of healthcare professionals (25%). The vaccination rate among nurses (92.8%) was statistically significantly higher than among physicians (86.2%) and other groups (81.1%) (p<0.001). The overall influenza vaccination rate was 89%. The awareness of both the health benefit of this vaccine (57.2%) and their heightened risk of acquiring influenza (41.1%) were the two most common reasons for vaccine acceptance. The most common reason for vaccine refusal was the belief that, without underlying disease or co-morbidity, the vaccine was unnecessary (43.2%). Further, the fear of potentially serious adverse

effects of the vaccine was also reported as a common reason for not being vaccinated (31.8%). The vaccinated group was significantly more likely to encourage their family members to receive this vaccine (74.6%) as compared to the non-vaccinated group (45.6%) ($p < 0.001$).

Conclusion: We identified a relatively high coverage of influenza vaccination among HCWs in Thailand. The complacency about their potential risk of influenza complication and the fear of vaccine adverse effect were the major barriers to influenza vaccination. Thus, the provision of proper education program on influenza vaccination is essential for the successful immunization campaign for HCWs.

Disclosure of interest: T. Chotpitayasunondh Employee of Government.

P85

Experience in confronting the H1N1 epidemic

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BMC Proceedings 2011, 5(Suppl 6):P85

Introduction / objectives: The epidemic influenza A (H1N1) virus is the result of reassortment between genetic material from the human, avian and swine virus. In July 2009 the World Health Organization published the sustained transmission of the virus in two continents, characterizing the epidemic and occurring prompt response by this agency worldwide. The objective to report the experience of the multidisciplinary team regarding adherence to and effectiveness of this training.

Methods: The survey was conducted in a public hospital of Infectious Diseases, Brazil. Hospital Infection Control, Nursing Continuous Education and medical staff assembled to determine the preventive actions and the routines that would be adopted to confront the epidemic. These actions were based on Standard Precautions and guidelines of the Ministry of Health, Centers for Disease Control (CDC) and the Epidemiological Surveillance Center of São Paulo. Training was carried out from 08 to 21 May, 2009 covering the entire hospital staff, broaching precautions and isolation, management of suspected and confirmed cases and hospitalized patients.

Results: 357 employees were trained, with good adhesion, improved adherence to preventive practices and routines and substantial increase in the use of alcohol gel by institution professional staff. There was a low rate of retirement of hospital employees due to infection by the virus. The difficulties encountered during training were due to the constant change in the guidelines issued by the official bodies by dealing with a relatively new disease.

Conclusion: Improvement in hospital infection control measures such as hand hygiene, importance of teamwork, as well as permanent education as strategies to implement effective measures for providing quality care.

Disclosure of interest: None declared.

P86

Abstract withdrawn

BMC Proceedings 1753-6561/2011/5Suppl 6P86

P87

Pandemic (H1N1) 2009 influenza A in Universiti Kebangsaan Malaysia Medical Centre in 2009-2010: laboratory diagnostic test methods and lessons learned

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BMC Proceedings 2011, 5(Suppl 6):P87

Introduction / objectives: Pandemic (H1N1) 2009 Influenza A virus has moved into the post-pandemic period since August 2010. Various laboratory diagnostic methods are available to assist patient management. The study aimed to assess influenza trends in this centre during and post-pandemic and the performance of rapid influenza antigen diagnostic tests (RIDT).

Methods: Data from August 2009 to December 2010 were collected. In high-risk patients and those with moderate to severe influenza-like illness

(ILI), diagnosis of influenza A and pandemic (H1N1) influenza were confirmed by real-time reverse-transcription polymerase chain reaction (rRT-PCR) by Roche LightCycler[®] 2.0 system. Seven RIDTs were used and results were compared with rRT-PCR to assess performance.

Results: In total, 733 respiratory specimens were tested from August to December 2009, where 165 (22.5%) were H1N1 influenza while 170 (23.2%) were seasonal influenza A. In 2010, out of 871 specimens tested, only 46 (5.3%) were H1N1 influenza while 97 (11.1%) were seasonal influenza A. RIDTs done on 1003 out of 1604 specimens showed low or variable sensitivities and negative predictive values, and generally high specificities and positive predictive values.

Conclusion: In post-pandemic period, H1N1 influenza continues to circulate at low levels. A proportion of patients with ILI may require further diagnostic tests for other respiratory pathogens since only a small percentage were confirmed as influenza by rRT-PCR. RIDTs have low sensitivities and negative results should be confirmed with more sensitive methods. Based on the limitations and advantages of the tests, clinical and epidemiologic data is integral in patient assessment and interpretation of results.

Disclosure of interest: None declared.

P88

Effectiveness of pharmaceutical strategies for pandemic H1N1 2009 influenza in TAIWAN

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BMC Proceedings 2011, 5(Suppl 6):P88

Introduction / objectives: Mass vaccination campaign conducted according to the priority groups, and provision of free rapid influenza diagnostic tests (RIDTs) and antivirals to predefined population at flu clinics, were implemented as a national program in Taiwan to reduce the impacts of the pandemic H1N1 2009 (pH1N1) influenza. This multi-center study aimed to evaluate the effectiveness of these pharmaceutical interventions based on hospital-wide influenza surveillance data.

Methods: From 15 Aug 2009 through 1 March 2010, all in- and outpatients who received RIDTs at 3 teaching hospitals located in the northern, middle, and southern Taiwan, respectively were analyzed. A time-series analysis was conducted to estimate the effects of various pharmaceutical strategies on the number of patients with positive RIDTs each day. The daily mean level of population immunity was estimated based on the nationwide vaccination coverage rate, seroconversion rate in different age groups and simulated time-lag for seroconversion.

Results: A total of 7,206 out of 34,359 patients had positive RIDT results for influenza A. The greatest number of daily positive cases in each hospital ranged from 40 to 56, and there were slight regional differences regarding the profile of daily positive rates. Multivariate analysis of the data from the largest hospital showed that establishment of flu clinics averagely reduce 7 daily cases ($p < 0.001$), and an increment of 10% daily mean level of population immunity against pH1N1 through vaccination averagely reduce 5 daily cases ($p < 0.001$). Similar results were obtained in the other two hospitals.

Conclusion: Pharmaceutical strategies implemented in Taiwan were effective in lowering the burden of pH1N1 influenza.

Disclosure of interest: None declared.

P89

Influenza A (H1H1) in the post-pandemic period: readjusting the focus based on e-health

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BMC Proceedings 2011, 5(Suppl 6):P89

Introduction / objectives: Influenza A (H1N1) pandemics was the 1st in the last 4 decades and consumed important resources. In the post-pandemic period, healthcare facilities had to readjust strategies to

optimize resources while ensuring adequate clinical approach of suspect cases and epidemiologic surveillance.

Methods: Hospital da Luz, a paper-free hospital, developed a plan for initial approach and follow-up of suspect cases, based on the e-health concept, coordinated by the Infection Control Committee (ICC) and in collaboration with the Internal Medicine Department. Approach included risk assessment using an electronic medical registry: "Flu tool" – a questionnaire generating automatic prescriptions of virologic tests for at risk patients, stated indications for admission, stratified patients for severity and generated a notification to the ICC. According to this evaluation, respiratory swabs were obtained for PCR (H1N1) Influenza A test for at risk patients, and antiviral therapy was prescribed while waiting results. The laboratory notified ICC of results of the H1N1 tests and ICC provided patients with test results (by phone call), either suggesting discontinuation of oseltamivir in case of a negative test or clinical reevaluation in all patients with a positive test and risk factors for a complicated illness. ICC scheduled Internal Medicine outpatient visit within 48h of test result for at risk patients. Inhospital cases were notified by e-mail to the Ministry of Health.

Results: Every patient was adequately followed.

Conclusion: Using the e-health concept, Hospital da Luz developed a new strategy for the approach and follow-up of suspect cases with universal assessment and orientation, improving quality of care.

Disclosure of interest: None declared.

P90

The aerodynamic behaviour of respiratory aerosols

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BMC Proceedings 2011, 5(Suppl 6):P90

Introduction / objectives: Hospital acquired infections (HAIs) claim on average 90,000 lives each year in the U.S., nearly three times the number of annual highway deaths. Although fewer than 15% of HAIs are directly attributable to airborne transmission, more than a third may be caused by surface microbes aerosolized by the movement of air from building systems, people and equipment. As a result, a study was devised to use a synthetic respiratory aerosol to track the movement airborne contagion with respect to various environmental conditions in a healthcare environment.

Methods: An actual hospital was used to map the spatial dispersion of synthetic respiratory aerosols with respect to particle size, airflow, door position and healthcare worker movement between a general patient room and corridor.

Results: Respirable aerosols 0.5µm to <1.0µm were found to exhibit distinctly different aerodynamic behaviours when compared to aerosols 1.0µm -10.0µm. Specifically, aerosols <1.0µm appeared to disperse randomly and uniformly throughout the test space with significantly less regard to mechanical airflow, pressure relationships, door position, and personnel movement when compared to aerosols 1.0µm -10.0µm.

Conclusion: Since expiratory droplets <1.0µm are believed to be both capable of carrying virus and penetrating into the alveolar region of the lung, these particles may present unique challenges for ventilation systems designed to protect the healthcare population from airborne viral transmission.

Disclosure of interest: None declared.

P91

Aerosol generating procedures (AGP) and risk of transmission of acute respiratory diseases (ARD): a systematic review

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BMC Proceedings 2011, 5(Suppl 6):P91

Introduction / objectives: The risk of transmission of ARDs to HCWs from AGPs is not fully known. We sought to determine the evidence for the risk of transmission of acute ARDs to HCWs caring for patients undergoing and not undergoing AGPs.

Methods: We searched PubMed, Medline, Embase, Cinahl, the Cochrane Library, Univ of York CRD databases, EuroScan, LILACS, Indian Medlars, Index Medicus for SE Asia, health technology agencies and the Internet in all languages for articles from 01/01/1990 – 22/10/2010. Abstracts and full text articles were screened and included using pre-defined criteria. Disagreements were resolved by consensus and a 3rd reviewer. Data were extracted and verified by a 2nd reviewer. The outcome of interest was risk of ARD transmission. The quality of evidence was rated using the GRADE system.

Results: We identified 5 case-control and 5 retrospective cohort studies which evaluated transmission of SARS to HCWs. Procedures with an increased risk of transmission included [n; pooled OR(95%CI)] tracheal intubation [n=8; 6.2 (3.4, 11.3)], non-invasive ventilation [n=2;OR 3.1(1.4, 6.8)], tracheotomy [n=1; 4.2 (1.5, 11.5)] and manual ventilation before intubation [n=1;OR 2.8(1.3, 6.4)]. Other intubation procedures, ET aspiration, suction of body fluids, bronchoscopy, nebulizer treatment, administration of O₂, high flow O₂, manipulation of O₂ mask or BiPAP mask, defibrillation, chest compressions, insertion of NG tube, and collection of sputum were not significant.

Conclusion: Our findings suggest that some procedures have been associated with increased risk of SARS transmission to HCWs with the most consistent association across multiple studies identified with tracheal intubation. These findings must be interpreted in the context of the very low quality of the studies.

Disclosure of interest: K. Tran : None declared, K. Cimon: None declared, M. Severn : None declared, C. Pessoa-Silva: None declared, J. Conly Other Clinical expert for other CADTH projects and speaker honoraria from Industry related to new antimicrobials.

OUTBREAKS

P92

Consequences of the multipatient use of a single-patient capillary blood sampling device (CBSD)

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BMC Proceedings 2011, 5(Suppl 6):P92

Introduction / objectives: Multipatient use of a single-patient CBSD occurred in an outpatient clinic during 4 to 16 months before its notification. We looked for transmission of blood-borne pathogens among exposed patients.

Methods: Exposed patients underwent serology testing for HBV, HCV and HIV. Patients with isolated anti-HBc received one dose of hepatitis B vaccine to look for a memory immune response. Possible transmissions were investigated by mapping visits and sequencing of the viral genome if needed.

Results: Of 280 exposed patients, 9 had died without suspicion of blood-borne infection, 3 could not be tested, and 5 declined investigations. Among the 263 (93%) tested patients, 218 (83%) had negative results. We confirmed a known history of HCV infection in 6 patients (1 co-infected by HIV), and also identified resolved HBV infection in 37 patients, of whom 18 were already known. 2 patients were found to have a previously unknown HCV infection. According to the time elapsed from the closest previous visit of a HCV-infected potential source patient, we could rule out nosocomial transmission in one case (14 weeks) but not in the other (1 day). In the latter, however, transmission was deemed very unlikely by 2 reference centers based on the sequences of the E1 and HVR1 regions of the virus.

Conclusion: We did not identify any transmission of blood-borne pathogens in 263 patients exposed to a single-patient CBSD, despite the presence of potential source cases. Change of needle and disinfection of the device between patients may have contributed to this outcome. Although we cannot exclude transmission of HBV, previous acquisition in endemic countries is a more likely explanation in this multi-national population.

Disclosure of interest: None declared.

P93

Outbreak investigation of Salmonella group D in staff and patients at Hamad Medical Corporation

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BMC Proceedings 2011, **5(Suppl 6)**:P93

Introduction / objectives: I.C section was informed that around 17 staffs who had eaten dinner on Dec 6. 2010 during Quality event and 27 cases of staff from different units and 7 cases from in patients areas had experienced gastrointestinal illness within 72 hr of finishing their meal. In total of 14 cases were stricken by this illness which subsequently identified as salmonella group D.

Objective: To investigate an increase in the number of Salmonella isolates detected to ascertain whether it was due to a nosocomial source, to identify the mechanisms of transmission, and to institute effective control measures to prevent future episodes.

Methods: retrospective study was conducted among HCW to assess exposure to food served during outbreak and subsequent illness. Exposed staffs were asked to complete Questionnaire. The Case definition was defined, screening of staffs, food samples and surfaces were done.

Results: The questionnaire was emailed to all 74 event participants, only 40 responded 17 staffs developed gastroenteritis. Stool cultures were available for 11 staffs. 7 staff became positive for Salmonella group D, and around 7 patients were reported to have Salmonella group D isolated in stool cultures. Screening of 130 staff from catering areas showed 6 catering staff were found to be positive for Salmonella group D, 2 of them returned from vacation and resumed their duties prior their clearance. Screening of different food items and surfaces were swabbed. All samples were negative for salmonella.

Conclusion: This outbreak illustrates the potential for food handlers in health care setting who are infected with Salmonella of same serotype to be a source of transmission. Strict on Routine stool culture of food handlers, HCW education and proper hygienic practices are important to prevent such outbreak in the future.

Disclosure of interest: None declared.

P94

Control of multidrug resistant (MDR) *Acinetobacter baumannii* outbreak in a pediatric oncology unit by optimizing infection prevention (IP) and control measures

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BMC Proceedings 2011, **5(Suppl 6)**:P94

Introduction / objectives: *Acinetobacter baumannii* is reconized as an important MDR pathogen. We present results of our effort to control a recent outbreak in our ICU

Methods: Our hospital is a 40 bed pediatric oncology unit. We defined our cases as any patient in the ICU positive for MDR *A.baumannii* from September 1 - October 31, 2010. Our intervention consisted of enforcing contact isolation (gloves and gown) for positive patients, update guidelines for airway management, and education for all ICU personnel.

Results: In the study period, 4 patients had tracheal aspirate (TA) positive for MDR *A.baumannii* (all on mechanical ventilation), one patient had positive catheter tip and blood cultures. The attack rate was 12.8% and the ventilator associated pneumonia rate rose from 20.30 to 34.96 per 1000 ventilator days. The first three cases occurred from September 13 to 20 all of them in TA. Contact precautions were initiated for positive patients. After a 20 day event free period, a patient developed signs of infection and had culture with *A.baumannii*; IP and control education was given to the respiratory therapy team and ICU staff including hand

hygiene promotion and airway management. Two additional cases occurred on October 18 and 20, since there have been no new cases.

Conclusion: Expedited basic IP and control measures implementation such as education, hand hygiene promotion, isolation precautions and adequate airway management controlled the outbreak of MDR *A. baumannii*. Universal IP and control education is key for successful outbreak containment.

Disclosure of interest: None declared.

P95

Outbreak of carbapenem-resistant *Acinetobacter baumannii* (CRAB) in a surgical department of a university hospital

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BMC Proceedings 2011, **5(Suppl 6)**:P95

Introduction / objectives: Multidrug resistant strains of *A. baumannii* are an emerging problem in hospitals. We describe the management of a CRAB outbreak including 12 cases in a surgical department comprising a 40-bed ICU and a 16-bed isolation-ward (IW) for patients with multidrug resistant organisms (MDRO). The IW was originally designed for MRSA patients only.

Methods: Descriptive epidemiological study of the time period before and after implementation of control measures.

Results: Between 23/1/2011 and 10/2/2011 five CRAB cases were detected in the IW. The following control measures were implemented: contact isolation and cohorting of cases, frequent disinfection of equipment and frequently touched surfaces, closure of the common bathroom and education of staff concerning contact and standard precautions. CRAB screening of all inpatients hospitalised on the ward since 15/1/2011 was performed. The screening sites were: 1) tracheal secretion or upper airway, 2) anus, perineum or groin, 3) wound. The screening revealed 3 new cases and the ward was closed for new admissions. Between 16/2/2011 and 22/2/2011 two new CRAB cases were detected on the surgical ICU and CRAB screening of all ICU patients was done revealing 2 more cases. Using repPCR, all isolates were found to be genetically identical. Further active surveillance cultures revealed no new cases until 15/3/2011.

Conclusion: Consistent and immediate implementation of the infection control measures resulted in the containment of the outbreak.

Disclosure of interest: None declared.

P96

Neonatal sepsis outbreak at the first maternity hospital of Ulaanbaatar

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BMC Proceedings 2011, **5(Suppl 6)**:P96

Introduction / objectives: In-depth analysis for Neonatal sepsis outbreak at the first maternity hospital.

Methods: We conducted screening by clinical signs among the newborns and then collected clinical samplings from the suspected cases with environmental samplings. Bacteriological analysis was done for all the samples and agents were detected along with antibiotic resistance analysis.

Results: In January of 2010, 21 neonatal infection cases with 2 death reported were screened by clinical signs. 76.2% of them had cesarean delivery and 23.8% were given normal birth. Clinical presentations were fever 100%, cyanosis 76%, breath distress 65%, abdominal filling 59%, abdominal vein unroll 53%, hyperbilirubinemia 53%, irritability 47% and rigidity 12%. Clinical samplings gathered from 18 neonates and 12 /66.6% of them were detected *multi resistant Klebsiella pneumonia*.

There are collected 33 environmental swabs. 27.2% of them have culture positive, including staphylococcus with resistance to ampicillin, streptococcus with sensitive to vancomycin, gram positive and gram negative bacteria and micrococcus resistance to vancomycin. 25% of 8 swabs collected from mothers of 2nd ward had culture positive, including enterococcus with resistance to vancomycin and bacillus cereus.

In air bacteriological sampling results determined 6 staphylococcus hemolyticus. 8 health care workers had Staphylococcus aureus in nasal swabs, 1 had streptococcus pneumonia and *klebsiella pneumoniae* which were detected from 5 neonates nasal swabs, blood and wounds.

Conclusion: The agents of the outbreak were **Klebsiella pneumoniae** and **staphylococcus** and transmission occurred from person to person due to poor performance of the relevant precautions. The increased workload of the staff, poor condition of the hospital building and sewage system were the supporting reasons of the outbreak.

Disclosure of interest: None declared.

P97

Epidemic keratoconjunctivitis outbreak in a closed psychiatry ward

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BMC Proceedings 2011, 5(Suppl 6):P97

Introduction: Epidemic keratoconjunctivitis (EKC) caused by adenovirus is a highly contagious infection of the eye frequently associated with healthcare services.

Objective: Description and analysis of an outbreak of epidemic keratoconjunctivitis (EKC) in a psychiatry ward of Gregorio Marañón General University Hospital, Madrid, Spain, which occurred during the months of May and June 2010.

Patients and methods: The outbreak occurred on a closed unit of the Psychiatry Department with 26 beds in 22 rooms. At the moment of the alert, 22 beds were occupied. The management of the outbreak consisted of reinforcement of hygiene measures and workshops on hand hygiene for the ward staff. The emergence of new cases in patients as well as in staff members lead to the restriction of new admissions and eventually to the closure of the unit.

Results: Altogether, 13 cases of EKC were identified among patients (12 probable cases and 1 confirmed case). There were 2 probable cases identified among staff. The overall attack rate was 22.4% (13/58) among the patients and 11.7% (2/17) among staff.

Conclusions: As far as we know, this is the first description of an EKC outbreak in a psychiatry ward where nosocomial infections are rather rare. The psychiatric pathologies of the patients of this specific unit caused many difficulties in the reinforcement of strict preventive measures and in the therapeutic management of these patients.

Disclosure of interest: None declared.

P98

National evaluation of rapidly growing mycobacteria outbreaks in Brazil

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BMC Proceedings 2011, 5(Suppl 6):P98

Introduction / objectives: This study describes the epidemiologic characteristics of HAI outbreaks caused by RGM in Brazil.

Methods: A retrospective study was carried out by consulting the Agência Nacional de Vigilância Sanitária (ANVISA), Brazil, data system from January 1999 to December 2009. Additional data from private and public laboratories were also analyzed, including genotyping of a large group of RGM by means of Pulsed-field Gel Electrophoresis (PFGE). Cases were defined as confirmed, probable or suspect according to a previously established definition.

Results: 2,520 RGM infections were reported to ANVISA from 23 States during the period studied. Confirmed cases were caused by *M. abscessus* (31.3%, n=265), *M. abscessus* subsp. *bolletti* (30.4%, n=257), *M. fortuitum* (13.8%, n=117), and other species contributed to 4.2% of the cases (n=34). Cases were mainly associated with videoscopies procedures (n=1,722), mammoplasty (n=210) or nonsurgical invasive procedures (n=141). PFGE fingerprints showed evidence of a nationwide spread of

a single strain of *M. abscessus* subsp. *bolletti*, mainly in cases involving video-assisted procedures, thus suggesting a common source. Due to the lack of relevant information we could not confirm the hypothesis generated by the descriptive study. Measures to control outbreaks and prevent new cases were adopted by ANVISA, including a sanitary audit, guideline publication and training programs.

Conclusion: Outbreaks involving RGM occurred with different epidemiologic features in Brazil during the period studied. Further studies are necessary to identify the factors implicated in the persistence and dissemination of a single clone throughout the country.

Disclosure of interest: None declared.

P99

Managing norovirus outbreaks: opportunities for organisational learning

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BMC Proceedings 2011, 5(Suppl 6):P99

Introduction / objectives: This study examines the impact of behavioural factors in the successful management of an organisation-wide Norovirus outbreak in a UK hospital.

Methods: A retrospective qualitative content analysis of a Norovirus outbreak was undertaken, using critical incident analysis as the basis for conducting semi-structured interviews with 24 key clinical and managerial participants. Behavioural references were mapped to a behavioural framework (Weick and Sutcliffe, 2007) that describes positive behaviours, known as 'mindful behaviours' and negative behaviours, known as 'mindless behaviours' which contribute to high and low performance respectively in the context of an unexpected event, using a qualitative software tool (NVivo). The resulting data was analysed using frequency tables.

Results: The results demonstrated a higher count of mindful behaviours than mindless behaviours in what participants perceived to be a successfully managed outbreak. Mindful behaviours included the engagement of clinical experts, daily reviews of hospital capacity and capability, prioritisation of patient safety over parochial interests, rigorous implementation of clinical reviews and effective communication with clinicians. Successful management was defined by participants as the appropriate balance between safety and performance that: minimised morbidity, ensured the hospital continued to meet its performance targets and maintained the hospital's reputation externally.

Conclusion: This study has an in-depth focus on the behaviours that facilitate and hinder the successful management of a potentially highly disruptive Norovirus outbreak. The lessons learnt can contribute to improved management of future outbreaks and an enhanced understanding of the behavioural drivers of an effective outbreak response.

Disclosure of interest: None declared.

P100

A hospital outbreak of seasonal influenza involving three health care workers – implications on the optimal choice of respiratory protection

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BMC Proceedings 2011, 5(Suppl 6):P100

Introduction / objectives: The guidance on the optimal choice of respiratory protection for health care workers (HCWs) caring for patients with suspected/confirmed influenza infection requiring non-invasive ventilation (NIV) has remained controversial.

Methods: We investigated an influenza A outbreak involving 3 HCWs in a medical ward in July 2009. Contact tracing & viral studies were performed to identify the source of outbreak.

Results: Three HCWs (a nurse, an intern & a general services assistant (GSA)) reported fever and upper respiratory symptoms on July 13. Nasal/throat swabs confirmed influenza A infection. On contact tracing, all 3 reported contact history with 2 patients (Patient A & B) admitted to the

ward on July 10 & 11 respectively who were later diagnosed with influenza A. Patient A was on 2L/min O₂ while Patient B developed respiratory failure requiring 100% O₂ and was soon transferred to a side room and put on NIV. Virological investigations confirmed that Patient B & the 3 staffs had influenza A/H3 subtype infection, while Patient A had influenza A/H1 infection.

The nurse had cared for both patients, the intern had performed physical examination for both patients, and the GSA transported both patients to the isolation facilities. They reported good compliance to droplet precautions & hand hygiene and were wearing surgical mask but not mucosal protection during the care of both patients. These 3 were the only staff among 24 that reported working within close proximity (<1 meter) of Patient B while he was on NIV.

Conclusion: Patient B was identified as the index case causing this outbreak of influenza A/H3 subtype.

Droplet precaution and the use of surgical mask may not offer adequate respiratory protection to HCWs caring for patients on NIV.

Disclosure of interest: None declared.

HAND HYGIENE I: UNDERSTANDING AND MONITORING BEHAVIOURS

P101

Hand hygiene myths

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BMC Proceedings 2011, 5(Suppl 6):P101

Introduction / objectives: Professionals promoting hand hygiene (HH) with multimodal strategies featuring the introduction of alcohol-based handrub (ABHR) are confronted by a common set of impeding opinions regarding the indications, safety and efficacy of ABHR. Some of these could be referred to as HH myths.

Methods: We undertook a review of the literature to assess the currently available evidence regarding five common barriers to the successful implementation ABHR: 1) poor HH before patient contact; 2) the risk of systemic absorption of alcohol; 3) adverse dermatologic effects; 4) risk of *Clostridium difficile* disease; and 5) ABHR as a fire hazard.

Results: Hand hygiene compliance is usually better after patient contact than before, despite a lack of evidence to suggest this is an effective means to prevent transmission of pathogens. Blood levels of ethanol and acetone after even supra-normal exposure are undetectable or insignificant. Appropriately formulated ABHR products are less likely to result in dermatitis than washing with soap and water. Appropriate implementation of hand hygiene guidelines does not result in *Clostridium difficile* infection incidence. Fire events related to ABHR are extremely rare and almost exclusively associated with inappropriate use.

Conclusion: Like any medication, ABHRs do have potential adverse effects, but these can be minimised by appropriate usage. Rare or even mythic complications should be weighed realistically against the potential of ABHR to prevent countless healthcare-associated infections each year.

Disclosure of interest: None declared.

P102

Evaluation of adherence to hand washing among health professionals: spy project

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BMC Proceedings 2011, 5(Suppl 6):P102

Introduction / objectives: Healthcare-associated infections affect hundreds of thousands of patients worldwide every year. Hand washing is a basic measure to reduce infections. The aim of this study was to evaluate the adherence to hand washing opportunities among the multidisciplinary team and to search for possible causes or situations that might promote hospital infections, including cross infection and infection outbreaks, among others.

Methods: The methodology used was a descriptive, quantitative method that took place in a midsized charity institution in the city of São Paulo, Brazil. For data collection a "check-list" containing 7 closed questions was created. From May to June and November to December, 2010, a professional from the Hospital Infection Control Service performed observational visits in inpatient units and intensive care units, covering the morning, afternoon and evening periods of the day. The professional observed if doctors, physiotherapists and nursing staff washed their hands before and after completing their activities.

Results: From the total of 758 opportunities for hand washing, the correct procedure was completed 491 times (65%). Considering the categories of health workers, physiotherapists washed their hands in 72% of the opportunities; nursing staff in 73% of the opportunities; and doctors in 40% of opportunities.

Conclusion: In conclusion, this project identified important issues as opportunities to improve infection control. By observing the results, we found that hand washing is not performed at every opportunity, which can increase hospital infections. It is not enough for just one team to have a correct practice, but it is necessary to understand the importance of meeting the prevention of infection recommendations.

Disclosure of interest: None declared.

P103

The best way to skin a cat: product consumption versus direct observation for monitoring hand hygiene performance

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BMC Proceedings 2011, 5(Suppl 6):P103

Introduction / objectives: Direct observation (DO) and alcohol-based handrub (ABHR) consumption per 1000 patient days (AC) are used to monitor hand hygiene (HH) performance in healthcare, and are increasingly utilised as quality indicators, sometimes for external benchmarking. We investigated the common assumption that there is a direct correlation between these two measures.

Methods: For the baseline period of a cluster-randomized trial regarding multimodal hand hygiene promotion at a 2200 bed tertiary-care facility, 8 validated infection control nurses performed DO using the WHO 'My 5 Moments' method in 65 non-ICU acute care wards for 15 months from April 2009. ABHR usage and patient days per ward were extracted from hospital databases to calculate AC over the same period. Linear regression was used to determine the correlation between these two variables, with each unit's compliance weighted for the number of HH opportunities observed.

Results: DO captured 4601 HH opportunities and 2962 HH actions, 99% of which involved ABHR use. HH compliance in individual wards ranged from 38.2% to 90.2% with a mean of 64.6% (CI95, 62.0-67.2). A total of 13,939 litres of ABHR was consumed during 459,917 patient days. AC ranged from 10.8 to 62.0 L/1000 bed days with a mean of 31.4 (CI95, 28.5-34.4). Both HH compliance and AC were normally distributed, with a weak and non-significant correlation ($r=0.13$; $P=0.21$).

Conclusion: In this setting, DO and AC are not significantly correlated, complicating efforts to monitor HH performance. Further investigation should examine which is a better indicator for relevant clinical outcomes such as microbial colonisation and healthcare-associated infection.

Disclosure of interest: None declared.

P104

Assessment of hand hygiene adherence using a web camera

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BMC Proceedings 2011, 5(Suppl 6):P104

Introduction / objectives: The most effective method of controlling nosocomial infection is hand hygiene. Hand hygiene has been monitored

by trained nurses' observation of hygiene practices and assessment of the amount of alcohol-based hand sanitizer used. This study used a web camera to examine hand hygiene adherence.

Methods: A web camera was installed in the ICU in September 2010, video from the camera was relayed to the Department of Infection Control via the hospital's intranet, and that video was saved on a server for later observation. Starting in December 2010, personnel on both the day and night shifts were assessed for a total of 100 hours using the Observation Form of the WHO Patient Safety team.

Results: Alcohol-based hand sanitizer were used 170L per 1,000 patients. Conventional observation by ward nurses indicated that compliance with hand hygiene before touching a patient was 77%. Direct observation with the web camera indicated that hand hygiene was required 11.6 times/hour for each patient. Adherence to hand hygiene was 22.5%. Compliance with hand hygiene was 25.3% before touching a patient, 25.2% before a clean/aseptic procedure, 14.0% after body fluid exposure risk, 30.6% after touching a patient, and 11.5% after touching patient surroundings. After improved education of and practices by health care practitioners, staff were again observed for 100 hours. Adherence to hand hygiene was found to have improved to 33.8% ($P < 0.05$).

Conclusion: Direct observation with a web camera allowed video to be recorded and saved for long periods and it allowed practices to be assessed. The saved video was circulated among the health care practitioners to allow a more objective intervention.

Disclosure of interest: None declared.

P105

The consumption of alcohol-based handrub during the 2009 influenza pandemic

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BMC Proceedings 2011, 5(Suppl 6):P105

Introduction / objectives: When the influenza A (H1N1) 2009 pandemic began, the Federal Office of Public Health released and regularly updated recommendations for the Swiss population and healthcare workers. At the University of Geneva Hospitals, the recommendations for patients, staff and visitors were adjusted according to the local epidemiology, hand hygiene and mask practices were reinforced, and screening of the cases and the prescription of the antiviral treatment were performed as indicated.

Methods: Using interventional time-series analyses, we performed a transfer model with aggregated data on alcohol-based handrub (ABHR) in litres at HUG and the number of confirmed cases of influenza A (H1N1) in Switzerland as an indicator to evaluate the adherence to the recommendations from April 2009 to January 2010 on a weekly basis.

Results: A statistically significant temporal relationship was found between the ABHR consumption and the number of H1N1 cases. Each additional H1N1 case was preceded by an increase of 0.51 ABHR liters at HUG ($P < 0.0001$) on week earlier. The R2 coefficient was 96% expressing how close the observed values are to the fitted values generated by the estimated model.

Conclusion: This study shows that modelling is a useful tool, complementing traditional epidemiologic approaches, can inform policy makers about the adherence to recommendations and could be used as an indicator in the follow-up of future influenza epidemics.

Disclosure of interest: None declared.

P106

Integration of hand hygiene in health-care workers behavior

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BMC Proceedings 2011, 5(Suppl 6):P106

Introduction / objectives: Healthcare workers (HCWs) hands play a crucial role in the transmission of micro organisms. Therefore, hand hygiene is acknowledged as the single most effective measure to prevent healthcare-associated infection. However many factors are interplaying making this simple, most effective preventive action not easy to be achieved, some are related to tools and others are in direct relation to behavioral incompetence of HCWs.

Methods: In a 1000 beds university hospital in Cairo, an infection control system was founded since 1989, and hand hygiene is one of the policies implemented in all hospital departments. Since 2008, system change, from hand washing to alcohol-based hand rub, was followed. Tools were provided in the form of WHO guidelines, educational material, and supplies as alcohol-based products (dispensers and pocket bottles). On-job training and follow-up was conducted to embed the new concept of hand hygiene and to measure the compliance among HCWs (nurses and doctors).

Two hand hygiene campaigns were conducted over 2009 and 2010. The former was for two weeks and assessment using a 5-moments designed observation sheet was used to measure the compliance. The later was for one week using the first moment observation sheet of WHO.

Results: For 2009, compliance was manually calculated in six departments and it ranged from 10.8% to 89% for **moment one**, 4% to 100% for **moment two**, 86% to 100% for **moment three**, 70.9% to 100% for **moment four** and for **moment five** 61% to 100%. In 2010, automatique calculation of compliance for moment one was 48.91% in five medical departments.

Conclusion: Integration of hand hygiene in HCWs behavior needs a long persistent educational program as well as continuous assessment of level of knowledge. Regular awareness courses for both nurses and doctors and provision of tools as alcohol-based products are recommended, to help for proper behavior change.

Disclosure of interest: None declared.

P107

"Hands of fame": a new tool to improve dedication of key opinion leader for hand hygiene

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BMC Proceedings 2011, 5(Suppl 6):P107

Introduction / objectives: Compliance of hand hygiene is frequently less than optimal and heavily depends on the dedication of the key opinion leaders. There are few tools to support their role model for hand hygiene. Dedicated days, information campaigns and similar activities lead to tremendous, but short-lived impact on the hand hygiene compliance. Psychological studies have shown, that a public statement improves compliance with the statement. We therefore searched for a tool who to trigger a public long-term statement of the key opinion leaders of the hospital.

Methods: The University of Basel hospitals is a 900 bed tertiary care center with 5 Intensive CUs and kidney and bone marrow transplant program. In January 2011, all key opinion leaders of the university hospital were asked to participate in an action to imprint both their hands on a flagstone of 80x80cm. The composition of the flagstone is a composite plastic, that allows to imprint the hands, and is fixed within one hour. In addition, the names are placed on the flagstone to indicate.

Results: Of the 21 key opinion leaders, 20 participate in the study. Flagstone with the hands of the individuals were placed in the main entrance of the hospital restaurant. The names of each participant is placed on the flagstone in copper letters to remind the individual as the healthcare workers of proper hand hygiene. The half-life of the 40kg flagstone (total of 880kg transported) is approximately, 25 years.

Conclusion: Imprinted flagstones placed in the hospital area allows to motivate key opinion leaders for hand hygiene. The "hands of fame" flagstones are a new tool to remind each opinion leader on a daily basis on their commitment for hand hygiene. The long-half life of flagstones will likely exceed the lifetime of the individual.

Disclosure of interest: None declared.

P108

Using the theory of planned behavior to identify predictors of handwashing among Iranian healthcare workers

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BMC Proceedings 2011, 5(Suppl 6):P108

Introduction / objectives: The incidence of healthcare associated infections in a surgical ward in Shiraz has been established as 18% with associated costs of approx US150,000. Healthcare workers (HCWs) had acceptable levels of knowledge and attitude about hand hygiene but poor self-reported practices. We used the Theory of Planned Behavior (TPB) to identify predictors of handwashing to underpin a theory-driven intervention.

Methods: Between April and September 2008, 1700 healthcare workers (HCWs) from all wards in 18 private and 10 public hospitals in Shiraz answered a self-administered survey designed in accordance with the TPB. Multiple logistic regression analysis was used to model two handwashing for patient contacts perceived to be clean and contacts perceived to contaminate hands.

Results: 90% of HCWs returned a completed survey. Significant predictors for clean contact handwashing in the hospital included compliance with similar community practice (AOR2.1, P<0.000) and contaminated contact handwashing (AOR1.6, P<0.000), perception that clean contact handwashing required little effort (AOR1.1, P=0.039) and nursing peer pressure (AOR 1.1, P=0.025). Significant predictors for contaminated contact handwashing included clean contact handwashing compliance (AOR2.5, P<0.000), community contaminated contact handwashing (AOR1.5 P=0.001), peer pressure from ICPs (AOR1.4, P=0.001) and attitudes about contaminated contact handwashing (AOR1.1, P=0.001).

Conclusion: Community-based handwashing practices exert strong influence on handwashing in the hospital. Given the interdependence between community and hospital handwashing a campaign to improve awareness about the benefit of community handwashing may improve HCWs' compliance.

Disclosure of interest: None declared.

P109

Consultant doctors' hand hygiene: practice and perspectives

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BMC Proceedings 2011, 5(Suppl 6):P109

Introduction / objectives: Hand hygiene is considered the cornerstone of infection prevention practice, but previous studies demonstrate one group of healthcare professionals, doctors, have not achieved good levels of compliance in comparison to other staff groups. The aim of the research was to examine consultant doctors' practice and perspectives of hand hygiene and explore their perceptions as leaders and role models, so as to identify strategies to improve compliance.

Methods: The study design was based on naturalistic inquiry, focussing on the social constructions of participants. Consultant doctors (n=19) were observed during hospital ward rounds using both a national audit tool to assess hand hygiene compliance and recording of field notes. These same consultants, plus a further two (n=21), were interviewed individually to elicit their views. Data from interviews and field notes were analysed qualitatively using thematic content analysis.

Results: Observations demonstrated high levels of hand hygiene compliance for high/medium risk activities, with low levels of compliance for low risk activities. Thematic content analysis revealed a strong belief by consultant doctors in the value of hand hygiene. However, a perceived conflict between political and scientific drivers of its promotion gave rise to confusion, frustration and a lack of engagement that created barriers to leadership and acting as a role model. Differing guidelines and audit tools that did not address levels of risk compounded the matter. However, they offered various recommendations to resolve the issues.

Conclusion: Compliance with hand hygiene by consultant doctors is dependant on perceived level of risk. To promote leadership and role modelling it is critical to engage them, understand their views, employ

their recommendations and recognise they are motivated by evidence-based rationales for practice rather than political mandates.

Disclosure of interest: None declared.

P110

The challenges of hand hygiene improvement: a comparison between inpatient and outpatient units

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BMC Proceedings 2011, 5(Suppl 6):P110

Introduction / objectives: WHO Hand Hygiene (HH) Improvement Strategy Program has been implemented mostly in inpatient units. We implemented this strategy in inpatient and outpatient units.

Objective: Compare the results of HH adherence in inpatient and outpatient units.

Methods: This program was conducted in a 500-bed private hospital in São Paulo, Brazil. WHO tool was used to assess HH adherence before (Jun-Aug2008) and after the intervention (Jul-Sept2009). The inpatient units were: Medical Surgical Ward, Oncology, Neonatal and Pediatrics and outpatient were: Surgical Ambulatory, Obstetric Center, Emergency, Post Anesthesia, Diagnostic Medicine Department and Dialysis Center. Several strategies were applied – campaigns, behavioral methods, and educational programs. More dispensers of alcohol-based product were made available in areas of the hospital such as restaurants, cafeterias, waiting rooms, lounges, receptions and next to elevators.

Results: In inpatient units the overall HH adherence improved 30.8%, from 63.8% (1433/2248 opportunities) to 83.5% (2144/2567 opportunities). In outpatient units it improved 53.2%, from 39.5% (679/1721 opportunities) to 60.4% (1044/1728 opportunities). The only exception in HH improvement was physician (no increase in inpatient unit) and Obstetric Center (5% decrease).

Conclusion: The higher compliance was in inpatient units, although there was a significant improvement in outpatient units. We must develop and apply different strategies according to the needs of inpatient and outpatient units.

Disclosure of interest: None declared.

P111

Changing behavior – ensuring hand hygiene is an institutional priority

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BMC Proceedings 2011, 5(Suppl 6):P111

Introduction / objectives: In 2004 the Victorian Quality Council developed a state-wide model aiming to improve hand hygiene and reduce healthcare associated infections across Victoria. Many aspects of this culture change program have been incorporated into the National Hand Hygiene Initiative which commenced in 2008.

Methods: All 86 acute public Health Services in Victoria were funded to participate and submit three hand hygiene compliance audits per year. Education, resources and auditor training was provided. Healthcare worker hand hygiene compliance was assessed by direct observation using a tool based on the WHO 5 Moments.

In 2009 an organisational hand hygiene compliance benchmark was included in the Health Service Performance Management Framework of the Department of Health. Health Service Chief Executive Officers (CEO) were provided quarterly feedback as to their performance against the agreed benchmark, this performance was also made known between organisations.

Results: Health Services have progressively improved compliance and most recently 95% achieved the current benchmark of 65%. Feedback from Infection Control Consultants has also been positive, reporting a marked increase in executive support for the hand hygiene initiative.

Conclusion: The successful implementation and sustainability of any hand hygiene initiative requires leadership from all levels including government, health service CEO, and ownership of the program by

individual clinical areas and clinicians. Hand hygiene compliance as a performance indicator promotes executive commitment to the program and ensures hand hygiene is an institutional priority.

Disclosure of interest: None declared.

P112

Hospital hand hygiene opportunities: where and when (HOW2)?

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Introduction / objectives: The purpose of this study was to estimate hand hygiene opportunities (HHOs) in two types of hospitals – large-teaching and small-community, and three different clinical areas – medical-surgical intensive care, general medical wards, and emergency departments.

Methods: Hand hygiene opportunity data were collected through direct observations using the World Health Organization's (WHO) monitoring methodology. Estimates of HHOs were developed for 12-hour AM/PM shifts and 24-hour time frames.

Results: During 436.7 hours of observation, 6640 HHOs were identified. Estimates of HHOs ranged from 30 to 179 per patient day on inpatient wards and 1.84 to 5.03 per bed hour in emergency departments. Significant differences in HHOs were found between the two hospital types and between the three clinical areas.

Conclusion: This study is the first to use WHO data collection methodology to estimate HHO in general medical wards and emergency departments. These data can be used as denominator estimates to calculate hand hygiene compliance rates when product utilization data are available.

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Healthcare students' hand hygiene knowledge, beliefs and practices

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Introduction / objectives: Hand hygiene (HH) compliance reduces the incidence of nosocomial infection, however, little research has been conducted on factors that influence healthcare students' HH practices. The study aims were to examine the relationships between healthcare students' HH knowledge, beliefs and practices, the ways they were educated and assessed on HH, and their perceptions of the importance given to HH in the curriculum.

Methods: A HH questionnaire was administered to 1485 nursing and medical students from 19 universities in Australia, Sweden and Greece. The General Linear Model was used to examine the relationships between study variables.

Results: Knowledge scores were significantly influenced by the frequency of HH assessment and the number of methods used to teach HH ($F=3.2$; $p=.04$). HH practices were significantly influenced by HH beliefs, knowledge, assessment frequency, number of teaching methods, perceptions of the importance of HH as an infection control measure and the importance given to HH in the curriculum ($F=84.7$; $p<.01$), although HH beliefs were the greatest predictors of practice. Hand hygiene beliefs were significantly influenced by HH knowledge, by students' perceptions

of the importance given to HH in the curriculum and by supervisors and facilities, and the importance of HH as an infection control measure ($F=46.3$; $p<.01$).

Conclusion: While repeated HH education and assessment offers a means of improving undergraduate health care students' HH knowledge and practices, students' beliefs about HH had a greater impact on their HH practice than their HH knowledge did. Encouraging more positive HH beliefs may be a more effective way of improving HH practice.

Disclosure of interest: None declared.

P114

The WHO glove use pyramid: knowledge gaps among Belgian nurses

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Introduction / objectives: Appropriate glove use is a cornerstone in effective hand hygiene programs. Nurses' knowledge regarding appropriate glove use has only rarely been studied in Belgium.

Methods: We developed a questionnaire based on the WHO glove use pyramid. The pyramid was used as campaign material for the most recent national hand hygiene campaign (end of campaign May, 2009). The final questionnaire contained 36 glove use indications with four response alternatives: "no gloves indicated", "non-sterile gloves indicated", "sterile gloves indicated" and "I do not know". Demographic data such as sex, age, years of nursing experience and type of ward where respondents worked, were also collected. The questionnaire was completed during class by nurses following a Bachelor-after-Bachelor's course in the spring of 2009.

Results: The questionnaire was filled out by exactly 100 nurses (response 100%). Maximum score was 94%, minimum 22%. The median total knowledge score (score_{TOT}) was 81% (IQR 75-86). Some of the most striking gaps in knowledge were;

- 18% do not wear gloves when performing a venal puncture
- 37% wear gloves when providing basic hygienic care and 18% wear no gloves when performing genital care (as a part of hygienic care)
- 29% will manipulate vascular catheters without gloves, 24% use sterile gloves
- 58% prepare cytostatics with non-sterile gloves

The median score_{TOT} for all acute care wards was 81% (IQR 78-85), respondents providing chronic or extramural care scored 75% (IQR 71-83). This difference was statistically significant (Mann whitney U test $P<0.001$).

Conclusion: We identified several knowledge gaps concerning appropriate glove use in Belgian healthcare workers. Nurses working in acute care wards scored significantly higher compared to nurses working in other wards.

Disclosure of interest: None declared.

P115

Surveying awareness of hand hygiene guidelines in the Sanin region of Japan

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Introduction / objectives: Given the history of the 2002 CDC guidelines usage in Japan, we surveyed the awareness and adoption of WHO Guideline on Hand Hygiene in Health Care published in 2009, particularly the Five Moments of Hand Hygiene tool by healthcare workers (HCWs) in Japan.

Methods: A questionnaire survey was conducted on 64 HCWs at the Tottori Prefecture Healthcare Associated Infection Control Seminar held on November, 2010.

Results: The rates for awareness on the WHO and CDC hand hygiene guidelines were 26 (41%) and 28 (44%) of HCWs, respectively. 14 (22%) of HCWs were able to explain the WHO Five Moments of Hand Hygiene tool when asked, and 13 (20%) had seen the tool but could not explain its meaning. The subject HCWs had reported being introduced to the WHO

guideline tools through publications, reviews in Japanese scholarly journals and in seminar presentations. The rest (58%) had no prior knowledge of the tool. All the subjects had never read the WHO guideline in English or a Japanese translation. However, 6 (9%) of the subjects had read the CDC guidelines. In addition, 43 (67%) of HCWs were willing to read the WHO guideline if a Japanese translation were available. There were many reasons why the survey subjects had not read the WHO Guideline, but the foremost reason was the lack of a Japanese translation.

Conclusion: During this investigation, we found that the HCWs who were aware of the new WHO guideline identified it with the included tools such as the 5 Moments of Hand Hygiene illustration, suggesting the strong impression of visual aids for HCW workplace education. Our results showed that many Japanese HCWs were willing to consider the WHO guidelines if a Japanese translation were available, which is thought to be necessary in releasing a Japanese translation of high quality as soon as possible and fostering faster adoption throughout the country.

Disclosure of interest: None declared.

P116

Improving hand hygiene: thinking outside the bottle

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Introduction / objectives: Hand hygiene is an integral aspect of infection control. The provision of Alcohol Based Hand Rub (ABHR) gel at patient bedsides has made effective hand hygiene (HH) more convenient for Health Care Workers (HCWs) by overcoming two of the main 'barriers' to HH- time and distance to sinks, by placing the bottles at the point of patient care. The ABHR bottles, being novel, ubiquitous and usually brightly coloured, were originally very effective in cuing HCWs to observe HH. In the years since their introduction, these attributes have not translated into HH rates much above 60%. This suggests that AHR bottles may not have retained the cue to memory they originally held.

Methods: A series of direct observations and interviews with HCWs have suggested that the ABHR bottles, in the modern, busy patient environment are not as noticeable as they once were. Even if they are brightly coloured bottles, HCWs have become inured to their presence. We drew upon the practice of commercial manufacturers of similar products- like liquid soap and shampoo. They constantly modify and refresh the external attributes of their products to maintain their profile in the public eye. We developed a study to test whether such an approach could have the same effect in a clinical setting. We developed a study which involves modifying the external attributes of the ABHR bottles to refresh them in the eyes of HCWs- and test whether they can improve HH rates as a result of these modifications. In addition to measuring HH compliance rates, it will have a qualitative aspect to gauge the perceptions of HCWs taking part in the study.

Results: The study will begin at a Sydney teaching hospital in May 2011.

Conclusion: This study will determine whether this novel approach can assist and support HCWs in complying with HH protocols.

Disclosure of interest: None declared.

HAND HYGIENE II: IMPROVING COMPLIANCES

P117

National observational study to evaluate the Cleanyourhands campaign (NOSEC) in England and Wales 2004-8: a prospective ecological interrupted time series

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Introduction / objectives: WHO SAVE LIVES initiative offers nations a multimodal hand-hygiene intervention. England & Wales rolled out similar

intervention, the Cleanyourhands campaign (CYHC) (bedside alcohol hand-rub (AHR), posters, audit & patient empowerment) to all 187 acute hospitals. We report results of independent study evaluating its national effectiveness & sustainability.

Methods: 6 questionnaires (5 voluntary, last mandatory) assessed CYHC implementation & sustainability every 6 months. Quarterly data on MRSAB, MSSAB & CDI, procurement soap & AHR, hospital type & bed occupancy collected for each hospital with data on other national infection control interventions Mixed effects Poisson regression model assessed associations between procurement & HCAI rates, testing for hospital heterogeneity.

Results: Questionnaire response rates fell from 134 (71%) at 6 months to 82 (44%) at 30 months, rising to 167 (90%) for final mandatory one. No evidence attritional/ selection bias. Widespread early implementation bedside AHR & posters. At 36 months, 90% respondents reported CYHC a top hospital priority, with implementation of AHR, posters & audit reported by 96%, 97% and 91% respectively.

Combined soap & AHR procurement rose from 22 to 60mls/bed day. MRSAB rate fell from 1.88 to 0.91 cases/10000 beddays & CDI from 16.75 to 9.49. MSSAB did not fall.

Each extra ml/bed-day of AHR associated with 1.3% reduction MRSAB: IRR 0.987 (0.983, 0.991) $p < .0001$. Each extra ml soap associated with 0.33% reduction CDI (IRR 0.997 [0.995, 0.998] $p < 0.0001$). Associations remained after adjusting for other variables significantly associated with reductions MRSAB & CDI: publication of Health Act & Department of Health Improvement Team visits.

Conclusion: The CYHC appears to have been widely implemented & sustained. Strong associations found between procurement AHR/soap & reductions in MRSAB & CDI, that remained after adjustment for other variables & interventions. Campaign's central funding & co-ordination and high profile political drive may affect its generalisability but may provide model for other countries to adopt to implement WHO SAVE LIVES initiative.

Disclosure of interest: S. Stone Grant/Research support from GOJO.

P118

Increase of alcohol based hand rub consumption in hospitals participating in the German surveillance system

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BMC Proceedings 2011, 5(Suppl 6):P118

Introduction / objectives: A new national surveillance system (HAND-KISS) of alcohol based hand rub consumption (AHC) in hospitals was implemented to the German national nosocomial infection surveillance system (KISS) in the year 2008. We analyzed the differences of AHC increase of hospitals over three years.

Methods: All hospitals participating in HAND-KISS send annually unit based AHC data to the HAND-KISS module. HAND-KISS is calculating AHC in Milliliter per patient day (ml/PD) stratified by specialty and by intensive care units (ICU's) and Non-ICU's. Reference data and the AHC distribution of 129 hospitals that provided baseline data in 2007 and follow up data in 2008 and 2009 were calculated. We grouped AHC baseline data of 2007 in quartiles and tested changes of AHC over three years between these groups using the Kruskal-Wallis-test. The following settings were analyzed: whole hospitals, ICU's only and Non-ICU's.

Results: 129 hospitals including 1659 units have consequently provided AHC data for the years 2007 to 2009. The overall median AHC increase from 2007 to 2007 was 30.7% ($p < 0.005$), 21.5% for Non-ICU's ($p < 0.005$) and 36.5% for ICU's ($p < 0.005$). We did find significant difference in AHC change between the defined quartiles analyzing ICU's only ($p < 0.001$) in contrast to whole hospitals ($p = 0.21$) and Non-ICU's ($p = 0.173$).

Conclusion: AHC is a surrogate parameter to characterize hand hygiene behaviour in different settings. ICU's starting at a low level of AHC achieved a significant higher increase of AHC. Overall, our results show that there is room for improvement in all analyzed settings, irrespective of level of baseline AHC.

Disclosure of interest: None declared.

P119

Comparing short term and sustained effects of two strategies to improve nurses' adherence with hand hygiene prescriptions: a cluster randomised trial

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BMC Proceedings 2011, 5(Suppl 6):P119

Introduction / objectives: Improving hand hygiene (HH) compliance is still a major challenge. We compared a literature based 'state of the art' strategy with a 'team directed' strategy, based on social influence and leadership, on their effectiveness on HH compliance.

Methods: We undertook a cluster randomised trial with inpatient wards as the unit of randomisation. The 'state of the art' strategy (SAS) included education, reminders, feedback and targeting adequate products and facilities. The 'team directed' strategy (TD) also contained activities based on social influence and leadership, gaining active commitment and initiative of ward management, modelling by informal leaders, and setting norms and targets within the team. Strategies were delivered during a period of 6 months. Measurements took place directly before and after strategy delivery and 6 months later. The effects were evaluated on an intention-to-treat basis by comparing the post-strategy hand hygiene compliance rates with the baseline rates. Multilevel analysis was applied to compensate for the clustered nature of the data by using mixed linear modelling techniques.

Results: The SAS showed a short-term improvement of 19,6% and a long term improvement of 23,7%. The improvement for the TD was 33,7% (short term) and 33.1% (long term). The difference between TD and SAS showed an Odds Ratio of 1.641 ($p < 0.001$) in favour of the 'team directed' strategy.

Conclusion: Both the 'state of the art' strategy and the 'team directed' strategy successfully improved hand hygiene compliance, but the 'team directed' strategy showed even better results. The methodology of this 'team directed' strategy can also be used to improve team performance on other patient safety issues.

Disclosure of interest: None declared.

P120

Discrepancy between self-reported and observed hand hygiene behavior in nurses and physicians

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Introduction / objectives: The most effective method to promote health care workers' Hand Hygiene (HH) is observation and combined with an investigation of perceptions concerning HH further increases effectiveness.

Methods: Data were collected at a university hospital in Japan. Nurses and physicians' perceptions regarding their own HH adherence were measured using an anonymous questionnaire based on the World Health Organization's (WHO) "Five Moments for Hand Hygiene." The respondents were asked about their HH adherence in each of the five situations, and the responses were made using a 5-point scale (0%, 25%, 50%, 75%, and 100%). For the analysis, these data were converted into points (0, 1, 2, 3, and 4, respectively). Observations were performed in 17 ordinal wards and 4 intensive care units.

Results: A total of 137 questionnaires were returned from 126 nurses and 11 physicians. The nurses' mean self-reported HH adherence scores for 1) before touching a patient, 2) after touching a patient, 3) after touching a patient's surroundings, 4) before an aseptic/clean procedure, and 5) after a risk of body fluid exposure were 2.59, 3.02, 2.25, 3.63, and 3.72, respectively, while the physicians' mean scores were 3.27, 3.45, 2.64, 3.91, and 3.91, respectively. The observed nurses' adherences were 62.0%, 72.8%, 43.0%, 70.8%, and 87.4%, respectively, while the physicians' adherences were 25.4%, 52.8%, 42.9%, 34.8%, and 96.5%, respectively. Seventy-three percent of the HH failures among physicians before the performance of an aseptic/clean procedure were due to glove use.

Conclusion: The self-reported HH adherence and the observed HH adherence were measured for nurses and physicians. The observed adherence before an aseptic/clean procedure was lower than the self-reported adherence, especially among physicians. This was due to glove use.

Disclosure of interest: None declared.

P121

Significant heterogeneity in hand hygiene compliance between different physician groups

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BMC Proceedings 2011, 5(Suppl 6):P121

Introduction / objectives: Although hand hygiene (HH) is known to be the single most important factor to reduce healthcare acquired infections, studies of HH compliance in health care workers (HCWs) has been reported to be between 30-50%. Physician HH compliance is consistently lower than other HCWs. Whether the physician group is homogeneous with regard to HH compliance is uncertain. This study examines the HH compliance between different physician groups.

Methods: Designated auditors were trained to perform HH audits in all inpatient and long term care units of our 1185-bed academic tertiary medical centre. The auditors used a standardized validated tool to audit HCW's HH during their patient interactions. The physician group was separated into 3 categories according to their seniority: staff physician, resident/fellow physician and medical student. When the auditors are unsure which category a physician belongs to, they ask for verbal confirmation. The HH compliance of the three physician groups was compared.

Results: Between Oct 2010 and Feb 2011, a total of 8337 HH opportunities were observed. 1292 (15%) opportunities were observed in the physician group: 486 opportunities were observed in staff physicians, 693 in resident/fellow physicians, and 113 in medical students. The overall average hospital compliance was 79%; overall physician group compliance was 65%. Among the physician group, staff physicians compliance was 71%, resident/fellow physicians was 61% and medical students was 67%. The difference between staff physicians and resident/fellow physicians was statistically significant.

Conclusion: There is marked heterogeneity in HH compliance between staff physicians and resident/fellow physicians. The capability to detect such differences is important to direct compliance improvement efforts, with the goal of improving overall HH compliance.

Disclosure of interest: None declared.

P122

Institutional involvement in the campaign for hand hygiene

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Introduction / objectives: The 14th Sanitation Campaign in 2010 had occurred since the planning, execution and finishing with the participation and institutional support. Through the stimulus coming from the oversight and development of a plan of action organized by the of Infection Control Service involving multiple organizational levels, were put into practice the strategies designed to raise awareness of the importance of hand hygiene.

Methods: This is an experience in a General Hospital, where among the planned activities were encouraged employee participation in the contest for creating a video simulating the technique of hand washing. The disclosure came through the opening event of the annual campaign that brought the video as a reference made by WHO in the same year. By distributing brochures emphasized the regulation considering an interval of three months for delivery of video and awards. Equipment such as video cameras became available and the evaluation of the videos came about through a jury.

Results: Six videos were entered in the contest, had the participation of 42 employees. The videos were presented to members of the Superintendent, SCIH, Marketing and Research and Education. The criteria were: use of the technique of hand washing, use of image, sound, design and evaluation of the material as a means of institutional promotion. After the presentation and selection of the winning video, awards were extended to all employees who participated.

Conclusion: Events like this do not replace regular training courses aimed at training of all employees, but call attention to the issue and lead institutional involvement on the basis of a need that is intended to provide safety to the patient against the risk of hospital infection.

Disclosure of interest: None declared.

P123

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BMC Proceedings 2011, 5(Suppl 6):P123

Introduction / objectives: Hand hygiene belongs to the basic components of any infection control program. Compliance is still an important issue, but the hand hygiene technique has gathered little attention. Proper technique of hand hygiene significantly improves bacterial killing, but few studies addressed this issue.

Methods: The University of Basel hospitals is a 900 bed tertiary care center with 5 Intensive CUs and kidney and bone marrow transplant program. After introduction of the alcoholic hand rub in 1970, hand washing has been replaced with the alcoholic hand rub in >90%. Since 2007, health care workers and medical students are routinely trained to apply the proper technique.

Results: 1'030 observations were made in different wards, emergency rooms, ICUs and transplant units. Overall compliance with all 6 steps was 13.4%. The steps focusing on the fingertips and the thumb were frequently missed, namely 83-90% for nurses and 95-97% for physicians ($p < 0.05$).

Conclusion: The compliance with hand hygiene technique requires more focus and training: the thumb and the fingertips are frequently not adequately in contact with alcohol. Several techniques have been proposed, but basic training should ensure that the fingertips and the thumb are not missed during the alcoholic rub-in.

Disclosure of interest: A. Widmer Grant/Research support from Ecolab, Switzerland, Speaker's Bureau of 3m, Switzerland.

P124

Improving hand hygiene compliance in Singapore via innovation

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BMC Proceedings 2011, 5(Suppl 6):P124

Introduction / objectives: The National University Hospital (NUH) is a 997 bed acute tertiary hospital. In 2006, we embarked on a MRSA prevention bundle, the cornerstone of which was a hand hygiene (HH) compliance programme.

Methods: HH is a standard for NUH hospital accreditation. In 2007 it became an internal key performance area with alcohol hand rub fitted to the foot of all beds. HH audits, using the WHO toolkit were conducted by Infection Control Liaison Nurses across hospitals, medical students and staff from our partner health cluster. Ward-specific audit results were displayed publicly in wards. Poor results were reported to nominated senior clinical 'HH Champions'. Good compliance results were recognised by the senior leadership. In 2009, a one week training programme demonstrated the WHO 5 moments for HH and the 6 steps to 4000 staff. HH competence was determined with UV lights and "glogerm". Staff signed a contract and pledged to compliance. Movement activated audio reminders were placed on 3 wards along with posters, hospital wide. On May 5, 2010, a media campaign was launched with a 13 metre high sign posted at the NUH's façade and internal events including awards and a roaming hand mascot.

Medical and nursing students undertake compulsory HH audits. Candidates in the final medical student (MBBS) clinical examination lose marks for failed compliance.

Results: We published HH compliance rates of 16% in 2006. Through 2010, our rate was 64% with about 1000 observed opportunities/month. Our hand rub purchases increased significantly from 391 units (sd 87) in 2006 to 1760 (sd 308) in 2010.

Conclusion: HH compliance requires active commitment from all, particularly top management. Formal and informal education, stringent audits, public displays and senior management support has significantly raised the HH compliance in NUH.

Disclosure of interest: None declared.

P125

Creativity in hand hygiene program

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Introduction / objectives: During SARS, high compliance in healthcare workers to hand hygiene was primarily driven by fear. However, the post-SARS period confirmed that this practice was not sustainable. At the Singapore General Hospital, a 1600-bedded acute tertiary care hospital, the hand hygiene program was revised in late 2006 following Singapore's signing of the pledge to the WHO "Clean Care is Safer Care" program.

Methods: The WHO audit tool was used in the measurement of hand hygiene compliance from 2007. Innovative education and prominent cues to action were initial building blocks used in transforming behaviour. Creative use of posters, stickers, advertisements on shuttle buses help to create awareness in staffs, patients and the public. A giant poster placed on one of the hospital walls is a strong public statement expressing the hospital's commitment to patient safety through good hand hygiene practices. Incentives in the form of handphone straps, magnets, bookmarks and vouchers given to staffs are other innovative means of staff engagement. The program was enhanced further with system changes, evaluation and feedback; and the fostering of institutional safety climate. Annually, the WHO Hand Hygiene day on 5 May was observed with creative fun activities involving both staffs and public.

Results: Hand hygiene compliance rate improved from 20% (2007) to 61% (2010). Improvement was also seen annually in the compliance to each of the 5 moments as well as in all staff categories. Healthcare-associated MRSA infections was reduced from 0.6 (2007) to 0.3 (2010) per 1000 patients days.

Conclusion: Leadership's support of the program through its visible presence, messaging and release of resources is the key factor in helping to make the program a true success. The hospital was recognised as a Global Hand Hygiene Expert Centre in January 2011.

Disclosure of interest: None declared.

P126

Hand hygiene improvement program in the Canary Islands, Spain

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BMC Proceedings 2011, 5(Suppl 6):P126

Introduction / objectives: To describe the evaluation of a coordinate campaign on hand hygiene (HH) improvement in the Healthcare System in the Canary Islands after the first year of implementation.

Methods: Setting: Ten public healthcare hospitals. A core team with a plan for implementation was set at the beginning.

Intervention: Implementation of the WHO multimodal strategy for improving HH.

Measures: Direct observation of hand hygiene for 1 and 2 moments (before patient contact and before aseptic task) in emergency and intensive care units and consumption of alcohol-based products for hand rub (liters / 1000 patient-days) every six months in two six-month's period. Training was performed in each facility.

Results: Alcohol-based hand rub products were made available at each centre. 1730 dispensers accounted for the 3861 available beds (44,8%). Seven out of ten hospitals implemented training about HH, but just four centers trained about the concept of "My Five Moments for Hand Hygiene". Medical doctors had the lowest level of attendance.

Eight out of ten hospitals have performed direct observation of compliance. Overall rate: 33,3%, (29,7% the first period; 35,9% for the second ($p < 0,05$)).

Alcohol-based products were used in 49,6% of occasions in which actions of HH occurred. The consumption ranged from 18,1 to 39,2 L/ 1000 patient-days (average 27,3 mL/1000 patient-days). Reminders were used and a local guide was performed and released.

The core team met in four occasions. Each facility was required to address a clear plan of activities for 5 May 2010. All centers have had registered to the 2009 WHO initiative "Save Lives: Clean your hands".

Conclusion: A clear improvement in HH practices was achieved. In order to get sustainability, new activities including clear commitment of leaders, patient involvement, and a system for ensuring HCW training are required.

Disclosure of interest: None declared.

P127

Effects of HH education program on HH compliance among empolyses working in a tertiary care setting in Saudi Arabia

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BMC Proceedings 2011, 5(Suppl 6):P127

Introduction / objectives: King Abdulaziz Medical City conducted a pilot study monitoring the rates of HH compliance among healthcare workers over time.

Methods: Two phases were identified. The **pilot phase**, where HH compliance was monitored in adult ICUs during a baseline period and again during a follow up period; and the **implementation phase** where monthly and quarterly feedback of HH compliance was provided.

Results: A total of 1,658 HH opportunities were observed during the pilot phase and more than 55,000 opportunities were monitored over the next 2 years of implementation. Compared to baseline, rubbing increased (63.8% to 85.0%) while washing decreased (36.2 to 15.0%) during the follow up period ($p < 0.001$). Baseline HH compliance rate was 45.3% and 76.1% thereafter. With an absolute improvement of 30.8% and relative improvement of 68.0%. The absolute improvement of compliance rate (average 30.8) was highest among nurses (34.6%) followed by other HCWs (28.0%) and finally doctors (21.9%). All HH indications had significant improvements with the exception of HH after body fluid exposure.

Conclusion: The initial improvement observed at the pilot phase of HH program at KAMC was maintained and actually improved.

Disclosure of interest: None declared.

P128

Hand hygiene compliance at neonate intensive care unit in a Brazilian hospital

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BMC Proceedings 2011, 5(Suppl 6):P128

Introduction / objectives: Several factors influence compliance to hand hygiene (HH) and different variables can be evaluated to improve quality of care assessment, incentive for performance improvement, outbreak investigation and infrastructure design.

Objective: To describe the general compliance to HH associated with variables of interest in a study of direct observation (DO) in a Neonate Intensive Care Unit (NICU) in a University Public Hospital.

Methods: DO was performed by 10 observers. Variables were # beds, # health care workers, professional category, type of opportunity, day of week, time of the day and product used. Statistical analysis used software Stata and SPSS for Windows.

Results: A total of 7,324 opportunities for HH were identified during 255 1 hour DO periods from December 2008 to March 2009. Overall compliance rate 50.2%. 69.5% for medical doctor (MD), 60.8% for other professionals (OP), 48.7% for nurses (RN) representing respectively 10.8%, 12% and 70.3% of all opportunities. Highest compliance was before aseptic procedure for MD and OP (100% for both) and after touching patient surroundings for RN (73.1%). Lowest compliance was after patient contact for all categories: 52% (MD), 42.7% (OP) and 36.7% (RN). 55% of HH were performed with soap and water, 23.1% with alcohol-based hand rub (ABHR) and 21.9% with soap and water followed by ABHR.

Conclusion: DO study results indicated that the NICU did not follow CDC 2002 guideline recommendation for HH. Compliance may be improved by focusing on the opportunities to perform HH using ABHR products.

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P129

Challenges for hand hygiene in a private hospital multi-cultural setting, Saudi Arabia

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BMC Proceedings 2011, 5(Suppl 6):P129

Introduction / objectives: The awareness of hand hygiene in a complex medical setting has been historically emphasized; however, more recently, hand hygiene has been strongly linked with healthcare associated infections to the point where insurance companies have declined coverage in many countries.

Methods: In Saad Specialist Hospital, we have been strongly proactive since the facility opened its doors in 2001. Following the publications has been a challenge to our Infection Control Team and Committee. Supported by the IPSC and IHI has shown hand hygiene plays a major role in HAIs and has stimulated the IC team to adopt the detailed process of "5 Moments of Hand Hygiene" and incorporate the recommendations of WHO into all disciplines throughout the facility. We have assessed products, the location of sanitizers, and installing sanitizers at the "point of care", including the OP Clinics.

Results: Intense teaching has been ongoing for over one year, however, it is difficult to attain and sustain our overall IHI goal of greater than 90% compliance. We have looked at different methods to increase awareness including giving certificates to units who have achieved over 90% for 3 or more months. At the end of each year, we have awarded a trophy to the highest scored unit sustaining the goal. We have called this the "Simmelwis Award", hence paying tribute to a great pioneer that has led us by hand to a healthier healthcare setting.

Conclusion: By showing the changes that have taken over the past year, utilizing unit staff to audit their own units, has increased the awareness and compliance. We can show that consistent hand hygiene has definitely decreased the healthcare associated infections.

Disclosure of interest: None declared.

P130

Testing of the WHO hand hygiene self-assessment framework

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BMC Proceedings 2011, 5(Suppl 6):P130

Introduction / objectives: The Hand Hygiene Self-Assessment Framework (HHSF) was conceived by the WHO 1st Global Patient Safety Challenge as a systematic self-assessment tool to provide a situation analysis of hand hygiene (HH) resources, promotion and practices within healthcare facilities.

Methods: Development consisted of three phases: initial drafting, usability testing and reliability testing. The HHSF draft was developed by a team of experts, based on the key elements of the WHO multimodal HH improvement strategy. For usability testing, 42 HC facilities were invited to score their facility and complete a feedback survey. For inter-rater reliability testing, two users in each facility independently completed the HHSF. The reliability of each indicator, component sub-total and the overall score was estimated by using the variance components model. After each phase, the tool was examined with regard to the need for modification.

Results: 27 indicators were selected during drafting. 26 facilities in 19 countries responded (62% response rate) for usability testing. Results reflected a broad range of HH promotion and practice with total scores ranging from 35-480 (mean, 262). The HHSF took <2 hours to complete for 21 facilities. The majority agreed that the HHSF was "easy to use" (23/26) and "useful for establishing facility status with regard to HH promotion" (24/26). Complete reliability responses were received from 41 facilities in 16 countries. The reliability for the total score for the HHSF and the subtotal of each of the five components ranged from 0.54 to 0.86.

Seven of the 27 indicators had poor reliability; these were examined for potential flaws and modified accordingly.

Conclusion: Results support the usability and reliability of this tool in the promotion of HH in healthcare.

Disclosure of interest: None declared.

P131

Use of the WHO hand hygiene self-assessment framework tool in Dutch hospitals

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Introduction / objectives: Recently, the WHO First Global Patient Safety Challenge team launched its newest tool, the Hand Hygiene Self-Assessment Framework, a validated tool to assess hand hygiene promotion and practices in health-care facilities (http://www.who.int/gpsc/country_work/hhsa_framework/en/index.html). Aim of the present study is to access the hand hygiene status-quo of Dutch hospitals.

Methods: A working party of members from the Dutch Society of Infection Control Practitioners and the Dutch Society for Medical Microbiology decided to use the WHO's self-assessment as a tool to progress hand hygiene promotion in the Netherlands. The framework tool was transformed into an on-line tool (e-trinity, Belgium) that allows data collection and automatic feed-back to all participants. Clinical microbiologists and infection control practitioners were contacted with support of the professional societies.

Results: The survey is planned for the beginning of April 2011 in order to use the data for national hand hygiene promotion on the 5th of May. The working party expects a 50% response rate, thus is aiming at data from at least 50 of the 100 hospitals of the country. Individual hospitals/participants receive their score automatically via the electronic system. Members of the working party will anonymously evaluate the combined national data.

Conclusion: The Dutch are part of a minority of countries that after signing the WHO pledge did not engage into a national campaign. In addition, a recent study showed that the compliance with the 5 moments of hand hygiene is one of the lowest internationally reported (19%). The results of the self-assessment framework tool should help to better advance future hand hygiene campaigns.

Disclosure of interest: None declared.

SLIDE SESSION: MULTI-DRUG RESISTANT GRAM-NEGATIVES I

P132

INCF plasmids responsible for dissemination of *bla*_{KPC} gene among enterobacteriaceae

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Introduction / objectives: In recent years, carbapenem resistance has emerged among *Enterobacteriaceae* in many geographical locations due to *Klebsiella pneumoniae* producing KPC carbapenemase. The aim of this study was to characterize the genetic elements involved in *bla*_{KPC} gene mobilization and diffusion.

Methods: A total of 22 isolates, *K. pneumoniae* (n=20), *Escherichia coli* (n=1) and *Enterobacter aerogenes* (n=1), were collected from a university hospital, in Lisbon, Portugal. MIC were determined by Etest and interpreted according to Clinical and Laboratory Standards Institute guidelines. PCR was performed with primers designed to amplify *bla*_{SHV}, *bla*_{TEM} and *bla*_{KPC} genes.

Molecular typing was performed by M13-PCR fingerprinting and in representative strains by Multilocus Sequence Typing (MLST). Replicon typing was used to define plasmid incompatibility groups (Inc).

Results: Twenty-two isolates had MIC ranging between 2 and 32 mg/L for imipenem and meropenem. All isolates encoding KPC-3. Associated to carbapenemase 7 isolates encoded for TEM-1 or SHV-1 and 6 isolates for both TEM-1 and SHV-type. Although M13-PCR fingerprint analysis showed four predominant profiles, but with MLST only one sequence type ST11 was found among *K. pneumoniae* isolates. The predominant plasmid was included in IncF (90.5%) and was found plasmids belong to different replicons FIC (52.4%), HI1, HI2, and I1-1γ (47.8%), T (42.8%), FIIAs (33.3%), W and P (32.8%) and FIB (9.5%).

Conclusion: The *bla*_{KPC} gene, often associated with other β-lactamases, was transferred between *K. pneumoniae*, *E. aerogenes* and *E. coli* strains by IncF group plasmid. The clustering of resistance genes in plasmids and their organization with regard to cotransfer underlines the importance of these plasmids in the spread of antimicrobial multiresistance.

Disclosure of interest: None declared.

P133

Prevalence of carriage of ESBL producing enterobacteriaceae in a Dutch teaching hospital

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Introduction / objectives: The prevalence of Extended Spectrum Beta-Lactamase producing Enterobacteriaceae (ESBL-E) is rapidly increasing worldwide. This study aimed to determine the prevalence of ESBL-E carriage in hospitalised patients and the relative contribution of nosocomial acquisition.

Methods: In November 2010, a prevalence survey was performed in all patients that were hospitalised in a Dutch teaching hospital by taking rectal swabs. Swabs were placed in a selective broth and incubated overnight. A subculture on a selective agar (EbSA, Cepheid) was performed. Species identification and susceptibility testing was performed for all isolates that grew on the EbSA agar using Vitek 2 (bioMérieux). For ESBL-suspected isolates (MIC ceftazidime and/or cefotaxime >1 ug/ml) the presence of ESBL was confirmed using the combined disk diffusion method for cefotaxime and ceftazidime, both with and without clavulanic acid (Rosco). Raman Spectroscopy (SpectraCell RA) was used to determine the similarity between the ESBL-E isolates.

Results: Rectal swabs were obtained from 559 of 668 (84%) hospitalised patients. The prevalence of ESBL-E carriage was 4,5 % (25/559). *E. coli* was the predominant species (96%). Age, sex, stay on the ICU, and length of hospital stay were not statistically significantly associated with ESBL-E carriage. Raman Spectroscopy revealed that 88% (22/25) of ESBL-E were unique isolates. One cluster of three patients was identified, and two of these patients could be epidemiologically linked.

Conclusion: In conclusion, the observed prevalence of ESBL-E carriage of 4.5% in hospitalised patients is unexpectedly high considering the previously reported ESBL-E rates in the Netherlands. Only one case of nosocomial transmission was found, indicating the presence of an extensive and diverse reservoir of ESBL-E in the community.

Disclosure of interest: None declared.

P134

Fecal carriage of multiresistant bacteria versus infection in ICU wards patients

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Introduction / objectives: Healthcare-associated infections (HAI) constitute major health care problem from their frequency, cost and gravity. Fecal carriage of extended-spectrum beta-lactamase (ESBL)-producing isolates has mainly been detected in HAI, and few studies have evaluated fecal carriage during non-outbreak situations and among

patients in the community. This study was undertaken to determine the spectrum of bacterial colonization and predisposing risk factors in patients being admitted to an acute care hospital, Lisboa, with special emphasis on ESBL producing Gram-negative bacteria.

Methods: To decrease HAI some active preventive measures were taken since November to February 2010. Nasal, oral and rectal swab samples were collected and processed for isolation of ESBL on chromID ESBL (bioMérieux).

Results: Bacterial colonization of one or more sites on admission was detected in 37 patients included in the study. The most common colonizers were *Escherichia coli* (n=10); *Pseudomonas aeruginosa* (n=9); *Klebsiella pneumoniae* (n=8) and *Enterobacter cloacae* (n=7), with simultaneous colonization in six patients. Seven patients were colonized and infected (blood, urine and bronchial secretion) with the same species identified from rectal swab. After one month of admission at ICU two inpatients were infected (catheter and pus) with *P. aeruginosa* and *Stenotrophomonas maltophilia* present at admission in hospital.

Conclusion: This study alerts medical professionals that should be aware of these isolates, should continue strict hygiene procedures and, additionally, should implement an ESBL screening system, in particular for faecal carriage, in order to prevent possible outbreaks caused by these multi-resistant organisms.

Disclosure of interest: None declared.

P135

Laboratory antimicrobial resistance surveillance: extend spectrum beta lactamase (ESBL) producing *E. coli*

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Introduction / objectives: This study aims to investigate the prevalence of ESBL producing *E.coli* in urinary tract nosocomial and community acquired infections of Isfahan selected hospitals.

Methods: The present study was performed at four tertiary care hospitals in Isfahan, Iran. During a 14 month period (Jun, 7th,2008 to July,6th,2010).690 of *E.coli* isolated from urinary tract infection were studied. 425 of *E.coli* isolated from community acquired and 265 isolated from nosocomial urinary tract infection were evaluated. Standard microbiological methods were performed (according to CLSI 2006). In order to validate the extended-spectrum beta-lactamases (ESBLs) producing strains were used by disk diffusion method. The collected data was analyzed thorough whonet 5.6 software.

Results: The prevalence of ESBLs producing *E.coli* isolated from community acquired urinary tract infection came out to be 17% and 58% for urinary tract nosocomial infection respectively (P<0.001). The antibiotic resistance rates of isolated in nosocomial and community UTIs were 94.9% and 84.4% to ampicillin. (P<0.01), 59.4% and 19.7% to ceftazidime, 64.2% and 19.8% to cefotaxime, 62.5% and 12.2% to ceftizoxime 60% and 18.6% to gentamicin. (P<0.001), 17% and 8.2% to amikacin, and 40.8% to Nalidixic acid, 23.1% and 10.2% to nitrofurantoin, 47.5% and 31.4% to ciprofloxacin and 84.4% and 60.1% to trimethoprim/sulfamethoxazole (p<0.005).

Conclusion: Establish systems for monitoring antimicrobial resistance in hospitals and the community and link these findings to resistance and disease surveillance data is fundamental to developing treatment guidelines accurately and to assessing the effectiveness of interventions appropriately.

Disclosure of interest: None declared.

P136

Prevalence and antibiotic resistance of the ESBL producing enterobacteria strains isolated in Bologhine hospital during the years 2007-2010

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Introduction / objectives: To determine the prevalence and the resistance of the extended-spectrum beta-lactamase (BLSE) producing enterobacteriaceae strains in our hospital.

Methods: All enterobacteriaceae strains were screened prospectively between January 2007 and December 2010 for ESBL on the basis of a positive double disk synergy test or positive Cefazidime and Cefotaxime clavulanic acid combination disks tests. To detect ESBL in the species producing Ampc Beta-lactamase a modified double disk diffusion test (MDDT) by Pitout et al. was used.

Results: Among 979 strains isolated during this period, 10.82 % (106) were ESBL producers. These bacteria were isolated in 94.33% in the inpatients specimens. Their distribution was essentially in the ICU (22.64%), the surgery (20.75%) and the pediatrics 21.21%. They were more frequently isolated from urines (36.79%), pus (33%), peritoneal liquid (15,15%) and bacteremia (12,26%). This beta-lactamase was produced by *Klebsiella pneumoniae* in 60.37%, *E. coli* in 21.69% *Enterobacter cloacae* in 15%. *Klebsiella*, *E. coli* and *Enterobacter cloacae* were also resistant to Fluoroquinolone (28.12%, 34.78% and 31.25%), aminoglycoside (71.8%, 56.52% and 50%) and Cotrimoxazole (28.12%, 30.43% and 31.25%).

Conclusion: This study showed that the ESBL producing enterobacteria strains rate is high in our hospital. Other strain than *Klebsiella* and *E.coli* are expressing ESBL. It is the case of *Enterobacter cloacae*. So we have to perform the detection of these strains in our laboratory, because these bacteria may function as a reservoir for plasmids carrying ESBL-encoding genes. In front of this situation we have to enhance the hygiene measures in the units where these strains were isolated to limit their diffusion.

Disclosure of interest: None declared.

P137

ESBL carriage, implementation variations of Dutch guidelines

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BMC Proceedings 2011, 5(Suppl 6):P137

Introduction / objectives: In 2005, the Dutch Working party Infection Prevention (WIP) published, its "Measures to prevent transmission of highly resistant microorganisms (HRMO)" guidelines. These guidelines provide strict definitions for the indications and measures that have to be taken in patients with HRMO, including for cases of ESBL carriage. In this study we aim to evaluate the implementation of these guidelines with regard to ESBL.

Methods: In September 2010 a questionnaire with 10 items has been sent to 90 Dutch hospitals (8 teaching hospitals, 82 non-teaching hospitals). Matters addressed were: origin of culture site, notification of infection control professionals, type and duration of isolation at (re-) admittance and type of department (ICU and non-ICU).

Results: Response rate to the questionnaire was 69% (7 teaching hospitals, 55 non-teaching hospitals). In 26/62 hospitals, Dutch culture recommendations for detection of ESBL carriage, namely throat and anal swab/faeces cultures, were not followed. Notification of infection control professional after ESBL detection occurred in 59/62 hospitals, at re-admittance in 31/62 hospitals. In 3/62 hospitals infection control measures were carried out based on individual risk assessment in every subsequent patient. Sixty percent of the non-teaching hospitals (33/55) used droplet isolation in case of respiratory ESBL isolates. In teaching hospitals this is the case in 2/7 institutes. At re-admittance the duration of isolation ranges from 2 months until the end of admittance.

Conclusion: In spite of clear ESBL carriage guidelines, major differences exist between hospitals concerning the implementation of these guidelines.

The main differences were: origin of culture site, notification after re-admittance and type of isolation measures.

Disclosure of interest: None declared.

P138

Antimicrobial use prior as a risk factor for developing extended-spectrum beta-lactamase-producing *Klebsiella* spp. in South Brazil

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BMC Proceedings 2011, 5(Suppl 6):P138

Introduction / objectives: Extended-spectrum beta-lactamase-producing (ESBL) *Klebsiella* spp. is a problematic nosocomial pathogen around the world. In the present study, we aimed to evaluate the previous use of antibiotics as a risk factor for isolation of ESBL *Klebsiella* spp.

Methods: In a retrospective case control study between June 2009 and June 2010 at Santa Casa de Misericórdia Hospital, city of Ponta Grossa, south Brazil, 61 *Klebsiella* spp. (29 ESBL and 32 controls non-ESBL-producing isolates) were enrolled. ESBL were screened by disk diffusion method and double disk approximation method, according to CLSI. Prior use of antibiotic was analyzed in electronic medical records. The antibiotic consumption (DDD_s – defined daily doses) was tested using the χ^2 test ($p < 0.05$).

Results: The DDD_s of prior use and full use of cephalosporines, fluoroquinolones, e metronidazole in ESBL and non-ESBL groups were (122.02/145.77; 8.78/69.07), (15.66/22; 0.01/26.2), (47.33/47.66; 3/28) respectively. Prior use of cephalosporines, fluoroquinolones, and metronidazole was higher in ESBL-*Klebsiella* spp. than non-ESBL-*Klebsiella* spp. ($p < 0.001$). Carbapenems were not used by the control group.

Conclusion: The prior use of broad-spectrum cephalosporins, fluoroquinolones and metronidazole is an important risk factor for acquisition of ESBL producing *Klebsiella* spp.

Disclosure of interest: None declared.

P139

First report of QNRA isolated from extended spectrum B-lactamase producing hospital-acquired *Klebsiella pneumoniae* in Kuwait

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Introduction / objectives: Extended Spectrum beta-lactamase (ESBL)-mediated resistant *Klebsiella pneumoniae* are important opportunistic pathogens. In this study we investigated the prevalence of plasmid-mediated fluoroquinolone resistance in ESBL-producing *K. pneumoniae* in nosocomial infections in Kuwait.

Methods: From a total of 72 non-duplicate quinolone and cephalosporin resistant *Enterobacteriaceae* obtained from October-December 2010 from Ahmadi hospital in Kuwait, 16 were *K. pneumoniae*. Antimicrobial susceptibility was determined by Vitek, Microscan, double disc diffusion, agar dilution and E-test against a panel of 26 antimicrobial agents. The presence of *bla*SHV, *bla*TEM, *bla*CTX-M, *gyrA*, *parC*, *qnrA*, *qnrB*, *qnrS* and class 1 integrons were determined by PCR and sequencing. Pulsed-field gel electrophoresis (PFGE) was used for typing the strains and the results were analysed according to Tenover criteria.

Results: All 16 isolates were resistant to all antibiotics tested including ciprofloxacin (MIC>4), tazobactam (MIC>16), cefotaxime (MIC>16) and ceftazidime (MIC>16); except for carbapenems, amikacin, and tigecycline. *bla*TEM, *bla*SHV & *bla*CTX-M-15 were present in 81.25% (13), 81.25% (13) and 68.75% (11) respectively. Nine (56.25%) isolates contained all three *bla* genes of which one harboured *qnrA* (A2 allele) and a class 1 integron. No mutations were found in *gyrA* and *parC*. PFGE revealed that *K. pneumoniae* isolates harbouring ESBL genes consisted of two distinct clones.

Conclusion: Contrary to a previous study, we hereby report the emergence of plasmid-mediated *qnrA* gene among ESBL producing nosocomial *K. pneumoniae* for the first time in Kuwait. Identification of these strains are crucial for administering the correct antibiotic and preventing their spread among hospitalised patients.

Disclosure of interest: None declared.

P140

Effectiveness of intensive educational sessions for nursing staff in large ICU on multi drug resistant organism's acquisition rate: 3 year prospective observational study

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BMC Proceedings 2011, 5(Suppl 6):P140

Introduction / objectives: unit-targeted, and informal educational interventions were included in several studies. The focus of the interventions was to encourage the behaviors change through improved understanding of the problem of multi drug resistant organisms (MDRO). Whether the desire change involved hand hygiene, or other outcomes, enhancing understanding and creating a culture that supported and promoted the desired behaviors, were viewed as essential to the success of the intervention.

Setting: A 100 Bed capacity Intensive care unit (ICU) in King Saud medical city in Riyadh.

Methods: A 3-year, unit-targeted, prospective observational study was conducted to assess impact of intensive educational activities -for nursing staff in ICU- on MDRO's rate. In-service educational session have been distributed to three cycles per year, each cycle contain (10) deferent topics about infection control policy in hospital in order of topic/week. Each topic was presented to (5-8) nursing staff in bed side area one time per day in each ICU section for about (10-15 min.). Same topics are presented in each cycle in order to insure maximum staff attendance from ICU staff at the end of the year.

Result: Total of (1720) educational session have been presented between (5/2008-12/2010) for (370) nurse per year annually. Attendance rate for were 78% and MDRO's rate was decreased from 51.8 per 1000 to 25.3 per 1000 patients' day, with attributable risk 48.8 %.

Conclusion: Provide education and training on risks and prevention of MDRO transmission during periodic educational updates, include information on organizational experience with MDROs and preventions strategies, is ensuring that systems are in place to promote optimal treatment of infections and MDROs acquisition rate.

Disclosure of interest: None declared.

P141

Active surveillance for KPC-experiencereport

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BMC Proceedings 2011, 5(Suppl 6):P141

Introduction / objectives: Bacterial resistance to antimicrobials has increased over the years, but the importance of empirical investigation of these bacteria contributes to the prevention of spread within the institution. The Infection Control Commission Protocol has as surveillance for resistant organisms since 1996. In Brazil, *Klebsiella pneumoniae* carbapenemase enzyme (KPC) was the first described in 2005 with an increased number of cases in the last year, prompting us to seek the epidemiological profile of inpatients.

Methods: Observational study in a general hospital for investigation of asymptomatic KPC, in two periods with an interval of three months between October 2010 and February 2011, with population as inpatients in the Intensive Care Unit and Medical Clinics with time hospitalization exceeding 20 days or Precaution Contact by resistant microorganisms, which were held in four anal swab samples.

Results: We selected a total of 108 patients, 20 of these (18%) were excluded from the study, 13 (12%) were discharged from hospital, 5 (5%) died, 2 (2%) were transferred to another hospital. A total of 128 samples were included, where seven (5.4%) tested positive for KPC and 4 (4.5%) patients were colonized.

Conclusion: Actions surveillance to identify resistant organisms, implementation of precaution-based transmission mode, adopting the policy of hand hygiene using alcohol gel at the point of care, allow for the prevention of spread among patients with risk factors such as

prolonged hospitalization, immunosuppression and the use of many antibiotics.

Disclosure of interest: None declared.

P142

Carbapenem-resistant enterobacteriaceae: a challenge for early detection and infection control

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BMC Proceedings 2011, 5(Suppl 6):P142

Introduction / objectives: In 2009, in response to the threat of emerging carbapenem-resistant Enterobacteriaceae, an alert system was introduced at Geneva University Hospitals.

Methods: The alert system detected patients harboring carbapenemase-producing strains as KPC or non-KPC. Referrals from other hospitals were screened on admission for the presence of multiresistant organisms, and put under contact control precautions if positive.

Results: Between October 2009 - January 2010, we identified 1 imported case of KPC (origin, Southern Italy) and 3 cases of NDM-1 producing Enterobacteriaceae, transferred from hospitals in India (1), Pakistan (2) and Serbia/France(3).

Patient 1- on admission digestive carrier of *E. coli* bla_{NDM-1}.

Patient 2- digestive carrier of *P. mirabilis* bla_{NDM-1} detected after extended hospitalization and antibiotic therapy

Patient 3- hospitalized in Serbia and France, with *K. pneumonia* bla_{NDM-1} urinary tract infection on admission.

All 3 patients were carriers of other multiresistant, Gram-negative bacteria on admission. The NDM-1 molecular identification was made retrospectively in October 2010. Patient 4 was admitted for elective surgery, without prior history of hospitalization. A urine culture yielded *K. pneumonia*bla_{KPC-2}. The patient was put under strict contact precautions; but developed a surgical site infection with treatment challenges related to dose finding, availability, toxicity of antibiotics. No secondary cases were found due to early screening and preemptive isolation.

Conclusion: The threat of carbapenemase-producing strains underlines the need for early detection, implementation of control measures and surveillance, which needs constant updating. The laboratory alert system focused on KPC but ignored initially the NDM-1 threat.

Disclosure of interest: None declared.

ANTIMICROBIAL-USE AND STEWARDSHIPS

P143

Antimicrobial stewardship programs in Emilia-Romagna, Italy

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Introduction / objectives: To evaluate the state-of-the-art of antimicrobial stewardship programs in Emilia-Romagna we sent a questionnaire to university hospitals (UH) and Local Health Authorities hospitals (LHAH) of Emilia-Romagna.

Methods: A multiple-choice questionnaire was sent to all public UH/LHAH of the region. The survey was constituted by 18 different questions, in 7 sections. An 8 parameters antimicrobial stewardship (AMS) score was calculated (score 0-14).

Results: All 17 UH/LHAH completed the survey. An antimicrobial stewardship group was present in 11/17 (58%) UH/LHAH. All UH/LHAH had implemented some antimicrobial control strategies. We analysed 4 areas. A) Restricted formulary: all UH/LHAH had restricted formularies, with a median of 12 antimicrobials. B) Education: courses on surgical prophylaxis had been performed in 56% of surgical specialties, courses

on antimicrobial therapy in 47% of UH/LHAH over the last year. C) Guidelines: guidelines on surgical antibiotic prophylaxis and on antimicrobial therapy were available in 100% and 71% of UH/LHAH, respectively. D) Data feed back: data on antibiotic consumption and on antimicrobial resistance were periodically fed back to the wards by 100% and 88% of UH/LHAH, respectively. The AMS score varied significantly among UH/LHAH, from 2 to 13 points.

Conclusion: All UH/LHAH have implemented some kind of antimicrobial stewardship program, although significant differences exists between centres. To face these differences a regional project has been implemented.

Disclosure of interest: None declared.

P144

Trends in regional outpatient antibiotic prescription data and interventions in the Dutch-German EURSAFETY HEALTH-NET-project

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BMC Proceedings 2011, 5(Suppl 6):P144

Introduction / objectives: Increasing prescription of broad-spectrum antibiotics is regarded to facilitate selection of multiresistant germs. Surveillance of outpatient antibiotic use might contribute to prevent the spread of Methicillin-resistant *S. aureus* (MRSA) within the EURSAFETY HEALTH-NET. Training sessions on MRSA and antibiotic awareness were offered to general practitioners. A possibility for reimbursement of MRSA eradication therapy in outpatients has been created.

Methods: Regional data for outpatient prescription of antibiotics (based on Defined Daily Doses (DDD)) were collected by the Association of Statutory Health Insurance Physicians Westphalia-Lippe (KVWL) and analyzed for the years 2002 to 2009. In order to compare the prescription of different antibiotics like fluoroquinolones or mupirocin in the EUREGIO to the whole KVWL region, we used the Cochrane Armitage Trend Test.

Results: Altogether, a total of 12.2 DDD / day per 1,000 inhabitants (DID) were prescribed in 2002, followed by 12.9 DID, 12.9 DID, 14.4 DID, 13.8 DID, 14.4 DID, 14.7 DID and 14.8 DID from 2003 to 2009, respectively. From 2002 to 2009 the percentage of prescriptions of all antibiotics and of fluorochinolones decreased significantly in EUREGIO relating to the whole KVWL region. In contrast, the number of mupirocin prescriptions increased significantly more in EUREGIO than in KVWL region.

Conclusion: As desirable, EUREGIO tends to prudent antibiotic use. The increasing number of mupirocin prescription among outpatients reflects the growing demand and, facilitated by new refunding possibilities, the increasing implementation of MRSA eradication therapy in outpatient care.

Disclosure of interest: None declared.

P145

Surveillance of antibiotic resistance in Streptococcus spp in China-CHINET project 2007 and 2009

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Introduction / objectives: CHINET program, which started at 2005, is monitors bacterial antibiotic resistance in 12 China medical centers in 2007 and 14 China medical centers in 2009.

Methods: The susceptibility testing was carried out by unified protocol of Kirby-Bauer method (KB) were Streptococcus pneumonia (1699), β -hemolytic streptococci(1428) including GAS (756), GBS (451), GCS (34), GGS (140), and GFS (31) none classified (16), and Viridans streptococcc group excluded *S. pneumonia* isolated from sterile parts (280). The susceptibility testing was assayed by Penicillin E-test were *S. pneumonia* and Viridans streptococcus. Results were analyzed according to CLSI2007 and 2009 criteria.

Results: Penicillin non-susceptible strains (PISP+PRSP) isolated from no bacterial meningitis patients in children aged < 5 year old group was 24.9%, and Erythromycin resistance was 96.9%, which were higher than that in ≥5 year old group (16.3%, 87.8%) separately . Erythromycin and Penicillin resistance were 88.7%, 0% in GAS, 52.3% and 2.6% in GBS, 61.8% and 6.7% in GCS, 58.1% and 0% in GFS, 57.0% and 0.7% in GGS, 66.7% and 21.3% in Viridans Streptococci group. All isolates were highly sensitivity to Levofloxacin, Vancomycin, Linezolid, Moxifloxacin and Meropenem.

Conclusion: In conclusion, the resistant of *S. pneumoniae* to penicillin is different between different age group. The resistant rates of streptococcus spp to erythromycin remain high in mainland China.

Disclosure of interest: None declared.

P146

Antimicrobial resistance pattern of gram negative bacteria to 3rd and 4th generation cephalosporins

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BMC Proceedings 2011, 5(Suppl 6):P146

Introduction / objectives: Antimicrobial resistance (AMR) is increasing & the status in rural areas is less known. To find out the AMR pattern of clinical isolates of selected gram negative bacilli (GNB) to 3rd and 4th generation cephalosporins (GCPs) at a rural and urban tertiary care hospital.

Methods: A total 2366(Rural= 1016; Urban=1350) isolates (various clinical samples) of GNB collected over 3 consecutive months were studied for AMR pattern of selected 3rd and 4th GCPs. The data were entered in WHONET & analysed & compared with each other.

Results: In rural & urban isolates the AMR pattern for 3rd / 4th GCPs varied from 60-100 /32-100 & 34-50/21-58 respectively to selected GNB, & it was significantly more among rural isolates. Among GNB, AMR was low with *E.Coli* & *Klebsiella* but high among *Pseudomonas*.

Conclusion: A heterogeneous AMR pattern observed in the study was comparable with published reports. The probable reasons for wide variations were due to overuse, misuse & dysregulated availability of antimicrobials; promotional incentives & high profit margins; & demands of the community. These push the rural practitioners to use newer generation of antimicrobials frequently. Also lack of adherence to medication, suboptimal regulatory system (Antibiotic policy, Monitoring), lack of prescribing policies and to some extent technical aspects of GNB, might have contributed to increased AMR in rural areas. Hence there is an urgent need to design & implement antimicrobial policy & surveillance system at regional & institutional level under national guidelines.

Disclosure of interest: None declared.

P147

Distribution of pathogens of nosocomial infections in a tertiary-level teaching hospital in Brazil

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BMC Proceedings 2011, 5(Suppl 6):P147

Introduction / objectives: The aim of this study was to describe the distribution of pathogens of nosocomial infections (NI) notified in a tertiary hospital of infectious diseases during 2010.

Methods: From January to December 2010, all patients notified with NI according to CDC criteria definitions with agents isolated in cultures were enrolled.

Results: In 2010 were identified 269 pathogens in 409 NI. The distribution including all sites of infection was: Coagulase Negative Staphylococcus (CNS) 20,6%, *Pseudomonas aeruginosa* 15,9%, *Staphylococcus aureus* 15,9%, *Candida sp* 7,8%, *Escherichia coli* 7,8%, *Klebsiella sp* 7,8%, *Enterococcus sp* 5,7%, *Enterobacter sp* 5,4%, *Acinetobacter baumannii* 3,4% and other agents 9,7%. The *Staphylococcus sp* sensibility to oxacilin were: 3,3% to CNS and *S. aureus* 29,7%; among *P. aeruginosa*, the sensibility to ceftazidima, cefepima, piperacilin-tazobactam, imipenem, meropenem and ciprofloxacin were, respectively, 64,4%, 62,2%, 59,5%, 72%, 55,5%

and 69,5%. The production of ESBL among strains of *E.coli* and *Klebsiella sp* were 4,7% and 61,1%, respectively. Among the 175 nosocomial pneumonias notified, only 45 (26%) episodes had pathogens identified. The most important agents identified were *P. aeruginosa*, *S. aureus*, CNS and *Enterobacter sp*; among the bloodstream infection the most prevalent agents were CNS, *S. aureus*, *Klebsiella sp* and *Candida sp* and the most important agents of urinary tract infections were *E. coli*, *P. aeruginosa*, *Candida sp*, *Enterococcus sp* and *Klebsiella sp*.

Conclusion: The commonest agents in our institution were SCN and *S. aureus*, and *P. aeruginosa* among the gram negative bacteria. Differently to other tertiary hospitals in Brazil, we found a very low prevalence of *Acinetobacter baumannii* as agents of NI.

Disclosure of interest: None declared.

P148

Fluoroquinolone (FQ) utilization in symptomatic bacteriuria (SB) due to *E. coli* and rate of FQ-resistant *E. coli* in a teaching psychiatric hospital

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Introduction / objectives: There are still very few data available on antibiotic utilization and bacterial resistance in the mental healthcare setting. The present study examined the extent of FQ utilization and the rate of FQ-resistant *E. coli* in SB in a 600-bed teaching psychiatric hospital. **Methods:** SB data were reviewed by the Infection Control Unit over a 5-year survey and compared across two inpatient populations, namely patients in long-term care (LTC) geriatric wards (128 beds) and in acute general psychiatry (AGP) wards (470 beds).

Results: Overall, 146 SB and 176 organisms were recorded in LTC wards vs. 336 and 376 in AGP wards, respectively. *E. coli* accounted for 55% of urinary isolates in LTC wards vs. 68% in AGP wards (p<0.01). In AGP wards, there was no significant trend (χ^2) in the year-to-year utilization of FQ for treating SB (range 60%>75%) as well as in the rate of FQ-resistant *E. coli*, rising from 12% to 15% over the study period. In contrast, a significant increase in the rate of FQ-resistant *E. coli* causing SB (from 11% to 50%, p<0.01) was seen in LTC wards over the study period and was concomitant of a linear decrease (r=0.90, p<0.05) in FQ utilization for treating SB in this setting. This increasing resistance rate could be explained in part by the high level of FQ utilization (74%) for treating SB in the LTC wards during the first year of the survey; yet other factors might be involved.

Conclusion: In this study, rate of FQ-resistant *E. coli* appeared relatively low in the AGP wards despite the extensive use of FQ. However, enhanced surveillance in LTC geriatric wards seems required because of the risk of emerging high rate of FQ-resistant *E. coli* in this setting.

Disclosure of interest: None declared.

P149

Applying quality indicators in Brazilian hospital: tool for improving prophylaxis

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Introduction / objectives: The preferred choice of the best surgical antibiotic prophylaxis practice is usually low despite many published guidelines. This study describes the application of quality indicators for antibiotic prophylaxis in a hospital in Sao Paulo, Brazil.

Methods: A retrospective study was carried out from November 2009 to March 2010. Medical records from adult inpatients submitted to cardiac, neurological and orthopedic clean surgeries were included. The quality indicators for antibiotic prophylaxis conformity were validated in a previous study. They were composed of six parameters of adequacy as stated by the Hospital Infection Control Committee (HICC) guideline. The conformity index was considered 100% when the antibiotic prophylaxis showed adequacy in all parameters evaluated. We investigated the association between conformity in each parameter and selected population characteristics. Analyses were conducted with 5% significance.

Results: Medical records from 101 (13.5%) cardiac, 128 (17.1%) neurosurgical, and 519 (69.4%) orthopedic surgeries were evaluated. The general conformity index was 4.9%. The greatest number of surgeries where antibiotic prophylaxis was used without HICC indication occurred among orthopedic procedures (n=293). The total conformity index was 5.8%, 3.1% and 3.0% respectively for orthopedic, neurological and cardiac surgeries. The parameter of administration via was the best achieved; the parameter of duration was the worst. No association was identified between parameter conformity and population characteristics.

Conclusion: This study reveals a low level of acceptance for HICC guidelines for antibiotic prophylaxis. Quality indicators should be fed back to surgical teams on a regular basis to improve surgical prophylaxis.

Disclosure of interest: None declared.

P150

Iranian surgeons' compliance with the American Society of Health-System Pharmacists guideline: antibiotic prophylaxis in private versus teaching hospitals of Shiraz, Iran

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Introduction / objectives: Surgical site infections (SSIs) are the prevalent and grave complication following surgery, that significantly increase the length of hospital stay, morbidity and mortality, and subsequently drain healthcare system resources. To address the compliance with the American Society of Health-System Pharmacists (ASHP) guideline of prophylactic antibiotic in private hospitals in Shiraz, Iran.

Methods: This was a cross sectional study using prospective data from April to September 2010 in entire surgical wards of all eleven private hospitals in Shiraz. We used descriptive analysis including frequencies for evaluating the results.

Results: From April to September 2010, 365 patients from 63 surgical wards of eleven private hospitals were enrolled in our study. Prophylactic antibiotics were inappropriately given to 64.6% of patients. Twenty out of 26 patients did not receive antibiotic appropriately. In cases that need antibiotic prophylaxis with respect to ASHP guideline, antibiotic choice was concordant in 32 (25.4%) out of 126 procedures. Patients who needed to receive prophylactic antibiotic and received, the duration and initiation time of prophylaxis were concordant with the guideline in 37(29.4%) and 77(61.1%) respectively. The overall compliance with ASHP guideline was 10.13%.

Conclusion: Our study revealed that in private hospitals in Shiraz, Iran about 90% of patients received inappropriate surgical prophylaxis. Thus practical measures to improve the implementation of guideline are urgently needed in the future.

Disclosure of interest: None declared.

P151

Antibiotic consumption in surgical site infections treatment in Polish hospitals according to data from the program of active surveillance of hospital acquired infections

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Introduction / objectives: The main scope of the HAIs control programs is quality of hospitalization improvement but the results of surveillance should also be used in benchmarking. The aim of this work was to assess and compare antibiotic usage in surgical site infections (SSI) treatment in Polish hospitals.

Methods: Data used in this analysis were gathered in 13 hospitals participating in the program of active surveillance of HAIs in Poland between 2002/2006. In this time 96426 surgical procedures were done in hospitals which participated in the program. Altogether 2206 SSIs were detected in this population. Defined daily dose (DDD) was used for assessing antibiotic usage – per one SSI and per one operation.

Results: Antibiotic usage in analyzed population varied in wide range: from 6,9 DDD/SSI to 45,5 DDD/SSI or from 0,1DDD to 1,6DDD per one operation. Similar differences were observed also when data according to type of

procedure were analyzed; in abdominal surgery antibiotic usage varied from 5,1DDD to 122,6DDD per one SSI or from 0,1DDD to 4,4DDD per one operation of this type. In cardiac surgery the rate varied from 5,3DDD to 19,0DDD per one SSI or from 0,8DDD to 2,6DDD per one operation. In orthopedic surgery those rates reached the following values: from 1,7DDD to 136,4DDD per one SSI or from 0,1 to 21,4 DDD per one procedure. There were no significant differences observed in microbial etiological factors and their resistance.

Conclusion: Presented data indicate huge discrepancies of antibiotic usage for SSI treatment in analyzed Polish hospitals. The results confirm the need of continuous developing and training in the infection control area, but also the need of developing reliable tools for benchmarking different aspect of infection control results.

Disclosure of interest: None declared.

P152

Adherence to guidelines for antimicrobial prophylaxis in surgery in university hospitals in Serbia

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Introduction / objectives: The aim of the paper was to evaluate the adherence of surgeons to guidelines for antimicrobial prophylaxis in two largest university hospitals in Serbia.

Methods: A study was performed in October 2010 in a General Surgery Clinic in a hospital in Belgrade and in February 2011 in seven surgery clinics in a hospital in Novi Sad. Data concerning preoperative health status, type and duration of surgery and parameters of antimicrobial prophylaxis (drug choice, timing of first dose, number of doses and duration of prophylaxis) were collected. Results are given as frequency and percent. Consumption of antibiotics was expressed as DDD/100 patient days, that was calculated using ATC/DDD methodology.

Results: A total of 312 patients were enrolled and operated on electively. In a hospital in Belgrade the most frequently prescribed antibiotic was ceftriaxone (33%), more than half of patients received antibiotics longer than suggested in the protocol and there was no data on timing of first dose available. In a hospital in Novi Sad the total consumption of antibiotics for prophylactic use was 25.6 DDDs/100 patient days. Cephalosporins with 59.5% were most commonly utilized (out of them cefuroxime with 12.3 DDDs/100 patient days was most commonly used), followed by aminoglycosides with 14.5% (out of them gentamicin with 3.8 DDDs/100 patient days), while ciprofloxacin was on the third place with 10.7%. Timing was appropriate in 44.3% of patients while the duration of prophylaxis was optimal in 28%.

Conclusion: Interventions have to be made about adoption of adequate guidelines for surgical prophylaxis in both university hospitals in Serbia.

Disclosure of interest: None declared.

P153

Irrational antibiotic use among teachers and academic staff, Shiraz, Iran

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Introduction / objectives: Antibiotics are amongst the most sold drugs. Inappropriate use of antibiotics leads not only to emergence of resistant bacteria, but also economic loss and adverse reactions. Knowledge, attitude and practice of academic staff and high school teachers about the use of antibiotics and self-medication are assessed in this survey. Also, the relationship between these factors is determined.

Methods: In this cross-sectional survey, 320 academic staff (except physicians, pharmacists and dentists) and 150 high school teachers were questioned by a questionnaire composed of 15 questions to assess their knowledge, attitude and practice about the use of antibiotics and self-medication. The reliability of the questionnaire was assessed by Cronbach's alpha internal consistency coefficient and the results were analyzed, using

Mann-Witney U. Spearman's Correlation Coefficient was used to determine the correlation between knowledge, attitude and practice.

Results: The questionnaires were completed by 134 academic staff and 308 high school teachers, among whom, respectively, 35.8% and 47.1% had had self-medication during the previous year, mostly to relieve sore throat in both groups. The teachers were significantly better than the faculty staff in knowledge ($P=0.008$) and practice ($P<0.001$).

In both teachers group and academic staff, a direct linear poor relationship was detected between attitude and practice ($r=0.243$ & $r=0.238$, $P<0.01$), and a poor reverse linear relationship was seen between knowledge and practice ($P=-.0218$) in the teachers group.

Conclusion: According to our results, Self-medication and irrational use of antibiotics is common among highly educated people in the community in Iran, which can be prevented by improving their knowledge.

Disclosure of interest: None declared.

P154

Role of the infectious disease consultant in improving antimicrobial therapy prescription in neurosurgery

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Introduction / objectives: To assess whether a systematic infectious disease consultation programme (IDCP) contributes to improve the diagnostic and therapeutic approach to infected patients in a 21-bed neurosurgery (NS) unit of an Italian 850-bed tertiary care centre.

Methods: The IDCP was based on regular consultations by the ID specialist for practice recommendations of prophylaxis or targeted therapy prescriptions, driven by local antimicrobial resistance surveillance and clinical pharmacology parameters, together with antibiotic formulary restrictions; the activity also included weekly reassessment and feedback meetings with NS staff, and subsidiary telephone calls; all the activities were recorded in electronic databases. The ICPC started in 2008; data related to the ID consultations, microbiological sampling and antibiotic prescriptions including costs were analyzed for one year before (2007) and two years after the ICPC implementation (2008 and 2009).

Results: ID consultations were 134, 125 and 154 in 2007, 2008, 2009 respectively. In particular, consultations to initiate empiric treatment and to either adjust or streamline ongoing therapy increased significantly from 2007 to 2009. Annual expenditures for antimicrobials decreased from € 88,800 in 2007, to € 60,500 in 2008, and to € 49,000 in 2009. From 2007 to 2009, the annual number of collected microbiological specimens significantly decreased (1829, 1031, 970, respectively).

Conclusion: The introduction of an IDCP in the NS unit improved the appropriateness of microbiological diagnostic sampling and antimicrobial therapy prescription and led to significant reduction of costs attributable to antimicrobials.

Disclosure of interest: None declared.

P155

Participation development of a cross-border antibiotic stewardship program as part of the EURSAFETY HEALTH-NET web 2.0 platform

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Introduction / objectives: Resistant bacteria pose more and more a risk to patient safety in Europe, especially in cross-border regions where differences in antibiotics prescription and hygiene policies exist. Antibiotic Stewardship Programs (ASPs) have been implemented in some hospitals to facilitate healthcare professionals in adequately prescribing antibiotics to improve patient safety and to reduce costs. However the implementation of ASPs does not always run smoothly. The research goal of this study is to create and implement an ASP via a participatory development process. We assume that participatory development reduces the problems associated with the implementation of ASPs.

Methods: We have applied a literature study (non-systematic) as well as a currently ongoing ASP pilot evaluation to assess how ASPs can be

implemented successfully and sustainably. Using our eHealth development roadmap, workshops with important stakeholders shall be held in the near future to further identify problems, and the stakeholders' needs and values regarding ASP.

Results: The literature study showed that there is a lack of usable and tailored information on antibiotic use in local care facilities. ASPs need to be implemented at a local level, based on local policies and local resistance/susceptibility patterns. These ASPs need to be carried out by multidisciplinary teams that provide prescribers with appropriate and evidence-based feedback. The implementation can include educational activities, reminders, (computer aided) decision support, and patient education, depending on the stakeholders' needs.

Conclusion: We expect that the ASP that is created via a participatory design process helps to realize adherence and commitment to a more prudent antibiotics prescription policy.

Disclosure of interest: None declared.

P156

Risk management and the perception of the nursing staff on the error in the administration of antimicrobial

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BMC Proceedings 2011, **5(Suppl 6):P156**

Introduction / objectives: The diversity of professionals in the Risk Management has as its aim to expand knowledge and discuss of the facts and risk events and the nurse is an important component of this group, and related to administration of antimicrobial drugs. The objective of this research was to examine the perception of nursing staff in three work shifts, from a health institution in Ponta Grossa - PR, 2009, in relation to the error in the administration of antimicrobials.

Methods: This is a quantitative research, conducted through a questionnaire with open and closed questions.

Results: We found that medication error is a multifactor action and the main responsibility is related to the nursing staff. It was found that when antibiotics delays occur in their unit, 14 (58%) do not consider as a medication error, 16 (67%) think it is important to notify the pharmacist and 16 (67%) are aware of the existence of the Nursing and Patient Security Network in Brazil and the Intra-hospital Risk Management Committee and 8 (33%) are unaware about this subject.

Conclusion: The continuing education for professionals responsible for the administration is the best way of transformation, by encouraging the notification in the register of risk management linked directly with the Committee of Hospital Infection Control of the institution, aiming at quality and safety of care provided to patients.

Disclosure of interest: None declared.

INFECTION CONTROL IN LONG TERM CARE FACILITIES AND NURSING HOMES

P157

Healthcare associated infections (HAI) in long-term care facilities in Europe

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BMC Proceedings 2011, **5(Suppl 6):P157**

Introduction / objectives: The HALT Project (HAI in European Long-Term Care Facilities) has been funded by the ECDC in 2009, to develop and implement a sustainable methodology to estimate the prevalence of infections and antimicrobial use, and to assess the status of infection control programmes in Europe. A pilot point prevalence survey (PPS) was conducted in November 2009 and an European wide PPS in May-September 2010.

Methods: High skilled nursing homes (NHs) were included, on a voluntary basis. Each facility collected on a single day: 1) institutional data; 2) aggregated data on residents' characteristics; 3) individual data for residents on systemic antibiotics and/or with an infection the day of the survey. Infections were diagnosed according to McGeer definitions, but the physician diagnosis was also recorded. An ad hoc software was developed for data input, providing a report to each facility. A questionnaire was completed by national representatives.

Results: A total of 13 countries, 117 NHs and 14,491 residents participated to the pilot PPS. The survey was perceived as feasible (median 5.6 hours/100 beds for data collection, range 1.1-40) and easy. Characteristics of the facility, care load indicators, and risk factors varied widely among facilities and countries as well as antimicrobial stewardship activities and availability of infection control resources. In May-September 2010, 28 countries and 722 NHs have joined the European PPS accounting for more than 60,000 residents.

Conclusion: Resources available in NHs for surveillance are limited. The HALT methodology may be feasible to assess infection and antibiotic use in this setting.

Disclosure of interest: None declared.

P158

Three-year prevalence of healthcare-associated infections in Dutch nursing homes

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BMC Proceedings 2011, **5(Suppl 6)**:P158

Introduction / objectives: The objective of this study was to measure the prevalence of HAIs (overall as well as per type of care) and to gain insight into infection prevention and control and antimicrobial use in Dutch nursing homes.

Methods: We conducted an annual, one-day prevalence study of HAIs among nursing home residents in the Nijmegen region over three consecutive years (2007-2009). Modified definitions based on CDC-criteria were used for bloodstream infection, lower respiratory tract infection, bacterial conjunctivitis and gastroenteritis. For urinary tract infections (UTI), criteria established by the Dutch Association of Elderly Care Physicians were used. Also resident characteristics were recorded. Data collection and resident assessment were done by the attending elderly care physicians.

Results: The prevalence of HAIs over the three years was 6.7%, 7.6% and 7.6%, respectively. UTI was the most prevalent HAI with an overall prevalence of 3.8% and most UTI were not catheter-associated. Overall most HAIs occurred among residents of rehabilitation units. On average, antibiotics were used in 6.6% of the residents.

Conclusion: This is the first prevalence study of HAIs in Dutch nursing homes, which became an important cornerstone of infection control programs in nursing homes, started in our region (see additional abstract). Based on the prevalence results, incidence studies for UTI need to be done in order to find risk-factors for their occurrence.

Disclosure of interest: None declared.

P159

Study about incidence of nosocomial infections in elderly care institutions and control measures

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BMC Proceedings 2011, **5(Suppl 6)**:P159

Introduction / objectives: Infections in the elderly are the major cause of morbidity, mortality and hospitalization, beyond the difficulty of approach and diagnosis. The objective estimate the incidence of nosocomial infections in the institution.

Methods: The study was performed in a hospital specialized in care of chronic patients with high dependency, in special elderly, advanced-stage cancer patients, dementia, severe neurological deficit and other chronic diseases. It holds 77 beds in three internment units, a semi-intensive care unit and emergency care. Data were collected daily through audit, and as the Brazilian statistics are being established, international data of incidence/patients-day were used for comparison.

Results: Rates of Hospitalar Infection in the institution were:

· General Rate of Hospitalar Infection: 10.31 infections/1000 patients-day

· Pneumonia Rate: 3.78 infections/1000 patients-day

· Urinary Tract Infection Rate: 4.12 infections/1000 patients-day

We carried out control measures aiming at prevention of urinary tract infection, such as clear-sighted evaluation of real need of bladder catheterization, nursing staff training regarding the technique and careful maintenance of bladder catheterization, which also included simple care such as using individual container for each patient to discard the urine. Enhanced training for hand hygiene. After thirty days of intervention there was reduction in the rate of Urinary Tract Infection from 4.12 infections/1000 patients-day to 3.51 infections/1000 patients-day.

Conclusion: Ideal level wasn't yet achieved, but we believe that with the continuous training of care during introduction, maintenance and clear-sighted evaluation for catheterization, lower rates of infection will be achieved.

Disclosure of interest: None declared.

P160

Selected multi-drug-resistance-organisms in selected Polish long-term-care facilities*

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BMC Proceedings 2011, **5(Suppl 6)**:P160

Introduction / objectives: Nosocomial infections and antimicrobial resistance (AR) are a very well-known public health problems. Unfortunately, up to now there is no surveillance of AR in Polish long term care facilities (LTCF). The aim of this presentation was to analyze prevalence of selected Multi-Drug-Resistance-Organisms (MDRO) among residents of LTCFs in Krakow, Poland.

Methods: The study was carried out from 10-2009 to 11-2010 in 3 public LTCF on a group of 193 residents. Screening test for MRSA and ESBL(+) Gram-negative rods were done at the beginning of the study. Also urine and wound cultures were performed, together with microbiological examinations of any biological materials taken when symptoms of infection were observed.

Results: Altogether 28.9% of the residents had wheelchair disability or were bedridden, 10.6% - disoriented in time and/or space, 49.5% had urinary incontinence and 35.3% fecal incontinence. Prevalence of MDRO was found to be 12.4%. The most common pathogens were MRSA, which consisted 43.2% of all *S. aureus* isolates (n=94) and ESBL(+) rods, which reached 13.9% out of 165 *Enterobacteriaceae* isolates. Factors independently (all p<0.05) associated with MDRO were asymptomatic bacteriuria, urinary and/or fecal incontinence, wheelchair disability or bedridden, low value of the Barthel and Katz Indexes and others.

Conclusion: This study showed that the prevalence of MRSA and ESBL(+) rods was lower than in other similar studies published recently. Unfortunately, microbiology tests were done not in all cases of infections which occurred during the study like as sputum samples from suspected pneumonia (14.3%). Thus, results obtained by us, importance of infection control for elderly patients. * This study was supported by the grant from the Ministry of Science and Higher Education (N N404 047236).

Disclosure of interest: None declared.

P161

Urinary tract infection (UTI) and infection control in municipal nursing homes

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BMC Proceedings 2011, **5(Suppl 6)**:P161

Introduction / objectives: A formalized infection control organization does not exist in the Danish municipal sector. The prevalence of infections

among residents in nursing homes is unknown and knowledge is sparse on the connection between primary care staff knowledge and infection rates.

Methods: This study investigated educational level and infection control knowledge as well as direct observations of hygiene performance among staff in four selected nursing homes. Data were collected through individual, self-administered questionnaires filled in by 70 staff members. Moreover, data were collected on infection rates (UTIs) between 1 January and 31 December 2009 in a cohort of all 2761 nursing home residents in the Municipality of Aarhus in Denmark (310.653 inhabitants). Data were collected from medical databases on infection rates and antibiotic use.

Results: Handhygiene compliance (alcohol-based handrubbing) among staff-members was 52.6 % before a procedure, 59.6 % after a procedure and the infection control knowledge was deemed insufficient among the healthcare staff. 26 (37.1%) of the 70 participants did not have any infection control education. During 2009, 961 (34.8 %) of nursing home residents (247 men and 714 women) had at least one UTI. A total of 861 (31.2 %) residents were treated with UTI specific antibiotics by their GP at least once during 2009.

Conclusion: UTIs are common among nursing home residents, and antibiotic use is very high. Infection control knowledge and practices among nursing home staff were insufficient. Further studies are needed to shed light on the association between infection rates and infection control efforts at individual nursing homes.

Disclosure of interest: None declared.

P162

Second MRSA outbreak in a nursing home; role for a super spreader or super sensitive resident

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BMC Proceedings 2011, 5(Suppl 6):P162

Introduction / objectives: MRSA prevalence is low in nursing homes (NH) in the Netherlands. However, outbreaks in NH are usually larger than those occurring in hospitals. The national MRSA database shows that in the last three years 24% of the outbreaks occurred in NH. The NH under investigation experienced outbreaks in 2007 and 2010. Two residents and one health care worker (HCW) were involved in both outbreaks. One of these residents (R-Z) has diabetes and pressure ulcers, and was therefore not considered for eradication therapy. R-Z could have acted as a super spreader.

Methods: Laboratory records and outbreak courses were studied for the role of R-Z in both outbreaks.

Results: The first outbreak (MRSA spa t032) was noted when two residents were admitted to the nearby hospital, and gave rise to spread to two hospital patients and two nurses. 12 NH residents and 4 NH-HCWs were found colonized. The second outbreak (MRSA spa t539) was noted in the OPD of the hospital without further colonization's in the hospital. 11 NH residents and 5 NH-HCWs were colonized in the second episode. During 2009 and early 2010 R-Z had been tested negative for MRSA on 7 occasions. Precaution measures instituted in 2007, were lifted. A positive MRSA result in May 2010 was initially mistaken as a recurrence, and neighboring residents and attending HCWs were screened negative. Only after the outbreak was noted 2 months later, typing revealed colonization with a new strain.

Conclusion: We cannot conclude that persistent super spreading occurred, since R-Z eventually cleared the MRSA. The fact that R-Z was the first to get colonized with the new strain illustrates increased susceptibility. Colonization-prone patients may require life long protective measures and surveillance.

Disclosure of interest: None declared.

P163

Hand hygiene knowledge in long-term care facilities (LTCFs): a multicentre pilot study

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BMC Proceedings 2011, 5(Suppl 6):P163

Introduction / objectives: Until now, promotion of hand hygiene was mostly targeted to acute care facilities. Yet, little is known about knowledge of hand hygiene recommendations in chronic care facilities. The objective of this study was to evaluate hand hygiene knowledge in health care workers in Flemish LTCFs.

Methods: We developed a questionnaire based on campaign material that was distributed by the Flemish government in order to improve hand hygiene in LTCFs. The quiz, based on the most recent WHO guidelines contains 18 specific healthcare related situations in which hand hygiene or wearing gloves is recommended. It was presented to a stratified sample of personnel from two LTCFs in January 2011, prior to continuing education regarding hand hygiene. Frequencies and total scores were calculated. Mann-Whitney test was used to compare scores in both LTCFs. Statistical analyses were performed using PASW Statistics 18 (SPSS, Chicago, IL, US).

Results: 81 LTCF health care workers participated. Response was 100%. The mean score was 9.21 on 18 items (Standard Deviation 2.58, min. 1, max. 15) or 51%. No significant differences were found between the two LTCFs. Some items scored below 50%. These items were related to four hand hygiene indication groups: 'before patient contact' (e.g. hygienic care, taking blood pressure, feeding), 'after glove removal', 'before a clean/aseptic procedure' (e.g. wound care and IM injections) and 'in case of risk of contact with body fluids' (e.g. oral medication administration).

Conclusion: Our study identified several gaps in the knowledge about hand hygiene recommendations in LTCF health care workers. These results indicate substantial room for improvement in this specific group of HCWs.

Disclosure of interest: None declared.

P164

EurSafety Health-net: development of an EURegional infection control quality certificate for nursing homes

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BMC Proceedings 2011, 5(Suppl 6):P164

Introduction / objectives: As part of the EurSafety Health-net project, a cross-border German-Dutch healthcare project to reduce HAIs, and in cooperation with regional specialists in care for the elderly, we developed an infection control quality improvement program for nursing homes. Aim of this multi-year project is to implement a complete infection control program for nursing homes in a step-by-step fashion.

Methods: A multi-step plan, each consisting of 10 measures, was developed to improve infection control practices in nursing homes. The audit was done by an EurSafety auditteam. Organizations reaching 5 of the 10 criteria receive a certificate and have up to 3 years to fulfill the remaining criteria, before advancing to the next step. Participation and certification are depicted on a website accessible for the public.

Results: The first certificates have been distributed in January 2011 to 27 institutions in the Nijmegen region. The initial ten criteria consisted of structure and process criteria, as well as HAI-prevalence and UTI-incidence studies. The poster will describe the criteria in detail.

Conclusion: Due to the frequent exchange of patients between healthcare facilities, Infection control programs in long-term care facilities become increasingly important. The EurSafety quality program stimulates LTCF's to structurally improve their performance, while the certificate gives visibility of their efforts to all stakeholders.

Disclosure of interest: None declared.

P165

Effect of an infection control programme in enteral feeding bacterial contamination in nursing homes

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BMC Proceedings 2011, 5(Suppl 6):P165

Introduction / objectives: This study was to investigate the effectiveness of an Infection Control Programme (ICP) in knowledge and practice of enteral feeding of nursing home staff, and to explore any enteral feed contamination and correlation among nursing home staff, residents and feeding equipment devices.

Methods: It was a quasi- experimental pretest posttest control study. There were 15 residents and 10 nursing home staff in experimental and control groups respectively. An ICP related to enteral feeding was given to the experimental group. The knowledge and practice in enteral feeding among nursing home staff was measured by questionnaires; and 60 pairs of specimens were taken for bacterial counts and MRSA culture from hands of nursing home staff, enteral feed, flow regulators, feeding tube hubs, residents' nasopharyngeal swabs and gastric fluid before and after ICP.

Results: After ICP, only experimental group had significant improvement in knowledge and practice at $p < 0.05$. Also, hands of nursing home staff, tube hubs, residents' nasal swabs and gastric content were contaminated with $> 10^4$ CFU/ml in pretest. This contamination was reduced significantly in the experimental posttest at $p < 0.05$ with no change in the control group. Also, there was a significant decrease in MRSA positive cases in the experimental group from 2.1 ± 1.6 to 0.4 ± 0.7 with $p < 0.05$. Moreover, highly correlation between contamination sites of positive MRSA in hands, regulators, gastric content, tube hubs and enteral feed was demonstrated at $p < 0.05$. It showed the closely relationship between the contaminated feed and poor hand hygiene.

Conclusion: The effectiveness of ICP demonstrated by the improvement in experimental enteral feeding contamination conditions. It is strongly to recommend the continuous ICP education.

Disclosure of interest: None declared.

P166

Mortality attributable to influenza-like illness, gastro-enteritis and pneumonia, results from the Dutch Sentinel Network for Surveillance of Infectious Disease (SNIV)

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BMC Proceedings 2011, 5(Suppl 6):P166

Introduction / objectives: Elderly and especially nursing home residents are at increased risk of infectious diseases due the high prevalence of underlying chronic illnesses, age-related immunosenescence and the close (d) environment typical for this population. The impact of the occurrence of infectious diseases on mortality is subject of this study.

Methods: In the Sentinel Surveillance Network on Infectious diseases in nursing homes (SNIV), elderly care physicians and/or nurse practitioners report weekly numbers of 1) mortality and 2) infectious diseases on the basis of clinical definition. On these weekly time series (mid 2008-beginning of 2011) we used Poisson regression models (which included linear and periodic components) to characterize the association of total death counts with trends in influenza-like illness (ILI), gastro-enteritis (GE), and probable pneumonia.

Results: In total 35 nursing homes with a total of 4516 residents participated during part of the 128 week study period. The incidence of mortality and infectious illnesses displayed seasonal peaks in winter. In total 2324 residents died. Per 1000 residents, each reported case of pneumonia was associated with 3.4 (95%CI:1.7-5.2) deaths occurring in the same week and 2.2 (95%CI:0.5-3.9) occurring 2 weeks later. Each reported GE case was associated with 1.1 (95%CI:0.4-1.7) deaths one week later. Together with these infections, the linear and periodic terms

were no longer significant and were thus excluded from the final model. Of all deaths, our model attributed 745 (32%) to pneumonia and 172 (7%) to GE.

Conclusion: Probable pneumonia and gastro-enteritis were significantly associated with overall mortality, while influenza-like illness was not.

Disclosure of interest: None declared.

MRSA EPIDEMIOLOGY AND CONTROL II

P167

Persistent carriage of MRSA in pig farmers

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BMC Proceedings 2011, 5(Suppl 6):P167

Introduction / objectives: Livestock associated methicillin-resistant *Staphylococcus aureus* (MRSA) is a known and prevalent pathogen related to livestock farming. Little is known about the dynamics of carriage over time in pig farmers.

Methods: In this prospective cohort study, pig farmers and their employees from 50 pig farms in The Netherlands were tested for MRSA presence in nose and throat at 5 time points in 8 months. Questionnaires were taken as well. Persistent carriers were defined as persons with 100% of nasal samples positive for MRSA. Multilevel multivariate regression analysis was performed in SAS. This is a preliminary analysis as the collection of data is still ongoing.

Results: In total, 130 pig farmers and employees entered the study (101 males, 78%). Eighty of them (62%) were MRSA nasal carriers at the start of the study and 49 (38%) were persistent carriers. Presence of MRSA in throat samples at the start of the study (OR=6.1, 95% CI 1.6-23.6), giving birth assistance to sows (OR=8.1, 95% CI 1.9-35.3), and the presence of goats on the farm (OR=6.0, 95% CI 1.0-35.7) were significantly associated with persistent carriage. Amount of working hours per week did improve the model fit, but was not a significant factor (OR=1.0, $p=0.18$).

Conclusion: The vast majority of persons working with pigs on a daily base is carrier of MRSA and almost 40% are persistent carriers. Throat carriage and specific tasks or farm characteristics were determinants of persistent carriage.

Disclosure of interest: None declared.

P168

Outbreak of livestock-associated methicillin-resistant *Staphylococcus aureus* in a nursing home

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BMC Proceedings 2011, 5(Suppl 6):P168

Introduction / objectives: We describe an outbreak of livestock-associated methicillin-resistant *Staphylococcus aureus* (LA-MRSA) in a nursing home in the Netherlands from October 2010 to February 2011. The nursing home consists of three separate wards and is located in the southeast of the Netherlands, an area with a high pig-density.

Results: In October 2010, MRSA was cultured from a wound of a resident of the nursing home. Subsequent screening revealed six additional residents and four healthcare workers with MRSA colonization. The colonized residents were located on two wards of the nursing home. The outbreak was controlled by short term isolation of affected residents and decolonization of carriage. Six of the seven affected residents were successfully decolonized. The resident who failed treatment had regularly contact with livestock. Two of the four colonized healthcare workers reported frequent contact with livestock. An epidemiological analysis was

performed and the strains were typed using pulsed field gel electrophoresis (PFGE) with *Cfr9I* digestion. PFGE revealed that the MRSA of all residents and the two healthcare workers who did not report contact with livestock were identical. The two healthcare workers who did have contact with livestock had different strains.

Conclusion: This outbreak shows that LA-MRSA can spread in nursing homes. It can be controlled using relatively simple control measures. PFGE was a useful tool to assist epidemiologists in the control of LA-MRSA.

Disclosure of interest: None declared.

P169

MRSA-ST398 in livestock farmers and neighbouring residents in a rural area in Germany

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Introduction / objectives: The aim of the study was to establish, for the first time the prevalence and risk factors associated with MRSA-ST398 carriage, a strain usually found in animals, in a rural population with occupational livestock contact as well as neighbouring residents.

Methods: A cross-sectional survey was out in a pig and poultry dense area in Germany. 2756 questionnaires and self-sampling nasal swabs were sent out in the winter of 2009/2010.

Results: Overall 1872 out of 2753 (response 70%) people, aged between 26 and 53 years of age, took part in the study. Overall, 1.5% of the tested population without and 24% with occupational livestock contact tested positive for MRSA and MRSA-ST398 for the former; MRSA-ST398 only for the latter. The group without occupational livestock contact were 3.8 times (95% CI 1.5-9.3) more likely to be colonized if a household member had livestock contact; 3.2 times (95% CI 1.4-7.4) more likely if they regularly carried out private farm visits (e.g. to buy eggs or milk). In the group with occupational livestock contact, pig contact had an Odds Ratio of 7.1 (95% CI 2.9-17.2) for MRSA-ST398 acquisition.

Conclusion: This is the first study establishing a MRSA prevalence of 1.5% within the general population without occupational livestock contact. The study furthermore confirmed already established risk factors for those with and those without occupational livestock contact. It also suggested private farms visits as new potential risk factor for MRSA colonization for the group without occupational contact. More research however into establishing the exact transmission routes and foremost into measures to prevent the spread of the bacterium in the farming environment is still required.

Disclosure of interest: None declared.

P170

Prevalence of livestock associated MRSA in blood isolates

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Introduction / objectives: In the Netherlands there is an extensive reservoir of livestock associated methicillin-resistant *Staphylococcus aureus* (LA-MRSA) in pigs and calves. The aim of this study was to establish the prevalence of LA-MRSA in human blood isolates.

Methods: This study was based on data from the national antibiotic resistance surveillance (ISIS-AR) in The Netherlands. The 22 participating laboratories cover approximately 50% of all hospital beds. Data from 2008 through 2010 on *S. aureus* (SA) isolates were evaluated for methicillin resistance and *spa*-type, to identify LA-MRSA strains. Only the first isolate per patient was included. For this preliminary examination, we used tetracycline resistance as an indicator for LA-MRSA. In further analysis presented at the congress, *spa*-types will be included.

Results: The proportion of MRSA of all episodes of SA bacteremia was 1.5% (51/3355). Of the MRSA isolates with an antibiotic resistance profile,

17% were tetracycline resistant (8/48, 95%CI 9-30%). The proportion of tetracycline resistance in MRSA isolates from other sources was 41% (872/2124, 95%CI 39-43%, chi-square blood vs non-blood $p < 0.0001$). Extrapolation results in an average annual incidence of 5.3 patients with LA-MRSA bacteremia in The Netherlands.

Conclusion: The current annual incidence of LA-MRSA bacteremia is low. Tetracycline resistant MRSA is significantly less prevalent in MRSA blood isolates compared to non-blood isolates. This can be the result of an excessive screening regime resulting in overrepresentation in non-invasive isolates or a decreased virulence of the livestock associated strains.

Disclosure of interest: None declared.

P171

Mupirocin resistance among MRSA surveillance isolates from neonatal intensive care unit under 10 year-search and destroy policy compared to

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BMC Proceedings 2011, 5(Suppl 6):P171

Introduction / objectives: One of major threatening of search and destroy of MRSA is rising mupirocin resistance. In a 2,200-bed tertiary care hospital, only 38-bed neonatal intensive care unit (NICU) was under active surveillance and decolonization of MRSA colonizers for last 10 years. Mupirocin resistances of MRSA surveillance isolates from NICU and clinical isolates of *Staphylococcus aureus* from the institute were compared.

Methods: From October 2008 to September 9, all MRSA surveillance isolates from NICU mupirocin MICs were determined by E-test (AB Biodisk, Solna, Sweden). From December 2009 to March 2010, 500 clinical isolates of *S. aureus* were consecutively collected by the first isolate per a patient and their MICs of mupirocin were measured using MicroScan Pos Breakpoint Combo Panel Type28 (Siemens, USA) and MIC of resistant isolates were confirmed by E-test. All mupirocin resistant isolates were submitted to PCR for *mupA*.

Results: 70 (10.8%) of 648 patients were MRSA-colonized in NICU. 11 (15.7%) of 70 MRSA surveillance isolates were mupirocin-resistant with high-level MIC. Clinical isolates comprised 315 MRSA and 185 methicillin-susceptible *S. aureus* (MSSA). 39 (7.8%) including 30 (9.5%) MRSA and 9 (4.9%) MSSA were mupirocin-resistant, but only 8 MRSA (26.7%) and 7 (77.8%) MSSA had high-level MIC. All high-level resistant isolates and no low-level resistant one were *mupA*-positive.

Conclusion: Mupirocin high-level resistance of MRSA surveillance isolates under the search-and-destroy condition was much higher than clinical isolates of MRSA or MSSA. MRSA decolonization requires caution and monitoring of rising mupirocin-resistance.

Disclosure of interest: None declared.

P172

Methicillin-resistant *Staphylococcus aureus* without borders: USA300 in Cuba

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Introduction / objectives: Methicillin-resistant *Staphylococcus aureus* (MRSA) is an increasing problem in the Americas and the Caribbean including Cuba. Recently, MRSA isolates are emerging as significant pathogens in the community. In the USA, the most prevalent community associated (CA)-MRSA clone is USA300 (ST8, *spa* type 008). Little is known about the molecular epidemiology of MRSA in some of the Caribbean countries. In this study we aim to investigate the molecular epidemiology of MRSA isolates from 4 major Cuban hospitals.

Methods: During a 3 months period in 2008 all clinical isolates suspected to be MRSA were prospectively collected. Three major Cuban hospitals and the national reference centre for infectious diseases participated in

the study. Oxacillin susceptibility testing was performed in Cuba. Further examinations were done in the Netherlands, including Pantone-Valentine leukocidin (PVL), genes *lukS-lukV*, *mecA* and Spa-typing.

Results: From the 56 suspected *Staphylococcus* isolates, 38 were confirmed to be MRSA. Spa typing identified 5 different spa-types. In decreasing frequency we found Spa-type t149, t008, t037, t4088 and t2029, in respectively 22, 8, 6, 1 and 1 isolates. Only the eight t008 isolates were PVL positive.

Conclusion: Here we report the first molecular typing results of MRSA isolates from Cuba. The predominant clone was the Spa-type 149, followed by CA-MRSA USA300. We conclude that an economic and political embargo is a weak infection control measurement to contain the spreading of a potentially harmful pathogen.

Disclosure of interest: None declared.

P173

Epidemiologic profile of *Staphylococcus aureus*-methicillin resistant (MRSA) bacterium in hospital-acquired-infection in neonatal-intensive-care-unit (ICU) from -2000 to 2010 analysis in general hospital

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BMC Proceedings 2011, 5(Suppl 6):P173

Introduction / objectives: Awareness of epidemiologic profile of MRSA-hospital-acquired infection in neonatal-ICU might improve an early recognition of this infection.

Evaluating the clinical epidemiologic profile of hospital-acquired *Staphylococcus aureus*-bacterium infection in neonatal-ICU patients according to its methicillin sensibility.

Methods: The infections cases were prospectively recorded for an eleven-year period from 2000 to 2010; the program used was EPI-INFO v 3.4.1.

Results: 31 strains of *Staphylococcus sp* were identified in some hospital-acquired-infections. 46.7% of *Staphylococcus aureus* were methicillin resistant. Bloodstream infection (BSI) was the most prevalent site of infection of MRSA (40%) as well as for methicillin-sensitive *Staphylococcus aureus* (MSSA) (62.5%). Symptoms of infection had began as early as 8.5 days and as late as 11 days (average time) from the admission date in methicillin-sensitive and methicillin-resistant *Staphylococcus aureus* cases respectively. The previous antibiotic therapy was more usual in MRSA cases (80%) than in MSSA (0%). The average weight of newborn infant was heavier in MSSA (2.222g) than MRSA (1.626g). The frequency of death was higher in MRSA than MSSA (40% and 12.5% respectively). The average duration of stay was slightly longer in MRSA (24 days) than in MSSA (22.8 days).

Conclusion: From that analysis we have pointed out an epidemiologic profile of MRSA-hospital infections in neonatal-ICU concerning its prevalence and others epidemiologic issues in order to prevent its increase and diffusion in neonatal ICU.

Disclosure of interest: None declared.

P174

Underreporting of methicillin-resistant *Staphylococcus aureus* (MRSA) carriage by surgeons in the operating room planning software

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BMC Proceedings 2011, 5(Suppl 6):P174

Introduction / objectives: MRSA carriage should be notified to operating room (OR) teams in order to guarantee continuity of contact isolation precautions, planning of MRSA carriers after non-carriers, and adequate antibiotic prophylaxis if indicated. The objective of our study was to assess the proportion of known MRSA carriers notified in the OR software.

Methods: In our hospital, the surgeon in charge is responsible for notifying patients who carry multiresistant bacteria in the OR software at time of intervention planning. We merged the OR database with the MRSA database of our laboratory. All surgical interventions (10 surgical specialties) conducted between January and December 2010 were analyzed.

Results: 11'701 interventions were analyzed. We identified 584 (5%) interventions in known MRSA carriers. Only 318/584 (54.5%) MRSA carriers were notified as such by the surgeon in charge in the OR planning software. This reporting rate varied from 23% to 72% depending on the surgical specialties. It increased significantly with the mean weekly prevalence of MRSA carriers on each specialty ward in a weighted regression model (regression coefficient: 2.9, p=0.046).

Conclusion: Surgical interventions in MRSA carriers represented 5% of all interventions in our hospital. Pre-operative MRSA carriage was notified to the OR team in only 54.5% of cases, which may increase the risk of transmission and prejudice adequate antibiotic prophylaxis. Notification rates were associated with the burden of MRSA cases on the wards, which may highlight an insufficient awareness of the problem among surgeons. Beside education efforts, an automated transfer of MRSA information to the OR database should be implemented.

Disclosure of interest: None declared.

P175

Abstract withdrawn

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P176

Comparison of different methicillin-resistant *Staphylococcus aureus* (MRSA) typing methods when poorly distinguishable isolates are causing epidemics

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Introduction / objectives: Fast, accurate, and reliable strain-typing is a prerequisite in managing MRSA epidemics. In this study, we compared three different strain-typing methods.

Methods: The usefulness of spa-typing, pulse-field gel electrophoresis (PFGE) and automated repetitive extragenic palindromic sequence-based (rep-PCR) method (DiversiLab, Bacterial Barcodes, Inc.) for typing Finnish MRSA strains was studied. A total of 110 clinical MRSA isolates collected from well-defined outbreaks in Ostrobothnia region and 96 isolates from several epidemics or sporadic sources all over Finland were analysed.

Results: Among all studied isolates 11 different major rep-PCR groups, 20 different PFGE and 10 different spa types were formed. Geographically close strains from separate local epidemics in Ostrobothnia caused difficulties in the grouping and discrepancies among the typing methods. From this material three minor rep-PCR groups could be formed by DiversiLab software's overlay analysis and 4 different PFGE groups. All of these isolates were, however, undistinguishable by spa-typing.

Conclusion: PFGE method had the highest discriminatory power, but it is a non-automated and labour intensive method. Spa-typing was unable to differentiate close strains that belong to separate epidemics. Automated rep-PCR typing represents an attractive option for accurate and rapid molecular typing of MRSA. In addition, a rep-PCR strain library can be created that aids laboratories to classify isolates and hospitals to monitor the occurrence of different types.

Disclosure of interest: None declared.

P177

Use of the multiple-locus variable-number tandem repeat fingerprinting method and microfluidic chips for rapid genotyping of *Staphylococcus aureus* isolates

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BMC Proceedings 2011, 5(Suppl 6):P177

Introduction / objectives: The early detection of outbreaks of methicillin-resistant *Staphylococcus aureus* (MRSA) and a rapid and

accurate identification of sources and routes of transmission are important objectives in hospital settings. In this study we investigated the application potential of Multiple-Locus Variable number tandem repeat Fingerprinting (MLVF) combined with microfluidic technology for a rapid discrimination of MRSA lineages in outbreak settings.

Methods: A total of 206 non-repetitive MRSA isolates recovered from infected patients at the University Medical Center Groningen between 2000 and 2010 were tested. The results obtained by MLVF using microcapillary electrophoresis were compared to those obtained by *spa* typing and Multiple-Locus Variable number tandem repeat Analysis (MLVA).

Results: The discriminatory power was 0.98 (107 patterns), 0.969 (85 allelic profiles) and 0.959 (66 types) for MLVF, MLVA and *spa* typing, respectively. Isolates defined as identical by MLVF were almost always (99%) indistinguishable by *spa* typing. All methods tested showed a high concordance of results calculated by adjusted Rand's coefficients. Of the three tested methods, MLVF is the cheapest, fastest and easiest to perform.

Conclusion: MLVF applied to microfluidic polymer chips is a rapid, cheap, reproducible and highly discriminating tool to determine the clonality of MRSA isolates, and to trace the spread of MRSA strains over periods of many years. Although *spa* typing should be used due to its portability of data, MLVF has a high added-value because it is more discriminatory.

Disclosure of interest: None declared.

P178

DNA microarray analysis reveals variability of accessory genes among isolates recovered during an MRSA outbreak

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Introduction / objectives: Although MRSA outbreaks might have significant consequences on patients and/or health care resources, few data are available about the microevolution of a strain during a single outbreak. In this study, our aim was to characterize the variability of accessory genes among isolates recovered during a local MRSA outbreak.

Methods: Ten MRSA isolates recovered during a large outbreak occurring at the Lausanne University Hospital (Switzerland) were characterized using a DNA microarray (StaphyType, Alere Technologies, Germany) that targets approximately 180 genes including several resistance and virulence genes. Each isolate belonged to the South German clone (ST-228-SCCmec I) and had been recovered between September 2008 and December 2009.

Results: As expected during the clonal dissemination of a strain, the 10 isolates shared identical presence/absence for most of the *c.a.* 180 genes tested. Nevertheless, variation was observed for several resistance and virulence genes. These included the beta lactamase operon genes (*blaZ*, *blaI*, *blaR*), genes involved in the resistance to Trimethoprim and Mupirocin (*dfpA* and *mupR*, respectively), a gene encoding unspecific efflux pump conferring resistance to a variety of antiseptic such as chlorhexidine (*qacA*), and genes potentially involved in virulence (*lukX*, *lukY*, *aur*). This variability affected at least 5 of the ten isolates.

Conclusion: Our results indicate the gain/loss of resistance and virulence genes during a local outbreak, suggesting that the biological characteristics of the strain might vary through time.

Disclosure of interest: None declared.

P179

Abstract withdrawn

_BMC Proceedings1753-656120115Suppl 6P179

P180

MRSA surveillance in a rehabilitation centre with liberal isolation policy

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Introduction / objectives: In our hospital with 178 beds the core business is multidisciplinary rehabilitation. Close contacts between staff, patients and their environment are inherent in this process. Isolation in single room in case of MRSA is not advisable in the purpose of social reintegration. Isolation is difficult because of long stay and a limited number of single rooms. Before changing the MRSA isolation policy the hygiene team started their infection control program in 2007 with focus on MRSA.

Methods: In every admission an MRSA screening of the nose is taken. Clinical samples are also taken from exsudative wounds, sputum and urine on admission as well as during hospitalisation. Strategies to prevent patient-to-patient transmission exist from standard precautions with hand hygiene for all residents, wearing gloves, gown and eye protection glasses for contact with blood and body fluids. All health care workers are informed and trained by the hygiene team during information sessions.

In case of single MRSA colonization in the nose chemical decolonisation is done.

Microbiological data from screenings and clinical samples are collected. Differentiation between colonization and infection is made.

Results: The nosocomial MRSA incidence density in clinical samples in 2008, 2009, 2010 was respectively 0.28; 0.15; 0.15. In 2008 only 6 cases out of 15 were nosocomial infection, in 2009 one out of 6; in 2010 6 out of 8.

Conclusion: The infection control strategies taken for MRSA-spread in our rehabilitation centre don't lead to a high incidence density of MRSA clinical samples. Continuous focus is given to information about standard and specific precautions and training sessions for all HCW's. No single room isolation is done for MRSA positive patient. Chemical decolonisation is done in selective patients.

Disclosure of interest: None declared.

CLOSTRIDIUM DIFFICILE - FROM BENCH TO BEDSIDES

P181

Abstract withdrawn

_BMC Proceedings1753-656120115Suppl 6P181

P182

Improved diagnostic test for *Clostridium difficile*: clinical and infection control implications

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BMC Proceedings 2011, 5(Suppl 6):P182

Introduction / objectives: *Clostridium difficile* reporting is mandatory in England, numbers have increased since the mid-1990s with over 25 000 reported per year. At Imperial College Healthcare it was observed that isolation of *C. difficile* from stool did not always reflect clinical disease; particularly when testing was changed to detection of glutamate dehydrogenase (GDH) and the *tcdB* gene by PCR. Testing for *C. difficile* in liquid stools was not restricted. All positive patients were therefore reviewed to determine if they had *C. difficile* associated disease (CDAD).

Methods: A patient was considered to have CDAD if they had at least 3 episodes of diarrhoea in 24 hours, the stool was positive for *C. difficile* by PCR, diarrhoea was not attributable to another cause and symptoms consistent with pseudomembranous colitis. A standardised clinical review was undertaken to determine if new cases of *C. difficile* met the case definition. Data were captured prospectively on an electronic surveillance system (ICNet).

Results: 250 patients admitted between June 2010 and January 2011 were test positive; of these, 166 (66%) were classified as hospital-acquired. Clinical review found 67 (40%) did not have CDAD: 29 (27%) did not have diarrhoea; in 80 (73%), diarrhoea was attributable to another cause, most commonly underlying bowel disease (38 cases). Severe disease occurred in 16%; there were 7 deaths associated with CDAD.

Conclusion: This analysis indicates that improved laboratory tests for toxin-producing *C. difficile* do not correlate well with CDAD. Whilst this may be an advantage in terms of prompt initiation of infection control measures, reporting based on positive tests does not represent the true

burden of disease and the laboratory method used diagnosis may have a significant impact on rates.

Disclosure of interest: None declared.

P183

Absence of *Clostridium difficile* stool carriage in asymptomatic volunteers

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BMC Proceedings 2011, 5(Suppl 6):P183

Introduction / objectives: *Clostridium difficile* is considered a leading cause of hospital-acquired diarrhea. Currently there are published case-reports of symptomatic Health-Care-Workers (HCW) and one report demonstrating transmission of *C. diff* from patient to HCW. Therefore, we initiated a prospective study to evaluate the prevalence of asymptomatic *C. difficile* stool carriage among healthcare workers at a single university hospital comparing them to non-healthcare workers to assess the risk for HCW's acquiring *Clostridium difficile*.

Methods: The study population consisted of 113 healthy HCW's of clinical departments with a high incidence of CDI in inpatients. The 128 controls were taken from the administration department of a Food Company and from frozen stool samples of healthy subjects from a colon cancer screening program. Both groups were comparable in age-and sex-distribution. From April to July 2010, in total 241 stool specimens were tested for toxigenic culture of *C. diff*. 51% of stool samples (58/113) of the study population and all control-samples (n=128) were confirmed by broth enrichment technique at the National Reference Laboratory for *C. difficile* in Vienna.

Results: Both investigated study-groups (n-total = 241) were negative for *Clostridium difficile* by both culture techniques (direct plating and broth enrichment method).

Conclusion: We conclude, therefore, that healthy HCWs are probably not at risk for acquiring *C. diff* spores from contacts with CDI-patients. They are themselves no risk for spreading *C. diff* spores in health-care facilities. Data about *C. diff* carriage in the community (up to 3%) demonstrates a possible overestimation.

Disclosure of interest: None declared.

P184

Impact of *Clostridium difficile*-associated disease in a regional hospital

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Introduction / objectives: For the recent years, our institution had an incidence of *Clostridium difficile* associated disease (CDAD) higher than the provincial rate. This study reviewed the burden of CDAD in our hospital.

Methods: CSSSRN is a tertiary regional 230-beds acute care, with only 34 (15%) single rooms with toilet. Cases from April 2009 to March 2011 were retrieved with Nosokos, a web-base electronic surveillance software used by our Infection Control Team. Data analysis included demographics, risk factors, origin of acquisition, isolation, intra-hospital transfers and complications. The estimated daily costs per case of CDAD were 1000\$/inpatient care, 200 \$/isolation and enhanced environmental disinfection, 300\$/transfer.

Results: A total of 242 episodes of CDAD in patients were observed in 190 patients, including 57 (23,4%) recurrences. Our incidence rate was 9,6/10000 patients-days. Many cases were caused by the hyper-virulent strain NAP1/027. The median age was 75 years (range 2-98) and 57% were women. The origin of acquisition from first episodes were nosocomial 60%, transfer from another facility 9%, non nosocomial 27%, unknown 4%. Hospitalization was required in 181 episodes (75%) for a median of 7 days (range 1-167). Colectomy was performed in 5 patients, death < 30 days occurred in 12% cases. Of 13445

isolation-days, 13,5% were associated with CDAD, for an average of 1,6 CDAD isolations/100 patients-days. Also, 10357 intra-hospital transfers were done and 1,3% were CDAD cases. Using our definitions, the estimated costs of CDAD in our institution were 2 600 000 \$ for the 2-year period.

Conclusion: CDAD caused severe disease, in an elderly population, with a high death rate of 12% and yearly costs of 1 300 000 \$ in our institution.

Disclosure of Interest: P. Dolcé Shareholder of Nosotech, J. Blanchette: None declared, C. Ouellet: None declared, K. Levesque: None declared, H. Bernatchez: None declared.

P185

Recovery of MRSA and *Clostridium difficile* in an ICU ward

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Introduction / objectives: The role of the hospital environment as a reservoir of infection is poorly understood. Therefore, baseline levels of MRSA (methicillin-resistant *Staphylococcus aureus*) and *Clostridium difficile* contamination on surfaces were determined in an ICU ward. The aim was to determine whether contamination differs at certain times of the day, if recovery of pathogens is influenced by total background contamination and to what extent cleaning affects contamination levels.

Methods: Sampling occurred in an 18 bed ICU ward on regular days for one month. Surfaces were sampled from patient and non-patient areas, morning and afternoon, to detect total viable counts (TVC), MRSA and *C. difficile* using contact plates and swabs. Multi-locus variable number tandem repeat fingerprinting (MLVF) was performed on selected isolates to determine relationship of MRSA from patients and environment. Statistical analyses were carried out using non-parametric tests.

Results: Data showed MRSA was recovered from 32% and *C. difficile* recovered from 27% of surfaces. All surfaces tested were contaminated with no significant difference in TVC regardless of time of sampling. MLVF data suggested transfer of MRSA from patient to environment rather than the converse.

Conclusion: Cleaning was scheduled in the morning however, whether surfaces were re-contaminated after cleaning or whether cleaning was ineffective remains to be established and requires more investigation. Therefore bacteria were detected throughout the surveillance period providing data on baseline levels of MRSA and *C. difficile* on surfaces. Bacterial contamination remains at easily detectable levels despite regular cleaning so ward cleaning protocols may need to be revised.

Disclosure of interest: None declared.

P186

C. difficile associated diarrhoea-don't blame community or norovirus

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Introduction / objectives: *C. difficile* associated diarrhoea (CDAD) has been recognised as the most common cause of hospital acquired diarrhoea. At the beginning of 2008, our Trust's Infection Prevention and Control developed a comprehensive intervention plan to reduce the number of CDAD cases.

Methods: Implementation of multi-modal intervention which included, early diagnosis, prompt isolation, introduction of hand hygiene, implementation of antibiotic stewardship programme, education and training, enhanced environmental cleaning, and feed back of surveillance (outcome and process) proved very effective in reducing the total no. of CDAD.

Results: As a result of multi-modal interventions, the total no. of CDAD case were reduced from 286 in 2008 to only 38 cases in 2010. We also carried out Root Cause Analysis of all cases of CDAD and found that only 15 % cases were 'true' community cases. In addition, during the winter of 2009, our wards were affected with outbreaks of norovirus and we tested all norovirus outbreak specimens for *C. difficile* toxin. However, unlike previous years, we did not see a rise in the number of new cases of *C. difficile* infection and for the first time, we were not able to find even a single case that was positive both for norovirus and *C. difficile* toxin.

Conclusion: We concluded that the health care facilities are the major sources of CDAD. We conclude that once you start to control CDAD in hospitals, the number of cases of *C. difficile* will reduce both in hospital and community. We also conclude that isolation of *C. difficile* toxin from specimens submitted for norovirus outbreak may detect patient with *C. difficile* colonization¹.

1. Damani NN, Wallace S. Does viral gastroenteritis really increase the reports of *Clostridium difficile* infection? *J of Hosp infect* 2011; 77: 171-172.

Disclosure of interest: None declared.

SURGICAL SIDE INFECTIONS

P187

First incidence study of the site surgical infection in the obstetrics and gynecology services during the years 2008-2010 in Bologhine Hospital. DZ

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BMC Proceedings 2011, **5(Suppl 6)**:P187

Introduction / objectives: The aim of this study is to evaluate the incidence of the site surgery infection (SSI) in the obstetrics and the gynecology services in our hospital.

Methods: All patients hospitalised in the two services during this period were included in this study. We used the CDC definitions.

Results: 5797 patients were monitored, including 3530 and 2267 patients of obstetrics and Gynecology. 0.92% and 2.15% of the inpatients in Gynecology and Obstetrics were operated during this period. The infection rate was very high in the obstetrics service (90%) and the SSI represented 94,73%. The infection rate was maybe lower in the Gynecology 35,95% but it was represented essentially by the SSI (80,35%). Patients have undergone an operation during the first day of their admission in 65,27% in obstetrics and the second day in 58,82% in Gynecology. The infection appeared during the first week in 54,16% in obstetrics and the second week in 64,70% in the Gynecology. The surgery was done urgently in 68% for the obstetrics patients and programmed in 88,23% for the gynecology patients. The etiological agents were essentially *S. aureus* and enterobacteria respectively isolated in 27,14% and 25,71% in Obstetrics and 26% for the two genus in Gynecology.

Conclusion: This first study showed that the SSI rate is very high, the operation is done on an emergency or scheduled. Much work remains to be done in these two services. We have to enhance the hygiene measures around the patient to operate (among others hand hygiene and the use of the alcoholic solution) and maybe involve also surgeons in transmitting their own infection rates.

Disclosure of interest: None declared.

P188

Abstract withdrawn

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P189

Risk factors of surgical site infection post cesarean section

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Introduction / objectives: The risk factors for post cesarean surgical site infection (SSI) have not been identified, although the occurrence of SSI is increasing.

Objective: To identify the high risk factors of post cesarean section SSI.

Methods: Retrospective study was conducted at WH. This included a total of 1806 women who underwent to C-section from Jan 2008 to Dec 2009. The risk factor data were collected from I.C surveillance notification form of each patient's SSI. The risk factors which were studied included: age, SSI bundles, type of C-section elective or emergency, duration of operation (less or more than 57 minutes), SSI index score, receiving anti-biotic as prophylaxis, length of stay pre/post surgery, PROM, comorbidity.

Results: During 2Yrs study period, 1806 patients underwent CS, of those 82 patients met the case definition for SSI with onset of infection within 30 days after CS. Over the study period, of those 82, 74 (90.2%) were classified as superficial incision, 6 (7.3%) had deep incision SSI, and 2 (2.4%) had organ space infection. Over the study period, 82 infected CS cases, 65 were underwent emergency CS, giving an overall SSI incidence (79.2%).

10 risk factors were studied such as emergency operation, co-morbidity as obesity and diabetes, premature rupture of membranes, prolonged operative time, length of stay pre/post surgery, lack of implementing SSI bundle such as Chlorohexidine skin preparation and hair removal. The emergency CS and obesity s were identified as the high risk factors for acquiring SSI post CS. The other factors were not shown to be significantly high risk factors as timing of antibiotic prophylaxis and duration of operation.

Conclusion: The finding shows that the 2 high risk factors make difference that lead to different approach concerning wt control, implementing SSI bundle properly and following the IC standards for skin preparation.

Disclosure of interest: None declared.

P190

Safety of non-woven polypropylene surgical adhesive drapes to prevent wound infection

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BMC Proceedings 2011, **5(Suppl 6)**:P190

Introduction / objectives: Wound infections caused by intra-operative contamination can be a major problem in surgery. The passage of bacteria through drapes is a potential source of wound infection. In this study we aimed to test the bacterial penetrability of 6 brands of non-woven polypropylene drapes.

Methods: Six brands of disposable non-woven polypropylene drapes were tested. A latex glove was used as a negative control and a woven cotton drape was used as a positive control. For each drape, a rodac plate was inoculated with 10⁵ colony-forming units / ml of *Staphylococcus aureus* ATCC strain 6538 and incubated at 37°C for 24 h to obtain confluent growth. Thereafter, each drape was placed between the incubated rodac plate and an inverted rodac plate with a weight of 400 gram placed thereon for 30 minutes. Subsequently, the inverted rodac plate was incubated for 24 h at 37°C and inspected for growth of *S. aureus*.

Results: The latex glove was totally impermeable, in contrast to the woven cotton drape which revealed heavy growth after 30 minutes. All the drapes made from non-woven polypropylene were impermeable.

Conclusion: Although bacterial penetration through surgical drapes can be time dependent, we here show that polypropylene non-woven drapes were impenetrable at 30 minutes. We therefore recommend the use of non-woven polypropylene drapes in surgical procedures

Disclosure of interest: None declared.

P191

Central nervous system infections in postnerosurgical patients

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BMC Proceedings 2011, **5(Suppl 6)**:P191

Introduction / objectives: Central nervous system infections in neurosurgical patients (pts) are a serious complication with high morbidity and mortality. We describe characteristics of patients and episodes, microorganisms and evolution of neurosurgical pts with meningitis (M) or ventriculitis (V) in one ICU in Uruguay.

Methods: Retrospective analysis of neurosurgical pts with M or V in a ten year period (2000-2010). M and V was defined based in cerebrospinal fluid findings (glucose <0.4 g/L, < 40% plasmatic glucose, leucocytes > 50/ mL (>50% neutrophils), lactate > 4 mM/L) and culture (definitive episodes). V required intraventricular procedure or device implantation.

Results: 69 pts (47 years, male 69%, SAPS II 33, mechanical ventilation 92%) developed 77 episodes (M 44, V 32). Neurosurgical diseases were trauma (39%), meningeal hemorrhage (20%), intracerebral hemorrhage (17%),

intracranial tumor (12%). Cerebrospinal fluid leakage was present in 25%, ventriculostomy in 35% (catheter permanence 6.2 days), subdural catheter in 30% (catheter permanence 4.2 days). Microorganisms were mainly Gram negative bacilli (*Acinetobacter* sp (20, 26%), *Klebsiella* sp (7, 9%), *Ps aeruginosa* (7, 9%), *Proteus* sp (3, 3.9%), *Enterobacter* sp (3, 3.9%), *S aureus* (8, 10.4%), *S coagulase negative* (6, 7.8%), *Enterococcus* sp (3, 3.9%), *Candida* sp (5, 6.5%). Crude mortality was 29% (20/69).

Conclusion: In a selected group of seriously ill and high risk neurosurgical patients M and V were mainly caused for Gram negative bacilli and had high mortality.

Disclosure of interest: None declared.

P192

Patient readmission for surgical wound infection

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BMC Proceedings 2011, 5(Suppl 6):P192

Introduction / objectives: Surgical site infection (SSI) rates are underestimated mainly in the absence of a successful program of post discharge surveillance. Readmissions monitoring can contribute to accurate infection rates.

Methods: Exploratory descriptive study, developed in a governmental hospital of tertiary care in Minas Gerais (Brazil), from January 2008 to December 2009. Medical records and reports of control infection practitioner of 98 patients readmitted with SSI were reviewed and the data were analyzed in relation to gender, age, co morbidities, length of staying, surgery, specialty, type of procedures, wound class, duration of surgery, SSI and micro-organisms.

Results: Readmissions occurred in patients who underwent clean and potentially contaminated surgical procedures, with co morbidities commonly among people 50 years or older. Duration of surgery did not differ from the cut point recommended by CDC. *Staphylococcus aureus* predominated in orthopedic procedures and *Escherichia coli* in general surgery, both with multi-resistance profile below the results presented in other studies.

Conclusion: Whereas the SSI occurred more frequently in clean surgeries and readmissions can provide information about the quality of care, these findings are important to control infection practitioner review the antibiotic prophylaxis protocols and surgical practices in patients undergoing clean and potentially contaminated procedures.

Disclosure of interest: None declared.

P193

Surgical-site infection indices detected by post-discharge surveillance in a medium sized hospital in the city of São Paulo, Brazil

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BMC Proceedings 2011, 5(Suppl 6):P193

Introduction / objectives: Surgical-site infections (SSI) account for about 24% of hospital infections. Due to short postoperative staying, SSI diagnosis is eventually made after discharge. SSI rates may be under reported; therefore surveillance after discharge is needed to obtain reliable indices of SSI and to improve quality of care. **Aim:** To describe the SSI rate assessed after discharge and to compare post-discharge rates to intra hospital rates.

Methods: This is a retrospective analysis of data collected between September 2009 and December 2010 in a medium sized private hospital in the city of Sao Paulo. Active surveillance after discharge is a governmental requirement and was performed by telephone. We used a standard questionnaire to investigate the occurrence of signs and symptoms of infection: pain, swelling, redness, warmth, fever, presence of secretion and nodules around the incision. Once the SSI was identified, its occurrence was notified and the patient was followed by 60 and 90 days, by telephone.

Results: From 5,414 surgical patients, 5,213 (96.3%) agreed to answer the questionnaire. SSI rate was 2.4% (129/5,414): there were 88 (68.2%) intra hospital SSI and 41 (31.8%) cases identified post-discharge. No suspected cases of *Mycobacterium spp.* infection were identified.

Conclusion: The post-discharge infection rate highlights the importance of a follow up. For institutions that do not have outpatient clinics, post-discharge surveillance is required. Amongst other methods, telephone contact seems to be a reliable strategy since it is possible to assess a large number of patients, although costs and feasibility need to be considered before its implementation.

Disclosure of interest: None declared.

P194

Incidence, risk factors and etiological agents in surgical site infections in a developing country

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Introduction / objectives: There is limited data about the epidemiology of SSIs in developing countries. To investigate incidence rates of SSIs, risk factors, etiological agents and antimicrobial resistance rates of pathogens in a developing country.

Methods: Prospective surveillance of SSIs was performed during May 2005 and April 2009 in neurosurgery (NS) and general surgery (GS) unit. All patients who had gallbladder (CHOL), colon (COLO), gastric (GAST), small bowel (SB) and bile duct, liver or pancreatic surgery (BILL) in GS and craniotomy (CRAN), ventricular shunt (VSHN) and spinal fusion (FUSN) surgery in NS were included.

Results: SSI was determined in 415 (10.8%) patients in GS and 146 (4%) patients in NS. SSI rates were 4%, 16.8%, 6%, 16.4% and 14% in CHOL, COLO, GAST, SB and BILL, respectively in GS. In NS, SSI rates were 4%, 4.8% and 4.5% in CRAN, VSHN and FUSN. Cefazolin was used in 780 (49%) operations in GS, 1266 (95%) of operations in NS for antimicrobial prophylaxis. Broad spectrum antibiotics were administered in the rest of the patients. Antimicrobial prophylaxis (AMP) were administered for >24 h in 69% and 64% of patients in GS and NS, respectively. The most significant risk factors for SSIs were total parenteral nutrition, transfusion and presence of drain in GS, and total parenteral nutrition, transfusion, stress ulcer prophylaxis, presence of drain and foreign material in NS. The most common pathogen was *Escherichia coli* in GS and *Acinetobacter baumannii* in NS. Isolated pathogens were multiresistant, with 58% quinolone resistance in *E.coli* and 67% imipenem resistance in *A.baumannii*.

Conclusion: Surveillance of surgical site infections is one of the most important infection control issue. Prolonged use of AMP and use of broad spectrum antibiotics are associated with emergence of resistant bacterial strains.

Disclosure of interest: None declared.

P195

Changes in postoperative infections following implementation of safe surgery checklist and hand hygiene in University of Gondar Hospital

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BMC Proceedings 2011, 5(Suppl 6):P195

Introduction / objectives: To measure the changes in post operative wound infections before and after introduction of hand hygiene and safe surgery check list.

To see the compliance of health workers on hand hygiene and on using the safe surgery check list.

Methods: Baseline assessment made on wound infection rate of 100 patients before the implementation of hand hygiene using the WHO accredited alcohol based hand rub technique. Six months after, surgical site wound infection in 100 patients of similar profile is reassessed. Wound infection is declared if there are clinical signs of wound infection from day 3 on post operative course. Wounds already infected during or before surgery were excluded. Study was conducted in two wards namely general surgical and Obstetric wards.

Results: Post operative wound infection rate in surgical wards was reduced by 45% while surgical site infection in obstetric wards went down by 33% after health workers used the hand hygiene and check list in 50% of the cases.

Conclusion: the implementation of hand hygiene and safe surgery check list was only 50% while it brought about significant changes surgical site infection in both wards. the impact on patient safety in general and surgical site infection rates will go down by fully implementing the hand hygiene and safe surgery check list.

Disclosure of interest: None declared.

P196

Complications after surgery in patients with colorectal cancer: the evidence for nursing care

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BMC Proceedings 2011, 5(Suppl 6):P196

Introduction / objectives: Patients with colorectal cancer undergoing surgical treatment require planning and preparation of interventions for prevention of postoperative complications, especially considering the complexity and commitment of its clinical and psychosocial condition.

Objectives: To identify and synthesize the factors that influence the occurrence of postoperative complications and establish the implications of these scientific evidence for nursing care.

Methods: It is an integrative review of literature where descriptors were used, wound, colorectal cancer and complications with search in the databases Medline, CINAHL and Lilacs, resulting in a sample of 10 scientific articles.

Results: Results indicated that the preoperative bowel preparation, staging and tumor location, surgical technique and care of the wound in the postoperative period as the factors influencing the occurrence of postoperative complications.

Conclusion: Thus, measures of prevention and infection control can be implemented that are related to the rigor of the completion of the enema, ensure the conduct, preparation and guidance of patients for diagnostic tests and specialized (CT, MRI and colonoscopy), fitness and education on pre-operative surgery and its consequences, evaluation of patient outcome and the surgical wound and hospital discharge planning with primary care for the patient and family, encouraging the physiological recovery and wound healing. These nursing interventions could help in decreasing the rates of postoperative complications and mortality of this clientele, as well as improve the quality of perioperative nursing care.

Disclosure of interest: J. Silva Other review, H. Sonobe: None declared, D. Andrade: None declared, A. Giordani: None declared, C. Naka Shimura: None declared, E. Watanabe: None declared.

P197

Deployment of national criteria for prevention of infection in surgical site in Ponta Grossa, Parana, Brazil

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BMC Proceedings 2011, 5(Suppl 6):P197

Introduction / objectives: The Surgical Site Infection (SSI) is one of the chief aggravation related to health care in Brazil, occupying the third position among all infections with a prevalence of 14% to 16% of those found in hospitalized patients. This is a prospective, qualitative and descriptive study whose aim was to implement preventive measures to control SSI at a Public Hospital, Ponta Grossa-PR, 2010.

Methods: A transposition of the "National Criteria of Infections related to prevention of SSI" had been carried out, ruled by the National Health Surveillance Agency (ANVISA, 2009) to the 15 surgeons and 12 nurses from the operating room and surgical clinic, as well as the application of a questionnaire with the purpose of verifying the concept of the team about the packages of measures, analyzed by the content of Bardin.

Results: The results showed that 18 (67%) of the participants had a shortage of knowledge concerning the packages of measures. Regarding their conceptions, the results were organized into two categories: Permanent

Health Education, aimed at minimizing risks and Implementation of Preventive Measures. Thus, this study has provided subsidies to systematize the preventive measures contemplating from pre to post-operative period, ensuring maximum integrity, recovery and mitigation of risks to patient health.

Conclusion: When you think the reorganization of health care practice, this should be done on new bases and criteria to replace the traditional model of care.

Disclosure of interest: None declared.

BONE- AND PROSTHETIC JOINT INFECTIONS

P198

Ring fencing of a joint replacement unit may not prevent MRSA in practice

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Introduction / objectives: Ring fencing of joint replacement (JR) surgery units is recommended to prevent the high morbidity and mortality associated with methicillin resistant *Staphylococcus aureus* (MRSA) infection in orthopaedic patients. However, little is known about the effectiveness of and compliance with such policies in practice.

Methods: Over 10 weeks in 2010, 250 prospectively recruited admissions to a busy, ring fenced JR unit underwent admission screening for MRSA and demographic screening using a standardised questionnaire based on the unit's admission policy which is designed to exclude patients at high risk of MRSA colonisation. Subjects comprised of patients admitted for reasons other than JR surgery, as well as JR patients who stayed in any other hospital ward prior to admission to the unit.

Results: Despite nearly perfect compliance (248/250; 99.2%) with unit's admission policy, 2.8% (7/248) of subjects complying with the admission policy were colonised with MRSA at the nares and/or groin. MRSA carriers were disparate in age, gender and inpatient hospital admission in the last 12 months. Non-JR patients and transfers from high dependency units represented a high risk for introducing MRSA into a ring fenced unit.

Conclusion: Demographic screening undoubtedly excludes a proportion of MRSA carriers; however, it is inadequate to completely prevent the admission of MRSA to a ring fenced unit. Where it is unavoidable that ring fenced units host patients not admitted for JR surgery and not screened for MRSA preadmission, these patients should be cohorted away from JR patients as they represent a higher risk for MRSA despite rigorous demographic screening.

Disclosure of interest: None declared.

P199

Antibiotic susceptibility and architecture of *Staphylococcus aureus* and *Staphylococcus epidermidis* biofilms

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BMC Proceedings 2011, 5(Suppl 6):P199

Introduction / objectives: The infection associated to metal surfaces or dead tissues like bone grafts, can be fatal for the patient and presents a major financial burden for the economy. The adhering bacteria in these cases can evade host defences by forming biofilms. For this reason, the prevention of bacterial colonization and control of implant associated infections are of special interest.

Objectives: Growth of *S.aureus* and *S. epidermidis* biofilms *in vitro* for antibiotic susceptibility tests and investigation of architecture.

Methods: *S. aureus* and *S. epidermidis* biofilms were grown over MBEC® (modified microtiter plates). Antibiotic susceptibility tests were carried out using gentamicin, vancomycin, rifampicin, fosfomicin, clindamycin and

linezolid. Cell counting, opacity density (OD₆₂₀) and scanning electronic microscopic (SEM) analysis were carried out.

Results: The counting of viable cells after antibiotic exposition and OD₆₂₀ showed significant efficacy of rifampicin and gentamicin against *S. epidermidis* biofilms and rifampicin against *S. aureus* biofilms compared to other antibiotics. SEM images showed proteic material in contact with cells which can be related to the proteic membrane characteristic of the biofilms structure.

Conclusion: The method for the development of bacterial biofilm *in vitro* using MBEC® plates is efficient and relatively fast. Gentamicin and rifampicin are good candidates for control of implant associated infections.

Disclosure of interest: None declared.

P200

Release rate and antimicrobial activity of gentamicin salts as coating for bone allografts

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BMC Proceedings 2011, 5(Suppl 6):P200

Introduction: The rapidly increasing number of joint arthroplasties performed around the world has seen a rising number of complications. Since the contamination is normally associated to metal surfaces and dead tissues like bone grafts, local delivery of antibiotics is an option for therapy and prophylaxis of implant associated infections.

Objectives: In this study, we tested the delivery rate and antibiotic activity of gentamicin palmitate mixed with gentamicin sulfate as coating for bone allografts.

Methods: Bone chips were obtained by morsellising femur heads and impregnated with GS+GP, GS pure and Herafill® as control. The samples were analysed before and after 1 month of storage at -80°C. The drug release rate was evaluated *in vitro* after 0, 1, 4, 8 and 12 hours and 1, 2, 3, 4, 5, 6 and 7 days. Antimicrobial efficacy was determined against *S. aureus* and *S. epidermidis*.

Results: The released rate of GS pure and GS+GP was similar along time and significant lower than Herafill®. However, for both strains, GS+GP and GP pure were more effective than Herafill®. *S. epidermidis* is significantly more susceptible to GS+GP, GP pure and Herafill® than *S. aureus*. No significant differences were observed before and after the storage of samples.

Conclusions: The capacity of bone grafts to act as antibiotic carrier has been confirmed in this study. The lower delivery rate of GS+GP compared to GS pure and Herafill® can be an advantage for longer release time increasing the local protection against infections. Short-term storage at -80°C does not compromise the coating activity.

Disclosure of interest: None declared.

URINARY TRACT INFECTIONS

P201

Hospital-acquired urinary tract infection: a case control study

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BMC Proceedings 2011, 5(Suppl 6):P201

Introduction / objectives: Hospital-acquired urinary tract infections (HAUTIs) are responsible for about 40% of all healthcare-associated infections. The aim of the study was to assess risk factors and microbiological aspects of HAUTI on six wards of a general regional hospital in Serbia.

Methods: A case-control study was nested within prospective cohort HAUTIs study conducted from January to December, 2007. Surveillance was performed on all patients admitted directly from the community to one of the study wards and whose hospital stay covered 72 h or more. The cases were patients with HAUTIs, identified using definition of the Centers for Disease Control and Prevention. Three controls were identified for each

case, being chronologically the next three patients surveyed who did not develop HAUTI. The patients and controls were matched by sex and age (+5 years).

Results: Assessment of 8,467 patients during study period revealed HAUTI in 125 of these. The overall incidence rate of HAUTI was 14.8 cases/1000 admissions. The mean age (range) of cases and controls were 64.9 (18-85) and 65.2 (17-86), retrospectively. Multivariate logistic regression analysis showed that increasing length of urinary catheterization (odds ratio [OR], 13.22; 95% CI, 3.36-51.91) and increasing length of hospitalisation (odds ratio [OR], 1.21; 95% CI, 1.04-1.42) were independently associated with increased risk of HAUTIs. The most frequently isolated Gram-negative bacteria were *Enterobacter*, *Klebsiella sp*, *Proteus mirabilis* and *Escherichia coli*. *Enterococcus sp* was the most frequent Gram-positive bacteria.

Conclusion: The length of urinary catheterization and prolonged hospitalization were the most important risk factors of HAUTIs.

Disclosure of interest: None declared.

P202

Urinary tract infections in patients of University Hospital Center of Tirana

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BMC Proceedings 2011, 5(Suppl 6):P202

Introduction / objectives: Urinary tract infections (UTIs) are the most common type of nosocomial infections. The majority of nosocomial UTIs occur following instrumentation. Because nearly 10% of all hospitalized patients are catheterized, preventing nosocomial UTIs is a major factor in decreasing nosocomial infections. The aim of the study was to register the prevalence, etiology and antimicrobial susceptibility of nosocomial urinary tract infection pathogens isolated in UHC.

Methods: It was a cross-sectional study. In one day, a total of 893 urine samples were taken from hospitalized patients of UHC. The Vitek 2 automated system was used to identify and to detect antibiotic susceptibility. We collected data regarding etiology and antimicrobial resistance profile of the urinary isolates collected.

Results: The six most commonly isolated organisms were in decreasing order: *E.coli*, *Candida sp*, *P.aeruginosa*, *E.collocaea*, *Klebsiella sp* and *Enterococcus sp*.

The overall resistance rate to ampicillin in Gram - negatives was 88%.

The antimicrobial resistance patterns of the study isolates confirm the changes reported in nosocomial pathogens from other sources.

Conclusion: The prevalence rate of nosocomial UTIs was 18.9 %. These data show the high level of antimicrobial resistance amongst the uropathogens causing nosocomial UTIs. UTIs is related to the use of indwelling urinary catheters and other intravesical procedures. The levels of resistance of pathogens must be a clear reason for stricter guidelines and regulations in antimicrobial policy.

Disclosure of interest: None declared.

P203

Modeling infectious diseases – urinary tract infection, a practical example

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BMC Proceedings 2011, 5(Suppl 6):P203

Introduction / objectives: The proper management of infectious conditions often requires optimized clinical decisions based on a complex decision making process. Computers are able to aid this process only if the medical knowledge used is machine readable, which requires scrupulous preparation and modeling. Here we describe and evaluate a dynamic model framework for Urinary Tract Infection (UTI).

Methods: We used Bayesian Belief Network (BBN), a probabilistic model that can represent conditional dependencies between variables. Its dynamic characteristics allow modeling complex relationships between medical processes and symptoms. For the medical information we turned to clinical practice guidelines for UTI and abstracted as well as modeled their content with standard ontological concepts. Altogether we extracted several hundreds of rules describing diagnostic and therapeutic relationships. Finally we validated these rules against the original guidelines using an open-source reasoner (Euler) and a battery of test cases.

Results: We found that the results proposed by the reasoner coincided with that of the clinical guideline in 97% while allowing a much higher complexity with the possibility of freely adding and combining diagnostic and therapeutic parameters.

Conclusion: We conclude the BBN models in infectious conditions deliver not only accurate decisions but their application may also be warranted to effectively deal with large number of combinations of conditions when making complex decision. Similarly it also allows dynamic addition of non-medical (cost, other) parameters for a better optimized decision making process.

Disclosure of interest: None declared.

CATHETER-ASSOCIATED BLOODSTREAM INFECTION: RISK AND PREVENTION II

P204

Rapid detection of methicillin-sensitive and resistant *Staphylococcus aureus* and methicillin-resistant coagulase-negative *Staphylococci* from blood cultures by automated PCR assay

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BMC Proceedings 2011, 5(Suppl 6):P204

Introduction / objectives: We assessed the usefulness of a new automated molecular assay (GenomEra™ MRSA Confirm, Abacus Diagnostica Oy, Finland), which amplifies simultaneously the marker of methicillin resistance (*mecA*) and a *Staphylococcus aureus*-specific DNA segment, in detection of methicillin sensitive and resistant *S. aureus* (MSSA and MRSA) and other methicillin resistant staphylococci (MRCoNS) in blood culture samples.

Methods: We studied a total of 102 blood cultures (including 92 positive and 10 negative cultures) and two MRSA-positive control samples. All samples were inoculated into BacT/Alert enrichment bottles (bioMérieux, France) and analysed by routine diagnostic and antimicrobial susceptibility methods as well as GenomEra MRSA Confirm assay after a growth-positive signal or after a 7 days of incubation. The thermal cycling and detection were performed in GenomEra CDX instrument directly from diluted blood culture bottle medium without previous DNA extraction step. Results were obtained within an hour.

Results: A total of 41 *S. aureus* (39 MSSA and 2 MRSA) and 27 MRCoNS strains were identified from the blood cultures and control samples by routine methods. Of these, all except one were correctly identified by the GenomEra assay. The deviant result was obtained from a multi-bacterial sample, containing MRCoNS and methicillin susceptible staphylococcus other than *S. aureus* in a ratio of <1:1 000. Thus the overall sensitivity of the assay method was 98.5%. For MRSA and MSSA, the sensitivity was 100%. No false positive results were obtained with the assay, yielding a specificity of 100%.

Conclusion: GenomEra assay is a useful method for direct detection of MRSA, MSSA and MRCoNS in blood cultures. It offers a rapid support to infection control and clinical decision making.

Disclosure of interest: None declared.

P205

Central line associated blood stream infectious cause by multi drug resistance coagulase-negative *Staphylococci* in newborns from neonatal intensive care units in Poland

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Introduction / objectives: The project aims to analyze epidemiology and microbiology of Central Line Associated Blood Stream Infections (CLABSI) cause by Multi Drug Resistance Coagulase-Negative Staphylococci (MDRCoNS) in children with very low birth weight (VLBW).

Methods: Data collection on CLABSI in VLBW newborns was made prospectively for 2009 year. Study covered 386 neonates of birth weight <1500g in 2 Polish NICUs (A and B), among which 55 cases of CLABSI were detected. CoNS strains isolated from 26 newborns with CLABSI, were determined in blood in the automatic system Vitek, drug resistance was determined by disc diffusion method. This study was supported by a grant no. NN401615340.

Results: Birth-weight and gestational age were significantly different between newborns in NICU-A and B ($P < 0.01$). The CLABSI incidence per 1000 CVC/pds (patient days) in NICU-A and B were 8.5 and 5.2, respectively (RR1.6). CVC utilization in NICU-A and NICU-B were 0.5 and 0.4, respectively. The most common etiological factors of CLABSI were CoNS (66%). The dominant species were *S. epidermidis* (63%), *S. haemolyticus* (20%), *S. warneri* (8%), *S. hominis* (5%), *S. xylosum* (2%) and *S. capitis* (2%). Among 26 newborns with CoNS BSI, 2 children had polymicrobial infections caused by *S. haemolyticus* and *S. epidermidis*. Resistance to methicillin, macrolides, aminoglycosides and fluoroquinolones was detected in 98%, 70%, 78% and 43% of isolates, respectively. All methicillin resistant CoNS strains had *mecA* gen.

Conclusion: Understanding the epidemiology of CLABSI in VLBW neonates is a key step in development of targeted prevention strategies and reduce antibiotic consumption.

Disclosure of interest: None declared.

P206

Species distribution and antifungal susceptibility of *Candida* species causing candidaemia in a Thai university hospital during year 2006-2010

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BMC Proceedings 2011, 5(Suppl 6):P206

Introduction / objectives: Bloodstream infections due to *Candida* species play an important complications in severely-ill hospitalized patients which may lead to therapeutic failure. During a 5-year period from 2006-2010, 7 *Candida* species and 14 unidentified strains were identified from 887 candidaemia of patients admitted at Ramathibodi Hospital, Mahidol University, Bangkok, Thailand.

Methods: *Candida* species were identified according to characteristics of chlamydoconidia production and carbohydrate assimilation/fermentation profile using 13/6 carbon substrates. Only a limited number of *Candida* were tested for antifungal susceptibility by agar gradient diffusion (Etest®) to amphotericin B and fluconazole.

Results: From a total of 887 isolates, *Candida albicans* remains a major pathogen accounted for 50.3%, followed by *C. tropicalis* (27.4%), *C. parapsilosis* (12.5%), *C. guilliermondii* (6%), *C. glabrata* (1.8%), *C. krusei* (0.23%), *C. rugosa* (0.23%), and unidentified species (1.6%). From a total of 103 *C. albicans*, amphotericin B MIC ranged from 0.016-1ug/ml whereas fluconazole MIC ranged were between 0.023 to > 256ug/ml. Other species tested were *C. tropicalis* (73 strains) which yielded MIC range of 0.19-2ug/ml for amphotericin B and 0.5->256 ug/ml for fluconazole. 34 strains of *C. parapsilosis* gave amphotericin B ranged from 0.023-16ug/ml and 0.094->256 for fluconazole.

Conclusion: *C. albicans* remains the most prevalence *Candida* species causing candidaemia followed by *C. tropicalis*, *C. parapsilosis* and *C. guilliermondii*. Those non-albicans *Candida* seemed to express decrease susceptibility to both major antifungal agents like amphotericin B and fluconazole whereas a small number of *C. albicans* gave high MIC to fluconazole.

Disclosure of interest: None declared.

P207

Intrahospital infection as a risk in haemodialysis patients with central venous catheters

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BMC Proceedings 2011, 5(Suppl 6):P207

Introduction / objectives: Central venous catheters (CVC) are routinely used in the management of haemodialysis (HD) patient (pts). One of the most frequently encountered complications is catheter-related bloodstream infection.

Methods: We describe a HD pts who developed *S. maltophilia* bacteremia associated with use of CVC.

Results: During two years period five pts (3 male, 2 female) on chronic HD program were admitted to our hospital with clinical signs of CRBI. Three pts had tunneled subclavian catheter, one tunneled jugular catheter, and one femoral catheter. Duration time of chronic HD program was between 1 month and 5 years, and duration time of CVC was 1-18 months. All pts had clinical symptoms of high fever and chills during or after the HD, and we took blood cultures from catheter and peripheral vein and antibiotics were used. Incubation of blood cultures for 48 hours yielded bacterial growth of *S. maltophilia*. A complete blood count in all pts revealed a white blood cell count of 7,550-24,000 cells/mm³ (70-90% polymorphonuclear cells) and high CRP. Pts had been receiving broad-spectrum antibiotic therapy from the beginning but without effect, and they were changed later according to antibiogram from blood cultures. Antibiotic therapy in all our cases dose not generally cure CRBI so removal of the CVC was recommended, and all CVC were removed. After the insertion of new CVC all clinical signs of infection disappeared and blood culture were sterile.

Conclusion: In conclusion, the treatment of CRBI caused by *S. maltophilia* must include early and accurate diagnosis, use of effective preventive strategies, and appropriate therapeutic clinical decisions about catheter removal.

Disclosure of interest: None declared.

P208

Decreasing but differential trends of adverse events among dialysis outpatient following re-enforcement of infection control measures; 20-month surveillance study

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BMC Proceedings 2011, 5(Suppl 6):P208

Introduction / objectives: We set to monitor adverse events among hemodialysis patients following re-enforcement of infection control measures.

Methods: We conducted a 20-month prospective surveillance study among end-stage kidney disease patients served by the outpatient hemodialysis unit at KAMC. We used the same methodology described by US National Healthcare Safety Network (NHSN). We monitored the following adverse events; overnight hospital stay for any reason, outpatient start of an intravenous (IV) antimicrobial, and access-associated bacteremia. Starting the fourth month of the study, we re-enforced infection control measures including aseptic technique, catheter care, hand hygiene, judicious use of antimicrobials, and patient education.

Results: A total of 339 hospitalizations, 302 antimicrobial start and 174 access-associated bacteremias were observed during 20 months of surveillance. The overall adverse events rate per 100 patient-months showed a 40% decline, *p* for trend <0.001. For adverse events, the decline was obvious in hospitalizations (39% declined from 10.4 to 6.4, *p* for trend <0.001) and antimicrobial start (46% declined from 11.7 to 6.4, *p* for trend <0.001) more than access-associated bacteremia (19% declined from 4.4 to 3.6, *p* for trend 0.564). Primary (57%) rather than recurrent (2%) adverse

events were the main to benefit from the decline. Adverse events associated with central line catheter (38%) declined more than those associated with AV fistula (27%).

Conclusion: We report a significant decline of overall adverse events in our hemodialysis patients concomitant with enforcement of infection control measures.

Disclosure of interest: None declared.

P209

Microorganisms associated with access-associated bacteremia in hemodialysis outpatients in Saudi Arabia

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BMC Proceedings 2011, 5(Suppl 6):P209

Introduction / objectives: The number of patients on hemodialysis in Saudi Arabia doubled over the last decade. Monitoring organisms associated with access-associated bacteremia is necessary for empirical case-management.

Methods: A prospective surveillance study for all end-stage kidney disease patients at KAMC in Riyadh, SA. The same methodology and definitions applied by US National Healthcare Safety Network (NHSN) centers was used to allow benchmarking. Organism rates at KAMC were compared to those reported by NHSN.

Results: Out of 198 positive blood cultures recorded during the study, 174 (88%) were access-associated bacteremia. The majority (89%) of these bacteremias were cause by a single organism. Out of the 190 organism identified 51.6% gram-negatives, 39.5% gram-positives, 8.5% skin contaminants, and 0.5% fungi. There was no significant difference of the organism distribution between those with catheter and those with AV fistula or graft (*p*=0.973). *Staphylococcus aureus* (17.9%) and *Enterococcus* sp (16.8%) were the most common gram-positives. *Klebsiella* sp (13.2%), *Enterobacter* sp (11.6%), and *Pseudomonas aeruginosa* (6.8%) were the most common gram-negatives. Compared to NHSN centers, KAMC had significantly higher gram negative (47.9% vs 21.3%, *p*<0.001), lower skin contaminants (13.0% vs 43.1%, *p*<0.001), but similar gram-positives (39.7% vs 34.2%, *p*=0.171).

Conclusion: In KAMC hemodialysis patients known of their high rates of permanent catheter and access-associated bacteremia, gram negative rods were the most common organisms identified. The causes of such finding whether colonization pattern, catheter care, empirical antimicrobials, or patient comorbidities need to be delineated in future studies.

Disclosure of interest: None declared.

P210

Prevalence and predisposing factors for hepatitis C virus in haemodialysis unit Universiti Kebangsaan Malaysia Medical Centre

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BMC Proceedings 2011, 5(Suppl 6):P210

Introduction / objectives: Haemodialysis patients are at risk of infection by hepatitis C virus (HCV), suggestive of nosocomial spread. This study aimed to determine the prevalence and predisposing factors of HCV infection and evidence of outbreak among haemodialysis patients.

Methods: A cross-sectional study in 3 UKMMC dialysis centres from June 2009 to May 2010 included 35 patients. Data were obtained by review of medical records and interviews with patients and staff. HCV infection was determined by antibody detection using Abbott AxSYM® 3.0 and by in-house HCV RNA polymerase chain reaction (PCR). Genotype was determined by sequence analysis and Versant® HCV Genotype 2.0.

Results: The prevalence of HCV infection was 20.0% with no non-seroconverters. Genotype 1 was predominant (4/7). The predisposing

factors were duration of haemodialysis, history of dialysis at outside centres and place of haemodialysis. 3 out of 5 patients with history of dialysis at Mecca seroconverted. Based on epidemiological data, an outbreak with genotype 1 occurred in 2007, involving 3 patients after one of them had haemodialysis at Mecca. Review of laboratory results revealed that 2 of them were first diagnosed by HCV RNA PCR. Sequence analysis was not done in these 3 patients.

Conclusion: Screening for HCV antibody is inadequate for detection of early HCV infection. HCV RNA PCR is necessary for patients with history of dialysis at outside centres for early infection control measures and prompt treatment.

Disclosure of interest: None declared.

P211

Importance and impact of surveillance of the microbial quality of dialysate and RO water in a tertiary health

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BMC Proceedings 2011, 5(Suppl 6):P211

Introduction / objectives: To find the source of bacteremia in patients undergoing haemodialysis in our hospital and to know the impact of surveillance on preventing dialysis related infections.

Methods: This study was undertaken to find out the cause of bacteremias in patients undergoing haemodialysis in Medical Intensive Care unit (MICU) in our hospital. These patients developed fever, leukocytosis post haemodialysis and Blood cultures were positive. A total of 140 samples consisting of 64 Reverse Osmosis (RO) water samples from RO Water port in MICU and Dialysis unit., 56 dialysate samples and 10 each of bicarbonate and acid concentrate solution from the hemodialysis unit were analysed.

Results: Commonest isolate in dialysate was *Pseudomonas species* (45%) followed by *Citrobacter diversus* (28%) and *Acinetobacter species* (15%), while in RO water from MICU *Acinetobacter species* (39%) was the most common followed by *Pseudomonas species*. 15 of the 64 RO water and 49 of the 56 dialysate had growth, 3 of the 10 samples of acid concentrate showed growth. The bicarbonate concentrate tested showed high rate of bacterial contamination. 10 RO water samples from MICU showed bacterial contamination, Dialysate samples had higher colony count compared to the RO water samples. 16% of the Dialysate samples were non compliant with the AAMI RD 52 standard. 30% of Bicarbonate concentrate were non compliant. The RO water samples tested from dialysis unit were 100% compliant with AAMI standards.

Conclusion: The RO water contamination was due to absence of loop line in the MICU which led to stagnation in the RO water port. Regular microbiological monitoring of RO water and Dialysate is needed to ensure safety in patients undergoing haemodialysis.

Disclosure of interest: None declared.

P212

Surveillance of central-line associated bloodstream infections in ICU at a Malaysian medical centre

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BMC Proceedings 2011, 5(Suppl 6):P212

Introduction / objectives: We conducted a prospective surveillance study to determine the incidence and epidemiology of CLABSI in the intensive care unit (ICU) at a tertiary teaching medical centre using CDC definition of a bloodstream infection that develops in a patient who had a central line at the time of, or within 48 hours before, the onset of the infection.

Methods: A cross section observational study was conducted in a 24-bed GICU over 10-months period from April 2008 until January 2009 among patients with central venous catheters (CVCs) inserted in the ICU or operation theatre.

Results: A total of 20 CLABSI cases were identified among 155 CVCs in 100 patients with 3106 catheter days. The overall rate of CLABSI was 6.4 per 1000 catheter-days and device-utilization (DU) ratio of 0.81. The mean length of ICU stay for CLABSI and non-CLABSI cases was 37.2 days and 17.4 days respectively, while the median length of ICU stay for CLABSI cases was 16.0 days and for non-CLABSI cases was 10.0 days. This contributed to 6 extra days of ICU stay in CLABSI cases. CVCs inserted via the femoral vein were associated with higher infection rate of 22.2% followed by those of internal jugular vein (15.4%) and subclavian vein (5.1%). Gram-negative bacteria accounted for 50% of the CLABSI cases whereas gram-positive cocci and fungi caused 35% and 15% of these infections respectively.

Conclusion: Both of the CLABSI rate of 6.4 per 1000 catheter-days and DU ratio of 0.81 were above the 90th percentile of the NHSN benchmark. Comparing our findings to the INNIC 2003-2008 studies with 7.4 CLABSI per 1000 catheter-days, our CLABSI rate was lower. However, our DU ratio was higher. Hence, interventions aimed at improving outcomes related to CVCs should seriously be considered.

Disclosure of interest: None declared.

P213

Japan National University Hospitals Infection Control Conference (JNUHICC) report: data summary of device-associated infections

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BMC Proceedings 2011, 5(Suppl 6):P213

Introduction / objectives: To aggregate separate information into a national database and to enhance quality improvement activities, JNUHICC Sectional Meeting of Surveillance has created a data collection system for device-associated infection rates.

Methods: Data on CLABSI, VAP, and CAUTI occurring between July 2009 and September 2010 were collected from national university hospitals in Japan and were analyzed. A uniform protocol was constructed in accordance with the definitions of NHSN. CLABSI surveillance during the latter study period (from January to September 2010) included data on clinical sepsis (CSEP) and criterion 2-b (one positive blood culture with common skin contaminant and antimicrobial therapy), and the validity of this addition was assessed.

Results: CLABSI data were reported from 20 ICUs, 21 hematology/oncology wards, and 14 gastroenterological surgery wards. The mean rates were 1.14, 2.10, and 1.66 per 1000 device-days (DD), respectively. The rates on the data with the inclusion of CSEP and criterion 2-b were 1.93, 2.49, and 2.89, respectively. The VAP rate (reported from 27 ICUs) was 2.38 per 1000 DD. The CAUTI rate (reported from 11 ICUs) was 2.40 (SD 8.84) per 1000 DD. The rate and SD decreased 0.92 and 1.09, respectively, when cases only with asymptomatic bacteriuria (ASB), which consisted of 62% of the CAUTI cases, were excluded.

Conclusion: Indicative and representative values for three major device-associated infection rates at national university hospitals in Japan were obtained. To continue the multi-institutional surveillance of constant quality, analyzing the summary data and reviewing the protocols may be essential.

Disclosure of interest: None declared.

P214

Validation of cleaning process of cardiac catheters and reuse in the hemodynamics sector of a hospital in Ponta Grossa, Parana, Brazil

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Introduction / objectives: Reprocessing single use devices is the process to be applied to hospital/medical objects which allows their reuse; in order to reuse them it is necessary to include steps in order to ensure

that the catheters are clean, without organic matter, reducing the microbial load, pyrogens and biofilm. To develop and validate a cleaning protocol for objects from a cardiology sector in a hospital in Ponta Grossa, Parana, Brazil.

Methods: A quantitative and experimental study undertaken in February and March 2011 with a sample of 72 cardiac catheters. A protocol for cleaning tools and training with the nursing staff has been developed, using as a method to detect organic matter in the lumen, the Hemocheck®, a tool that can detect from 0ug to 100 ug.

Results: In the beginning, we observed that the catheters were flushing with 1 (1.38%) of the catheters had 100 ug of matter in the lumen, 5 (6.94%) had 10 ug of dust, 3 (4.16%) of the catheters showed 1 ug, 11 (15.27%) showed 0.1 ugo of organic matter and 52 (72.22%) with 0ug of dirt in the lumen; after 45 days conducting a systematic way of cleaning and tests in random days and times, there was not positivity of dirt in the catheter compared to results found previously.

Conclusion: The Infection Control Service and Materials Centre of will need to implement the protocol, giving priority to patient safety, as the critical items such as the hemodynamic, by its nature and we need more care with this item.

Disclosure of interest: None declared.

SHARP & POINTY: BLOOD-BORNE PATHOGEN EXPOSURES

P215

Factors affecting health and safety, particularly sharps injuries, in medical waste handlers in hospitals in the rapidly developing desert emirate of Abu-Dhabi; a questionnaire study

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Introduction / objectives: Globally, the management of medical waste poses an increasing concern to health authorities and the public. This is particularly notable in developing countries such as the United Arab Emirates (UAE), where efforts are underway to control the problem. Objectives: to investigate the health problems facing medical waste handlers while collecting medical waste in Abu-Dhabi hospitals and to assess the effectiveness of available measures for preventing accidental sharps injuries.

Methods: A cross-sectional survey among medical waste handlers (MWHs) was performed in five government hospitals in Abu Dhabi emirate during 2010. A sample of 250 was chosen using power and sample analysis. The data were collected using self administered questionnaires. Univariate analysis and the Chi-square test were used to analyse the data.

Results: Of the total participants 58% were males. Over one half were aged 26-35 years and one third was aged 18-25 years. Among workers, the regular use of personal safety equipment showed marked differences. Gloves were used by 92%, face-masks by 85%, footwear 62% and goggles 42%. Of total responders; general health problems were reported in 17.4%, and "any health" in 8%. Sharps injuries were reported by 7.4%. Following an injury, all responders reported seen by a doctor. In the follow-up of 79 responders, 61% had the accident reported and filed; 16% received 3-monthly follow-ups.

Conclusion: The results have thrown light on the many components of the collaborative aim of having a healthy, active and consequently productive workforce through a sound system of health protection of MWHs, as part of the nation's healthcare system.

Disclosure of interest: None declared.

P216

Risk-estimation and handling of occupational blood exposure accidents by nationally operating telephone service in the Netherlands

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Introduction / objectives: Health care workers, who are not working in a hospital, may not easily find access to care after having been exposed to blood exposure accidents. To improve handling of these accidents outside the hospital setting, in 2006 a nationally operating telephone expert centre was established by a Dutch occupational service.

Methods: All occupational accidents could be reported directly by the injured to a national call centre on 24/7 basis. Trained staff members provided an assigned risk-estimation and plan of action to take appropriate measures, whenever indicated. All registered accidents in a 3-year period were analyzed on incidence and risk level per occupational branch. Also hepatitis B vaccination level, interval between accident and reporting, and the medical interventions taken were analyzed.

Results: A total of 2927 reported accidents were analysed. Private clinics and hospitals had highest incidence rates (68.5 and 54.3 accidents/1000 person years, respectively). Ambulance staff, midwife practices and private clinics reported more high risk accidents whereas penitentiary institutions often reported accidents with no risk at all. Hepatitis B vaccination levels in mental health care, penitentiary institutions and cleaners was low (<70%). Mental healthcare staff as well as private clinics and midwives often reported late.

Conclusion: The nationally operating centre proved to be capable of organizing the handling of blood exposure accidents. Several occupational branches, in which the risks so far were not fully known, showed to have a serious risk for blood exposure accidents. In these branches more research is needed to explore these risks and design preventive measures.

Disclosure of interest: None declared.

P217

The effect of training program to reduce needlestick injuries

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BMC Proceedings 2011, **5(Suppl 6)**:P217

Introduction / objectives: Needlestick injuries (NSIs) pose a serious risk for health care workers (HCWs). The aim of this study was to examine the impact of an education program on HCWs practices to prevent needlestick and sharp injury.

Methods: A hospital wide pre- and post interventional study was conducted in a cardiosurgical university hospital. In the first period, the baseline data including NSIs rate, occupation, location, time and activities associated with NSIs were collected using an anonymous questionnaire. During the second period (6 months) an education program was organized through four workshops. HCWs completed the pretest questionnaire at the beginning of the first period (before the first training session) and the post test at the end of last session.

Results: The questionnaires were answered by 93% of all HCWs in the first period and by 89% at the end of second period. There were 76.1% female respondents. Their mean age was 38.4 (SD 10.4) with mean total work experience of 15.8 years (SD 10.2). They included 14% physicians, 64% nurses, 3% laboratory technicians, 16% health assistants and 4% of other workers. In the six months before intervention, 13.0% of HCWs had at least one accident. About 40% of HCWs were not vaccinated against hepatitis B. During 6 months of education the NSI rate decreased from 13% to 11.2% (p=0.3). The NSIs because of recapping needles were less often (p=0.04) during the second period. The most frequent location of NSIs was patient's room (52.5% ca in first and 46% in second period). NSIs significantly decreased during night shift in the second period (p=0.01).

Conclusion: Training program should be implemented initially to reduce NSIs.

Disclosure of interest: None declared.

P218

Pattern of occurrence of occupational exposure to blood-borne pathogens in a tertiary hospital in Saudi Arabia

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BMC Proceedings 2011, **5(Suppl 6)**:P218

Introduction / objectives: Occupational exposure to blood borne pathogens (OEBBPs) remains a common occurrence globally despite the introduction of safety needle devices. We assessed the causative factors and pattern of occurrence of OEBBPs at King Abdul Aziz Specialist Hospital (KAASH), Taif Saudi Arabia.

Methods: We assessed the occurrence of OEBBPs at KAASH from January 2009 to December 2010. During this period, data on reported cases was collected using the Center for Disease Control and Prevention (CDC) OEBBPS notification form.

Results: 106 episodes of OEBBPs were reported comprising of 41 cases in 2009 and 65 in 2010. The incidence of OEBBPs was 4.09/10000 patient-days and 5.90/10000 patient-days in 2009 and 2010 respectively. This increased incidence in 2010 exceeded our internal of OEBBPs incidence benchmark of 3.00/10000 patient-days. Majority of episodes were recorded among the nursing staff (82%). The highest number of episodes were from the emergency room (21.5%) followed by the kidney center (16.9%). Majority of episodes were reported during the morning shift, occurring during specimen collection by venipuncture and while establishing intravenous or arterial access. Post exposure prophylaxes against hepatitis B virus have been given immediately as indicated. Laboratory tests for diagnosis hepatitis C virus seroconversion have been done. No case exposure to HIV positive was recorded. No case of seroconversion has been documented.

Conclusion: Introduction vacutainer blood collection method and needless devices as well as an OEBBPs notification hotline are recommended to address this high level of OEBBPs. In early 2011, a sharp injuries prevention campaign was conducted and evaluation of its efficacy in reducing the incidence of OEBBPs in our hospital is ongoing.

Disclosure of interest: None declared.

P219

Impact of infection control educational activities on the rates and frequencies of percutaneous injuries (PIS) at a tertiary care hospital in Saudi Arabia

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BMC Proceedings 2011, **5(Suppl 6)**:P219

Introduction / objectives: To study the Impact of educational activities on the rates and frequencies of Percutaneous Injuries at a tertiary care hospital in Saudi Arabia.

Methods: PIs Surveillance is a routine activity in King Abdulaziz Medical City in Riyadh using the Exposure Prevention Information Network (EPINet) data collection tool. On 2001 through 2003, we started educational activities of HCWs aiming at preventing PIs. This education included lectures and inservice training about the risk factors and unsafe practices contributing to PIs and how to avoid it. Data before the intervention (1997-2000) and after the intervention (2004-2008) were imported from our surveillance system and statistically analyzed.

Results: Compared to the pre-interventional period, the overall rate of PIs during the post intervention period has dropped significantly (14% vs. 32.8% per 1000 HCWs). The rates among nurses and housekeepers showed a significant drop (15% vs. 37.6% for nurses and 10% vs. 34.5% for housekeepers). PIs frequencies in Emergency Department (ED) and Intensive Care Units (ICU) showed significant decrease (3.4% for both vs. 12.4% & 13.7% respectively). Devices as needle on IV line, IV catheters, lancets and suture needles showed significant decrease in frequency. PIs frequencies occurring during device disassembly and devices left inappropriately showed significant decrease.

Conclusion: The educational program appeared to have positive impact on reducing some categories of PIs including the overall rate, nurses and housekeepers job categories, ED and ICU, Needle on IV line, IV catheters, lancets and suture needles. However, other PIs categories did not change significantly.

Disclosure of interest: None declared.

P220

Study of hepatitis B and C prevalence and adherence to standards of biosecurity on manicures and/or pedicures in Brazil

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BMC Proceedings 2011, **5(Suppl 6)**:P220

Introduction / objectives: The habit of removing the nails cuticles of hands and feet is a typical cultural practice in Brazil and can be an important factor for hepatitis B and C infection. We conducted a seroepidemiological survey of hepatitis B and C in professional manicures/pedicures in salons in Sao Paulo - Brazil, with the aim of estimating the prevalence of serological markers of HBV and HCV infection on manicures/pedicures; get to know the information level of that have about transmission routes and Prevention of Hepatitis B and C, evaluate the perception degree of risk exposure accidental infectious agents and check the use of biosafety norms in the work routine of these professionals.

Methods: This is a descriptive, cross sectional prospective study. The survey involved 100 participants manicures/pedicures from beauty salons, by random drawing. An individual for information about the characteristics participants; simultaneously questionnaire has been applied was blood collected sample for the detection of serological markers of HBV and HCV of each participant.

Results: Prevalence estimates were found in 8% of HBV and 2% of HCV. Membership biosafety standards for professionals were relatively low and inadequate. It was found that the degree of knowledge about routes of transmission, prevention, biosecurity standards and risk perception of infectious agents in their professional activity, was low. Manicures and pedicures are a group with increased risk factors, which determine a likely greater exposure to infection with viral hepatitis than the general population and all ways of prevention must be used to protect there health.

Conclusion: It important to raise awareness manicures and pedicures becomes for the use of individual protection in their routine work to prevent future disease.

Disclosure of interest: None declared.

P221

Needle-stick injuries in Isfahan, Iran: quality improvement

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BMC Proceedings 2011, **5(Suppl 6)**:P221

Introduction / objectives: The goal of the study was to investigate needle-stick injuries among health care workers in Isfahan, Iran and to evaluate the preventive measures which are to be taken to reduce these injuries and to improve their safety quality.

Methods: This study was carried out before and after intervention, and took six years, 2003 to 2008. At the beginning of the study, the injuries resulting from sharps among Isfahan Province health care workers in 31 hospitals were investigated. Then in the second, third and fourth years of intervention plan, the first phase was carried out by using the data analysis information. Most of the intervention was instructional and some parts were by using appropriate equipment. The third phase was the evaluation of intervention measures. Data were analyzed by Excel software and SPSS₁₃.

Results: The rate of needle-stick injuries was 61.4% in 2003 from which 25.5% were injured at least twice during that year. Most cases of injuries 36.6% were among personnel recapping the needles. In the third phase, the injuries were reduced to 7% ($p < 0.001$) and only 3% of the injured staff were injured twice and the injuries resulting from recapping were reduced to 11.3%. The injuries' average per each staff in the first year was 1.27 which was reduced to 0.2% ($p < 0.001$) in the sixth year of the study.

Conclusion: The study shows significant reduction in needle stick injuries after intervention. However, providing a purposeful plan according to existing demands and problems in hospitals of each area, along with continuous training programs needs appropriate supervision and safer medical devices utilization, which have the minimum risk of injury and which can considerably minimize the risk of injuries among health care workers.

Disclosure of interest: None declared.

P222

Needlestick injuries: a prickly need for improving prevention

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BMC Proceedings 2011, **5(Suppl 6):P222**

Introduction / objectives: Health Care Workers (HCWs) are at high risk for needlestick injuries (NI). Many NI occur because of inappropriate management of devices or instruments. Improved education and appropriate sharps disposal after use would help reduce NI for HCWs involved in everyday practice.

Methods: The Infectious Diseases Unit at Bolzano Hospital is the point of reference for all NI occurring in- and outside the hospital within the sanitary district (approx. 215,000 inhabitants). For each case noticed, a record form is drawn up by nurses, who take care of registration and demographics, occupation of the worker involved, timing of NI, and by physicians thereafter, who record cause of the accident and causal device, and manage potential exposure to bloodborne pathogens. All notified cases of NI occurring from 2003 to 2010 were recorded and analyzed.

Results: Overall, 327 accidental NI were recorded. Twenty-six % were NI by insulin or intramuscular needles, 18% were represented by neglected needles, 14% by glycostix or glycemia lancets. 13% of the incidents occurred with surgical instruments, 10% during blood drawing, 6% by excessively full sharps-disposal containers. A fewer number of cases (<5% each) was represented by injuries during placement of intravenous cannulae, "cobra effect" of butterfly needles after blood drawing, recapping, or wrongly disposed needles. A worrying increase of NI has been recorded in the last years, mostly attributable to increased turnover of inadequately trained HCWs.

Conclusion: Improper use of instruments or oversight of sharp-disposal containers by HCWs often causes incidents which would easily be prevented. Appropriate management of sharps is very important and needs continuous education and training not only at any HCWs level, but also for other employees in public utility jobs.

Disclosure of interest: None declared.

P223

Impact of adoption of safety devices in reducing accidents at work with biological material

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BMC Proceedings 2011, **5(Suppl 6):P223**

Introduction / objectives: Injuries from needles and sharps by health professionals, are considered extremely dangerous because they are potentially capable of transmitting microorganisms, and the human immunodeficiency virus (HIV), Hepatitis B and Hepatitis C, are the infectious agents most commonly involved. Institutions should seek to minimize risk as much as possible through measures including the installation of safety devices.

Methods: Observational study in a general hospital, analyzing workplace accidents with biological material in the period 2003 to 2010, before the sharps injuries related to manipulation of the venous needle, performing blood glucose testing with a lancet and capillary puncture vein without safety devices and analyzes the situations mentioned before and after the implementation of safety devices. The initiative of the Infection Control Commission in deploying these devices was to participate in the process, rigorous evaluation of these materials and the training of all health care team.

Results: Of the 398 accidents with biological materials and accompanied with the implementation of security devices including: the infusion tube systems had 90% reduction in accidents involving needles, lancets with the adoption of a security system for performing blood glucose monitoring, had 100% reduction in accidents, and venipuncture devices safely, we had 97% reduction in accidents.

Conclusion: Initiatives to make the everyday activity of professionals safer, preventing the risk of occupational accidents with biological material can minimize the possibility of acquisition of work-related diseases, are important actions taken by healthcare institutions.

Disclosure of interest: None declared.

P224

Epidemiological study of accidents with biological material involving healthcare workers exposed to hepatitis B, C and HIV

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BMC Proceedings 2011, **5(Suppl 6):P224**

Introduction / objectives: Health professionals are often at risk of accidents during the caution, and that these exposures may occur to the transmission of pathogens such as human immunodeficiency virus (HIV), Hepatitis B and Hepatitis C. The Committee on Infection Control has a fundamental role in the performance of the first visit to the accident, through guidance as to the serological monitoring and adherence to the monitoring of employees.

Methods: In this study in a general hospital, were analyzed all accidents involving biological material in the period 2003 to 2010, by attending at the time of the accident, with research into the causes and serological employees exposed during the accident involving biological material and collection of serologic of source patients.

Results: During the period, 398 accidents were monitored, and 234 (59%) with negative source patients, eight (2%) with the source patient Hepatitis B, 42 (10%) source patients with hepatitis C, 20 (5%) source patients with HIV and 90 (23%) patients with unknown source, which enables these patients have positive tests questioned. During the first three visits were diagnosed (0.75%) employees were seropositive for hepatitis C and no history of accidents with biological material. Of these, 16 (4%) did not complete the follow-up due to the shutdown of the institution, despite subsequent contact. E 382 (96%) employees did not show seroconversion.

Conclusion: Adherence to institutional guidelines for sharps injuries and the traceability of the source, the introduction of chemoprophylaxis, immunization against hepatitis B, are shown to be key measures in the management of accidents with biological material.

Disclosure of interest: None declared.

P225

Needle stick injuries among health care workers – a report from India

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BMC Proceedings 2011, **5(Suppl 6):P225**

Introduction / objectives: Preventing needle stick injuries (NSIs) is a challenge faced in virtually every work environment. There are very few studies in India documenting frequencies and consequences of needle stick injuries (NSIs). We report a 30 months ongoing surveillance of NSIs happened in Apollo Hospitals, Chennai (large tertiary care hospital in India).

Methods: Hospital infection control team document type of NSI, human immunodeficiency virus(HIV), Hepatitis B surface antigen (HBsAg, and hepatitis C virus (HCV) status of the source, anti HBs antibody titers of HCW, baseline and 6 months tests for HIV if the source was positive for HIV, and provided post-exposure prophylaxis to persons who had NSI.

Results: Of the 118 needle stick injuries reported during the surveillance period 47 (40%) were nurses, 25 (21%) were lab technicians, 24 (20%) were doctors, 20 (17%) were housekeeping staff and 2(2%) were other staffs. Hollow bore needle constituted 80.1% (95) of the injuries, solid needles constituted 16.5% (19) of the injuries and other sharps constituted 3.4% (4) of the injuries. On source analysis 17, 9, and 8 were positive for HBsAg, HIV and HCV, respectively. Improper disposal of the needles (27%) & recapping of the needle (25.8%) were the predominant activities responsible for NSIs. 9 HCWs who sustained injury with HIV positive source were given immediate antiretroviral therapy for 4 weeks. Subsequent six-month follow-up showed zero seroconversion.

Conclusion: NSIs were common among nurses & lab technicians and commonly take place in ICU. Half of the NSIs were happened after the usage of the needle before its disposal. Zero sero conversion for HIV was seen in NSIs with HIV positive source. Safer disposing methods are needed to reduce the incidence of NSIs.

Disclosure of interest: None declared.

P226

Needle stick and sharp injuries (NSSI) in health care workers in Ulaanbaatar

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BMC Proceedings 2011, 5(Suppl 6):P226

Introduction / objectives: The study's main objectives were to analyze the prevalence and assess the knowledge, attitude and practices (KAP) of health care workers regarding needle stick injuries in hospitals in Ulaanbaatar, Mongolia. In addition we also tried to determine the circumstances and type of injuries from needle sticks (such as from syringes, scalpels etc).

Methods: It was a cross sectional survey conducted in two main hospitals in Ulaanbaatar. A total of 621 health care workers were recruited through a semi-structured questionnaire.

Results: Health worker working 3 or more nights duties/week and more than 36 hours duty per week ($p < 0.05$) were more prone to injuries.

The prevalence of NSSI in both the hospitals was 840 / 1000 HCW / year (84%) and majority of injuries occurred among nurses ($p < 0.00$) besides laboratory assistants and housekeepers. A large amount of injuries occurred in injection room and in-patient departments. In majority of cases the common cause of injury was disposable syringe followed by needle on introgen line and medication ampoule. Index finger was the most common site for injury. Most injuries occurred during recapping, opening of ampoule or vial and improper disposal of syringes.

Many (66%) had injury of moderate nature skin was punctured and some bleeding also occurred. Majority (80%) didn't report injuries to hospital administration and neither seeks any treatment (75%) after injuries. Many consider needle re-sheathing the needle not important, which may lead to injuries to house keepers. We also found that majority had no training on NSSI and it was clear that incidence of injuries were less among trained health workers ($p < 0.00$).

Conclusion: To summarize the prevalence of NSSI among health care workers was very high.

Disclosure of interest: None declared.

P227

Six years review of the occupational exposure to blood and body fluids program at King Abdulaziz Medical City in the Western Region (KAMC-WR)

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BMC Proceedings 2011, 5(Suppl 6):P227

Introduction / objectives: Healthcare providers are vital asset of KAMC-WR. Due to the nature of tasks they perform, the risk of exposure to sharps contaminated with blood and body fluids is high. The objective of this study is to review gathered data, assess the effectiveness of measures taken in reducing percutaneous injuries (PI) rate, and identify areas of potential improvement.

Methods: PI rerecords from 2005 to 2010 were tracked using the Exposure Prevention Information Network (EPINet) program as adopted benchmark. Findings were analyzed using Root-Cause-Analysis (RCA) quality tool.

Results: A total of 290 PI were reported during a cumulative total of 1797 average daily census. Steady reduction observed from 20.5/100 occupied beds in 2005 to 10.6 in 2009. The average rate in six years was 16.2. Even though PI rate increased to 18.1 in 2010 due to the safety culture survey conducted in 2009 to increase reporting by Medical Doctors (MD) still these rates were comparable to EPINET average rate of 2007 (27.97/100 occupied beds). The source was identified in 80% of reported PI. A total of 42 working days were lost. 72% of PI reported by females compared to 28% by males. Nurses and paramedical staff were the highest affected groups with exception in 2010 where MD ranked second. Incidents occurred during administration were found to be the highest contributing factor to PI followed by uncapped needles post administration and thirdly came improper discard of sharps.

Conclusion: The program improved by 2 fold. EPINET program is a sounding approach to engage different occupation groups and MD in particular since decisions made were data driven. The need for comprehensive studies at bed-side, updating PI form, supporting closed systems and introducing focused training programs were identified as areas for improvement.

Disclosure of interest: None declared.

SURVEILLANCE AND INFECTION CONTROL INDICATORS

P228

Application of six sigma process to implement the infection control process and its impact on infection rates in a tertiary health care centre

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BMC Proceedings 2011, 5(Suppl 6):P228

Introduction / objectives: Health care sectors are facing major challenges in the form of Hospital Acquired Infections(HAI). Using six sigma we can analyze the problem, come to practical solutions and implement and sustainable improvements.

Methods: We introduced six sigma in our health care setup for implementation of infection control practices and studied its impact infection rates. After training the identified team in six sigma process we identified the matrices which will be included in the process. The baseline data taken was the lowest rates achieved in the previous year and the goal was to achieve 1/3rd of that rate. All the steps starting from Define to Control phase were done and we could achieve a remarkable decrease in our Infection rates. Various initiatives like Ventilator Associated pneumonia Green Star Project implementation all Intensive Care Units (ICU) Daily checks for implementation and compliance of infection control protocols,empowermentwas extensively carried out. Tools like dashboard,signages,infection control week were used to disseminate information.

Results: We could achieve Zero SSI rates in six months, Hand Wash compliance to 69% and achieve the target in all device related infections rates. Indirect measurement of number of beds available for new patient, early discharge/shift out of patient and patient satisfaction provided the necessary data to convince all the staff the need to sustain this new initiative.

Conclusion: This represents the first successful application of Six Sigma corporate performance-improvement method impacting purely clinical outcomes. HAI reduction was highly substantial and sustained after other traditional strategies had failed.

Disclosure of interest: None declared.

P229

Evolution of healthcare-associated infection surveillance in England: initiatives, implementation and opportunities for innovation

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BMC Proceedings 2011, 5(Suppl 6):P229

Introduction / objectives: Surveillance data needs to be capable of; identifying clusters; tracking trends; assessing the effectiveness of interventions; and providing timely results. This research assesses whether this is the case for healthcare-associated infection (HCAI) and antimicrobial resistance (AMR) surveillance systems in England, and endeavours to understand why in certain areas surveillance has not been more successful.

Methods: A systematic search of the literature was carried out. Original search results identified additional Government, committee and conference reports and guidelines.

Results: Surveillance of HCAIs and AMR has developed over time in response to numerous stimuli. The implementation of novel surveillance systems are often in response to issues identified through passive surveillance and research. Evidence of rising infection or resistance rates have caught the attention of the Government (and the media) occasionally leading to enhanced surveillance of specific infections to monitor progress towards targets. Several independent studies have concluded that post-discharge surveillance after surgery is required to provide more accurate surgical site infection rates. Funding for surveillance programmes has come from various sources including the pharmaceutical industry, particularly in AMR surveillance.

Conclusion: Some surveillance schemes have been successfully implemented, partially fulfilling criteria. However, many clinical areas have yet to see advances in HCAI surveillance specific to their area and are reliant upon generic passive surveillance systems. Future development of surveillance systems to rapidly identify clusters and outbreaks, and patients at increased risk of acquiring infection will ensure that control measures are best directed to prevent further cases occurring.

Disclosure of interest: None declared.

P230

Prevalence and antibiotic resistance profile of bacterial isolates from wounds in burn unit and a nearby trauma ward at Ramathibodi Hospital, Bangkok, Thailand

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BMC Proceedings 2011, 5(Suppl 6):P230

Introduction / objectives: Data analysis of prevalence and antibiotic resistance profile of bacterial isolates from the particular wards could lead to an improvement of treatment, control and prevention of infection in the units. The aim of this study is to evaluate predominant bacterial isolates from the Burn Unit (BU) and a nearby trauma ward (TW) in Ramathibodi hospital, Bangkok, Thailand.

Methods: A five-year retrospective review of wound cultures from patients who admitted at BU and a nearby TW, Ramathibodi hospital was performed.

Results: The highest prevalence Gram-negative and Gram-positive bacteria in both wards were similar as *Pseudomonas aeruginosa* (20.99 and 15.17%) and *Staphylococcus aureus* (13.12 and 12.16%), respectively. Although the prevalence of multiple drug resistant (MDR) strains of *Acinetobacter baumannii* showed no difference (59.09 vs 60.53%) in both wards, the prevalence of MDR *P. aeruginosa* and methicillin-resistant *S. aureus* (MRSA) in BU was higher than TW (15.28 vs 6.25% and 66.67 vs 51.95%, respectively). In contrast, the prevalence of *E. coli* and *Enterobacter* spp. isolated from TW was higher than BU whereas the second common Gram-positive organism was *Enterococcus* spp. in both wards.

Conclusion: Not only high incidence of bacterial infection but also high prevalence of MDR strains in Burn Unit has become another challenge for medical staff as well as those who involve in hospital infection control program to be seriously concerned.

Disclosure of interest: None declared.

P231

First report of Iranian National nosocomial infection surveillance system software

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BMC Proceedings 2011, 5(Suppl 6):P231

Introduction / objectives: Nosocomial infections are one of the most important health problems particularly in developing countries, because these infections cause high mortality and morbidity and have many economic loss consequences. To date however most surveillance studies have been conducted in most of developed countries, only a very few have been accomplished in Iran. The aim of this study is to determine the incidence of nosocomial infections in a big university hospital of Shiraz.

Methods: The study was conducted prospectively through six months from 21st March up to 22nd September 2006 in a 374 bed educational hospital. All patients admitted during this period were included in the study and examined everyday for detecting four types of nosocomial infections: surgical site infection, urinary tract infection, pneumonia and blood stream infections. Centres for Disease Control and Prevention National Nosocomial Infection Surveillance system criteria were applied.

Results: 4013 patients were admitted in hospital. Overall infection rate was 2.45% and UTI, SSI, BSI and pneumonia rates were 1.07%, 0.72%, 0.32% and 0.32% respectively.

Conclusion: To reduce nosocomial infections the first step is organizing a standard surveillance system, accurate and on time diagnosis of these infections and implying the infection preventing and control programs.

Disclosure of interest: None declared.

P232

Methicillin-sensitive *Staph. aureus* (MSSA) and methicillin-resistant *Staph. aureus* (MRSA) bacteraemia decline simultaneously

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BMC Proceedings 2011, 5(Suppl 6):P232

Introduction / objectives: The recent decline in MRSA infection is well recognised but the contribution of hospital-acquired (HA) versus community-acquired (CA) is not always clear, nor if MRSA has substituted for MSSA or is an additional burden. We examined our experience with *S.aureus* bacteraemia (SAB).

Methods: From April 2008 to March 2010, at Imperial College Healthcare NHS Trust (ICHNT), electronic microbiological records of patients with SAB were linked with patient administration data to determine if the *S. aureus* was methicillin-sensitive or resistant, and if infection was CA or HA. SAB within 2 days of admission was defined as CA, 2 days or more after admission as HA and a new episode if more than 2 weeks between 2 positive SAB.

Results: Of 345 SAB detected, 60% were CA and 40% HA; 250 (72%) were MSSA and 95 (28%) MRSA. Of MRSA bacteraemias, 49% were HA, but 37% of MSSA bacteraemias were HA. The rate of SAB per 100,000 bed-days had a downward trend due a decrease in both MRSA and MSSA bacteraemia. Since April 2009, the number of HA MRSA and MSSA decreased simultaneously. During the period April 2008 to March 2009, the rate of HA SAB was 19.6. In the period April 2009 to March 2010 this declined by to 11.7. Between these two periods the rates of MRSA and MSSA bacteraemia rates decreased by 1.7 (from 19.6 to 11.7), 2.1 (from 7.2 to 3.4) and 1.5 times (from 12.4-8.3).

Conclusion: *S. aureus* as a cause of bacteraemia at ICHNT is decreasing, particularly HA cases. MRSA and MSSA bacteraemia are decreasing simultaneously, suggesting either that MRSA substituted MSSA rather than reflecting additional cases or that MRSA control measures may also have had an effect on MSSA.

Disclosure of interest: None declared.

P233

The impact of active surveillance cultures in reducing methicillin-resistant *Staphylococcus aureus* infections in a surgical intensive care unit in Singapore

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BMC Proceedings 2011, 5(Suppl 6):P233

Introduction / objectives: Infection and colonization with methicillin-resistant *Staphylococcus aureus* (MRSA) is associated with significant morbidity and mortality. To study the impact of active surveillance cultures (ASC), environmental cleaning and decolonization regimen in reducing MRSA infections in Surgical Intensive Care Unit (SICU).

Methods: The study was conducted in SICU. ASCs were performed from 20 Sep 10 to 28 Feb 11 on all patients admitted/transferred in/transferred out of SICU. ASC specimens consisted of swabs from anterior nares and axilla/groin. The swabs were inoculated onto chromogenic agar selective for MRSA (MRSASelect, Bio-Rad). MRSA positive patients were placed on contact precautions/isolation. Automatic hand sanitizers were installed in SICU to increase hand hygiene compliance. The decolonization regimen consisted of mupirocin ointment tds and daily Prontoderm (0.1% polyhexanide) for 5 days. Sureclean, an ionic silver disinfectant lasting 24 hours was used for environmental disinfection.

Results: 453 patients were screened on entry/transfer in. 45 patients (9.9%) were detected to be MRSA colonized on entry. 214 patients were screened on transfer out/death. 9 patients (4.2%) acquired MRSA on exit. There were 10 skin, 29 nasal and 15 skin/nasal carriers. There was an increase in overall hand hygiene compliance from 68.4% in Sep 10 to 90.9% in Feb 11. The incidence of MRSA Infection was reduced from 1.7/1000 patient days (Mar - Aug 10) to 0.9/1000 patient days (Sep 10 - Feb 11).

Conclusion: We demonstrated a significant reduction of MRSA Infections in SICU with implementation of ASC.

Disclosure of interest: None declared.

P234

Achievements of BSI hospital-wide surveillance in Belgium

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BMC Proceedings 2011, 5(Suppl 6):P234

Introduction / objectives: Hospital-wide Blood Stream Infections (BSI) surveillance aims at identifying wards at risk, BSI origin and aetiology to set local and national infection control strategies. To assess its effectiveness and usefulness we studied five years of participation to this voluntary surveillance and the BSI incidence trends.

Methods: A repeated cross sectional analysis of the national aggregated database was made. The number of participating hospitals and surveillance periods were computed along with the chronological evolution of BSI incidence rates by admissions, patient-days and requested haemocultures. BSI origin and aetiology were also studied.

Results: Out of 141 acute hospitals, about 80.8 hospitals participated annually with 211.6 surveillance quarters and 5715.8 BSI episodes.

From 2005 to 2009, all indicators fell BSI/1000 admissions from 7.2 to 5.6, BSI/10000 patient-days (9.3 - 7.8), and BSI/1000 haemocultures (2.2 - 1.9). Catheter-related BSI also fell (21.6 - 17.6%), while secondary BSI remained stable (43.5-42.8%) and BSI of unknown origin increased (34.9 - 39.6%). Secondary BSI main source was, by far, urinary tract infections (UTI). Two microorganisms increased over the period: *Escherichia spp.* by 3% and *Streptococcus spp.* by 2%. The intensive care units (ICU) remained the first ward at risk (21.9 to 18.3% BSI were ICU-acquired), but geriatrics rose to a second place (11.6 - 14.0%).

Conclusion: Although voluntary and hospital-wide, the large participation to this surveillance suggests that practitioners perceive it as useful. The input is large enough to yield valid benchmark for local surveillance and to identify national outliers. Besides overall incidence reduction, the catheter-related BSI fell to an all time low. Future operational priorities include reinforcing ICU and geriatric surveillance, focusing on UTI.

Disclosure of interest: None declared.

P235

Use of data mining surveillance system in real time detection and analysis for healthcare-associated infections

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BMC Proceedings 2011, 5(Suppl 6):P235

Introduction / objectives: Hospital information system have been developed to provide better quality of patient care and efficient hospital management. However, these data have not been linked to infection control surveillance. Often time infection control practitioners (ICPs) can only detect healthcare-associated infections (HAIs) based on retrospective analysis of lab results and patient data. Thanks to data mining and artificial intelligence software, the ICPs may be able to detect HAIs in real time based on lab results in certain infections. Thus, the objective is to use knowledge management and artificial intelligence to design a real time HAI surveillance system.

Methods: HAIs caused by multi-drug resistant organisms are our targets in a medical center in southern Taiwan. We designed an automated mechanism to import laboratory results combined with patient-specific data (DOA, bed #, lab orders, etc.). The moving average and trend of positive cultures were plotted. We also used data mining rules (Apriori, Anomaly, and Time-Series analysis) to determine the potential of undetected HAI and outbreaks.

Results: The moving average is a good tool of predicting carbapenem-resistant *A. baumannii* (CRAB) transmission in ICUs. Our surveillance may also determine the potential index patient in a time-series analysis. The Anomaly analysis was able to point out the potential patient wards to have an outbreak by detecting multi-drug resistant organisms (eg. CRAB and MRSA) or rare organisms (eg. VRE) from laboratory results.

Conclusion: Our results showed that a real time rule-based automated infection surveillance system is possible to assist ICPs to detect potential HAIs which saves time and manpower to prevent nosocomial infections.

Disclosure of interest: None declared.

P236

E-RCA - collation and feedback of HCAI information

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BMC Proceedings 2011, 5(Suppl 6):P236

Introduction / objectives: Root Cause Analysis (RCA) is an analysis method which aims to identify the root causes of preventable Health care associated infections (HCAIs). It is based on the concept that problems are best solved by attempting to address and take corrective action by eliminating the *root causes* rather than merely addressing the immediately obvious issues.

The RCA tool developed by the UK Clean, Safe Care Team is useful helping to reduce MRSA (Methicillin resistant *S. aureus*) bacteraemias and *C. difficile* infections. We had been using RCA forms developed by the Clean, Safe Care Team until 2009 but felt that we needed to modify the content of the form to make it more effective and to develop a web based form to improve compliance with the RCA process.

Methods: We felt there was a lack of clarity with some RCA questions based on the feedback from clinical staff who were involved in the RCA process. MRSA and *C. difficile* forms were extensively revised. Both forms were made available electronically. The form had a validation tool at every step making it impossible to submit an incomplete form and this has provided us with the relevant information which was necessary to analyse and make recommendations from the RCA process.

Results: Since the introduction of E-RCA in March 2010 compliance has improved by 70%. The electronic form has allowed tracking of time delays within the system. The analysis of data was streamlined and simplified. Introduction of E-RCA forms has also increased ownership and accountability at both clinical and managerial level.

Conclusion: It is recognized that for the RCA tool to be effective, corrective action must be taken in a *timely manner* and all the recommendations must be implemented to 'close the loop'. As a result

we have managed to reduce *C. difficile* and MRSA bacteraemia and meet Department of Health targets.

Disclosure of interest: None declared.

P237

Point prevalence and risk factors of hospital acquired infections in a cluster of university affiliated hospitals in Shirz, Iran

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Introduction / objectives: Hospital acquired infections (HAIs) are one of the most critical complications in hospitalized patients, responsible for a major health and economic burden. The aim of this point prevalence study of HAI was conducted in Shiraz, Iran.

Methods: The study was designed as four point prevalence surveys with identical design in eight university hospitals, each consisting of 60-700 beds, during all four seasons in 2008-2009. All patients admitted for ≥ 48 hours were studied. For all patients, a standardized data collecting form was completed, consisting of name, age, gender, presence or absence of HAI, administration of any antibiotic, insertion of central line, an endotracheal tube, mechanical ventilation, and any urinary catheter. HAI's definitions were based on the US National Nosocomial Infection Surveillance (NNIS) definitions.

Results: Data from 3450 patients were analyzed. The prevalence of HAI found to be 9.4%. The most common HAIs were blood stream infection (2.5%), surgical site infection (2.4%), urinary tract infection (1.4%), and pneumonia (1.3%). Logistic regression analysis showed that the OR of acquiring infections in males was 1.56 (95%CI 1.21-2.02), higher than in females. Other risk factors for HAI included central intravascular catheter adjusted OR 3.86 (95% CI 2.38-6.26), and urinary catheter adjusted OR 3.06 (95% CI 2.19-4.28).

Conclusion: This point prevalence study showed that HAIs are frequent in Shiraz university hospitals, and that the proportion of antibiotic prescription is high. It implies more efforts in primary prevention of HAI associated with the use of indwelling devices, and prevention of SSI.

Disclosure of interest: None declared.

P238

Healthcare associated bloodstream infections – secular trends of 8 years hospital-wide surveillance in a tertiary care university hospital

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BMC Proceedings 2011, 5(Suppl 6):P238

Introduction / objectives: Healthcare-associated bloodstream infection (BSI) is the 4th major infection complication in medical care. BSI-surveillance is thought to be useful in monitoring trends of healthcare-associated infections (HAI) including outbreaks, emerging multiresistant pathogens, and effects of HAI intervention programmes.

Methods: Introduced 1995 in acute care, prospective and systematic BSI surveillance at the University of Geneva hospitals was extended to a hospital-wide survey in 2003. Positive blood culture results identified by an electronic automated alert system were individually investigated and allocated to the following categories: contamination, secondary BSI (sBSI), primary BSI (pBSI) and catheter-related BSI (CRBSI).

Results: A non-significant trend was detected for BSI to increase between 2003 (0.15 BSI/1000 patient-days) and 2009 (0.28/1000 patient-days) (IRR 1.09; 95%CI 0.73-1.62; $p=0.67$). This was predominantly due to rising rates of pBSI from 0.24/1000 patient-days in 2003 to 0.47/1000 patient-days in 2009 (IRR 1.05, 95%CI 0.62-1.77; $p=0.85$). No change was detected for sBSI and contaminations while CRBSI episodes increased between 2006 (0.17/1000 patient-days) and 2007 (0.27/1000 patient-days). All BSI-outcomes decreased in 2010 following a hospital-wide training in catheter care. No major outbreak was detected.

Conclusion: Eight years BSI-surveillance did not show significant variation making this mode of surveillance less likely to be affected by

confounding factors. Whether improved catheter care contributed to the reduced BSI-rates in 2010 needs to be confirmed.

Disclosure of interest: None declared.

P239

Surveillance of health care workers for multidrug-resistant organisms in faecal samples in a tertiary care cancer centre

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BMC Proceedings 2011, 5(Suppl 6):P239

Introduction / objectives: Antimicrobial resistance among nosocomial pathogens is a significant problem in most clinical settings adding to the cost of medical care and the morbidity and mortality of patients. *Enterobacteriaceae* carrying extended spectrum β -lactamases (ESBLs), Vancomycin resistant *Enterococcus* (VRE), methicillin resistant *Staphylococcus aureus* (MRSA) have emerged as significant pathogens. Many of the health care workers, who come in contact with patients regularly, are carriers of many of these organisms. They are potential source of transmission of these organisms.

This study was undertaken to determine the extent of prevalence of faecal carriers of multi-drug resistant organisms among health care workers.

Methods: A total of 211 faecal samples were processed on MacConkey agar with Ceftazidime, bile esculin azide agar, Salmonella – Shigella agar and blood agar as per standard microbiological methods. Identification of the organisms and ESBL production was done as per CLSI guidelines.

Results: Of the 211 faecal samples received, 66(31.2%) had growth of VRE's, 99(46.9%) had ESBLs and 13(6.6 %) had Salmonella spp.

Conclusion: Although several studies have been reported on faecal carriage of ESBLs and VRE's in patients, there has been no report on health care workers. Since we have high incidence of ESBLs and VRE's in our hospital, this study was undertaken. Health care workers have a high risk of transmitting as many of our patients are neutropenic. Many of our patients are VRE and ESBLs carriers who have got the infection from health care workers. This needs to be further investigated.

Disclosure of interest: None declared.

P240

The prevalence of environmental colonization of Legionella in hospital water systems in Taiwan – a 20 hospital surveillance

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BMC Proceedings 2011, 5(Suppl 6):P240

Introduction / objectives: Legionnaires' disease is a major cause of hospital and community acquired pneumonia. Hospital-acquired Legionnaires' disease is directly linked to the presence of Legionella in hospital drinking water. The objective is to systematically investigate the presence of Legionella and its colonization rate in hospital water systems in Taiwan.

Methods: Twenty hospitals (Hospitals A to T) throughout Taiwan (8 in northern, 2 in central, 7 in southern, 2 in eastern Taiwan, and one in rural island) were cultured for Legionella. We followed the standardized protocol to perform environmental cultures using (1) water samples; (2) BCYE and DGVP culture media; (3) latex agglutination test (LAX) and direct fluorescent antibody (DFA) technique for *L. pneumophila* speciation and serotyping. We also perform speciation for *L. micdadei* since it is implicated in transplant patients.

Results: Among 706 water samples collected during 2009 ~ 2011 period, 21% (149/706) were positive for Legionella. 65% (13/20) of hospital water systems are positive for Legionella; 2 have >30% site positive, 7 are between 10% ~ 30% site positive, and 4 are <10% site positive. *L. pneumophila* serogroups 1, 3, 5, 6, 7, were isolated from 62% (8/13), 31% (4/13), 8% (1/13), 38% (5/13), and 8% (1/13) of the hospitals, respectively. Five hospitals yielded *L. species*, but none of them were *L. micdadei*.

Conclusion: This study allow health official and healthcare professionals for the development of water safety plan to better protect patients and residents of Taiwan in an attempt to prevent Legionnaires' diseases.

Disclosure of interest: None declared.

P241

Infection control-termonous need for data

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BMC Proceedings 2011, **5(Suppl 6)**:P241

Introduction / objectives: Real-time high-quality data is a vital requisite to control HAI (Hospital Acquired Infections). Early identification of epidemics' spreading dynamics is of prime importance to locate the source of HAI and take measures in hospitals to a national level. Yet, technical possibilities to influence necessary key indicators and putting authorities in an acting rather than reacting position are not entirely used. Today's proceedings use notification by fax with receiving institutions passing them on to RKI (Robert Koch Institut) for further research and publishing. This results in low notification rates, data privacy issues, slow communication and few data mining possibilities. Authorities cope with incomplete forms and manual transcription into various systems.

Methods: A thorough analysis by research of literature and implementation guidelines has revealed a set of options, how to improve the process.

Results: The designed solution is adaptable to stakeholders' IT-systems, increases data quality and quantity, the availability for stakeholders and empowers them to further exploit the data. Hence, secure web-services are used for transport, CDA for structured data encoding, Arden Syntax or OWL as a knowledge representation language combined with a dashboard for visualization and central data repository. As a result the time span between first detection and reaction reduces significantly. Reports increase awareness and ensure visibility of epidemic situations as well as allowing electronic surveillance or scientific analysis.

Conclusion: Handling notifiable diseases remains behind technical means. The proposed solution solves identified problems offering a flexible, reliable and timeliness possibility. A first pilot shows that pathogens of different Laboratories are traceable and exploitable in a Population Dashboard.

Disclosure of interest: None declared.

HEALTHCARE-ASSOCIATED INFECTIONS AND PREVENTION WORLDWIDES

P242

Epidemiology of hospital-acquired infections at a tertiary care center in Lebanon

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BMC Proceedings 2011, **5(Suppl 6)**:P242

Introduction / objectives: To describe the epidemiology of hospital-acquired infections (HAI) at the American University of Beirut Medical Center (AUBMC) between October 2007 and September 2010.

Methods: The Infection Control and Prevention Program (ICPP) at AUBMC conducts prospective targeted surveillance of device-associated infections in critical care areas (ventilator-associated pneumonia [VAP], catheter-associated urinary tract infection [CA-UTI], and catheter-related bloodstream infection [CR-BSI]). Device-associated infections are benchmarked against the rates published by the National Healthcare Safety Network (NHSN) and the International Nosocomial Infection Control Consortium (INICC). All HAIs are identified using the Centers for Disease Control and Prevention (CDC) definitions.

Results: VAP rates were highest in the intensive care unit (ICU) (13.2-15.5/1,000 ventilator days). The most common organisms causing VAP were *A. baumannii*, *P. aeruginosa*, and *E. coli*. The respiratory care unit (RCU) had the highest rate of CA-UTI (13.6-16.0/1,000 catheter-days), with *E. coli* and *K. pneumoniae* being the most common pathogens. CR-BSI were mostly caused by coagulase-negative staphylococci, and rates ranged from 9.2 to 15.5/1,000 catheter days in ICU. The rates of device-related infections were in general higher than NHSN and comparable to INICC rates.

Conclusion: Active surveillance remains a critical step towards recognizing and preventing hospital-acquired infections. New infection control strategies should be implemented in order to decrease the rate of device-

related infections in critical care areas. These strategies include educational activities, compliance with hand hygiene and the device bundles, proper training for healthcare workers, and continuous monitoring.

Disclosure of interest: None declared.

P243

The National Nosocomial Infections Surveillance in Iran. A 4 years report

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BMC Proceedings 2011, **5(Suppl 6)**:P243

Introduction / objectives: The national nosocomial infection surveillance program was established in Iran since 2007 based on National Nosocomial Infection Surveillance (NNIS) system definitions for four main groups of infections including pulmonary, urinary tract, blood stream and surgical site infections. This report is reflected a 4 year overview from 2007 to 2010.

Methods: The nosocomial infection control department collected data from selected 100 hospitals with more than 200 beds, during a 4 year period and analyzed those using SPSS.16 software.

Results: During the study period 6616520 patients were hospitalized in 100 hospitals. A total number of 57082 patients got nosocomial infection according to NNIS definitions. The infection rate in 100 hospitals from 2007 to 2010 were 0.6%, 0.87%, 0.96%, 1.1% respectively, (range 0.2% to 5.7%). Urinary tract infections (UTI) was the most common infection (28.9%) among reported cases, followed by pneumonia (PNEU, 28%), surgical site infections (SSI, 26.8%) and blood stream infections (BSI, 16.4%). The nosocomial infections in burn ward was more prevalent, followed by intensive care units, Hematology and Oncology, Pulmonary and kidney wards respectively. The overall mortality rate among patients affected by nosocomial infections during four years was 14.8%.

Conclusion: The national nosocomial infection surveillance activities in Iran is a new program and the main weak point of the mentioned system is under-reporting which need educational interventions to change attitude of health workers and encourage them to detect, register and report nosocomial infection, thus authorities would be able to make evidence-based decisions.

Disclosure of interest: H. Masoumi Asl Other we have no conflicts of interest.

P244

Prevalence and distribution of most common ICU pathogens in a Thai-university hospital during a 5-year period

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BMC Proceedings 2011, **5(Suppl 6)**:P244

Introduction / objectives: Nosocomial infection remains a major problem among ICU patients which may lead to lethal outcome. Data analysis of prevalence and antibiotic resistance profile of bacterial isolates from ICU could help improvement of treatment, control and prevention of infection.

Methods: Microbiological data during year 2006-2010 of Ramathibodi Hospital, a 900-bed Thai-University hospital in Bangkok, Thailand, were retrospective analysed. All bacterial isolates were identified by conventional biochemical tests as recommended in Manual of Clinical Microbiology. *Candida* species were identified according to characteristics of chlamydoconidia production and carbohydrate assimilation/fermentation profile using 13/6 carbon substrates.

Results: From year 2006 to 2010, the main nosocomial pathogens in the ICU were *Candida albicans* (16.9%, 17%, 18.2%, 19.4% and 19.5% respectively), followed by non-fermentative gram negative bacilli either *P. aeruginosa* (11.3%, 12%, 12.2%, 15.3%, 14.3% respectively) or *A. baumannii* (12%, 11.3%, 14.7%, 13.1%, 17.7% respectively) or *Staphylococcus coagulase-positive* (10.7%, 11.75%, 9.45%, 10.3%, 7.6%). The second most common gram-negative bacteria were either *Escherichia coli* (8.1%, 8.5%, 6.4%, 6.8%, 8.0%) or *Klebsiella pneumoniae* (7.5%, 6.9%, 7.9%, 6.6%, 8%) which approximately half of them were ESBL producers.

Conclusion: In last 5-year period, the prevalence of nosocomial infection by *C. albicans* and *A. baumannii* in our ICU is rising, while the prevalence of ESBL-producing bacilli is quite stable. The same incidents were reported by many hospitals worldwide. This may be due to the change in preference of antimicrobial agents used by clinician which need further analysis.

Disclosure of interest: None declared.

P245

Abstract withdrawn

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P246

0.045% DAC N-055 a choice for poor Afghan surgical patients?

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BMC Proceedings 2011, 5(Suppl 6):P246

Introduction / objectives: O₂ enriched pharmaceutical chlorite [NaClO₂ German Drug Codex monograph DAC N-055, 1990] contains Na₂Cl₂O₆ formerly called TCDO, (NaClO₂)₄O₂ fights tissue infections and promotes wound granulation of radiogenic ulcers [http://www-pub.iaea.org/mtcd/publications/pdf/te_1300_web.pdf]. Under our hygienic conditions the intra- and postoperative topical use of 0.045% DAC N-055 helps us to deal with bone & tissue infections in orthopaedic surgery in Mazar. Here we document 4 cases out of the total number of 26 patients, we monitored in the former Military Hospital in Mazar 2004 - 2006 to familiarize ourselves with this German drug first registered as Oxoferin® in 1983.

Methods: The speed of ClO₂ release from 0.045% DAC N-055 (max. 160 ppm) increases with decreasing pH. ClO₂ induces no resistance. In all patients the field of surgical intervention is rinsed several times with 0.045% DAC N-055 in saline especially during the operation, especially before wound closure and dressed with cotton gauzes kept moist till the patient is discharged home. Post-OP irrigations are practised with 0.045% DAC N-055 for septic arthritis (closed method) and osteomyelitis (open method).

Results: 1/2 septic arthritis, osteomyelitis cases and 2/22 osteomyelitis cases are photo-documented. Without antibiotics, septic arthritis had an excellent functional outcome after 6 weeks, the open fracture with skin defect received mesh graft on excellent granulation after 1 month and was completely closed after 3 months. 11/22 osteomyelitis cases could be monitored for 6 to 18 months, 6 cases relapsed within this time, for 8/11 patients antibiotics were not available.

Conclusion: If 4.5% DAC N-055 could be sold in Afghanistan at 50% of the price of the finished drug Oxoferin® sold in Pakistan this could help poor patients in traumatology.

Disclosure of interest: None declared.

P247

Lupoid cutaneous leishmaniasis in Afghanistan treated with 0.045% DAC N-055

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BMC Proceedings 2011, 5(Suppl 6):P247

Introduction / objectives: Lupoid leishmaniasis (LCL) is a rare, face disfiguring, treatment resistant complication which has responded to the expensive photodynamic therapy in 5 patients in Iran [F. Ghaffarifar et al. La Rev. de la Méditerranée orientale Vol. 12 No. 6, 2006]. Here we report 5 cases, - photodocumented as best as we could under the actually disastrous conditions of Afghan Health Care, - treated with 0.045% DAC N-055 [German Drug Codex, 1990], which is split into ¹O₂ and 2NaClO₂ after 360 nm light exposure and reacts as chlorite in iodometry.

Methods: The faces of 5 patients with a CL anamnesis and clinically diagnosed as lupoid CL were treated daily for the first week with 0.045% DAC N-055 prepared in basic crème DAC B-20 under occlusive dressings,

thereafter the patients were instructed to treat themselves with this hydrophilic crème and were told to show up as outdoor patients at least once per fortnight. Pharmaceutical chlorite, NaClO₂ [monograph DAC N-055] is O₂ enriched due to its Na₂Cl₂O₆ content, formerly called TCDO, (NaClO₂)₄O₂, which fights viral, bacterial or parasitic tissue infections and promotes wound granulation even in radiogenic ulcers [http://www-pub.iaea.org/mtcd/publications/pdf/te_1300_web.pdf].

Results: 1 patient was lost, 4 patients healed completely without scarring and with excellent cosmetic results (see photos!), 3 within 3 months, 1 after 10 months because of an additional severe eczema. There were no clinical signs of recurrence, one patient was followed for 6 years.

Conclusion: The low treatment costs for such excellent cosmetic results are appropriate for poor Afghan patients.

Disclosure of interest: None declared.

P248

Cost analysis of hospital infections in a training hospital

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Introduction / objectives: In our study; we investigated the effect of the hospital acquired infections in Gulhane Military Medical Faculty Training Hospital, in Turkey, on hospitalization period, mortality, and additional cost caused by these infections. Additionally; we tried to define the hospital infections types having the highest cost.

Methods: Ninety patients with hospital acquired infection were included in the study. Ninety patients without hospital acquired infection one to one matched and having similar characteristics with study group were chosen as control. All expenditures for consumables were assessed in cost analysis.

Results: In our study; it was detected that, the hospital acquired infections developed averagely on 18th day of hospitalization, and that, the hospitalization duration increased 16.1 days due to these infections and the mortality was 14.5% higher. The additional cost per patient was approximately calculated 4435\$. It was detected that, patients with hospital acquired infection caused 83.4\$ of additional expenditure daily, and for these patients the highest cost were for consumables and drugs used. It was calculated that, 84% of increase in the drug cost was caused by additional antibiotics used. The cost increase in ventilation association pneumonia, in blood stream infection and in urinary system infection were more than that of other types of hospital acquired infections.

Conclusion: There have been several studies in developed countries, unfortunately in our country there is limited information about the cost analysis of the hospital acquired infections. This significance of this study is its being the first in Turkey due to its inclusion and context.

Disclosure of interest: None declared.

P249

Increase in length of stay and overcost attributable to hospital-acquired infections in a pediatric unit in Senegal

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Introduction / objectives: Economic data on healthcare-associated infections (HCAI) in resource-poor countries are practically nonexistent despite the importance of this issue. The objective of our study was to estimate the increase in length of stays and the overcost attributable to HCAI in a pediatric unit in a senegalese hospital to show their economic impact.

Methods: Retrospective analysis on hospital stays' database in the pediatric unit at Hopital Principal de Dakar between September and November 2010. Patients with a positive bacteriological test were selected. Probable cases of HCAI were included on clinical and bacteriological data (presence of multiresistant bacteria). Cases were matched to control patients (with no infection) by sex, age and

hospitalization period. The overcost is the difference cost of cases' stay and control patient' stay.

Results: 2 cases were excluded from the analysis because of death. 10 cases of HCAI were found in 9 patients aged between 0 and 5 years. Among them, 6 were bloodstream infections and 1 was an urinary infection. The increase in hospital stay potentially attributable to bloodstream infections was of 13 days with a mean overcost of 1203€.

Conclusion: It seems necessary to carry out this case-control study on more patients and to take into account the reason of hospitalization to increase the strength of the results. However, our analysis showed the economic burden of HCAI which is considerable in resource-poor countries where healthcare budget are insufficient. These results should prompt authorities to invest substantially in HCAI prevention.

Disclosure of interest: None declared.

Note: Abstract also presented as P350.

P250

Fist case of laboratory confirmed BCG infection following vaccination in children in Albania

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BMC Proceedings 2011, 5(Suppl 6):P250

Introduction / objectives: The attenuated bacilli Calmette-Guerin (BCG) vaccine is administered in Albania to all newborns at the first day of life to prevent tuberculosis. Although complications are rare after BCG vaccination and the outcome is usually favourable, serious BCG infections can occur. The risks associated with BCG vaccination include local complications, extraregional localized disease, and disseminated BCG disease.

Methods: We report a case of *M. bovis* BCG infection in an 11-month old immunocompetent girl. The child was referred to the National TB Reference Laboratory by the pediatrician to perform smear examination and culture for mycobacteria from supurated cervical lymph node.

Results: The smear result was positive for acid-fast bacilli and culture of specimen resulted positive for mycobacteria fully susceptible to rifampicin, isoniazid and ethambutol, but resistant to pyrazinamide. *M. bovis* BCG was identified by using a commercial identification kit (Genotype MTBC kit-Hain LifeScience). The VNTR-MIRU genotyping and spoligotyping of the isolate DNA was performed subsequently. The child was sent by her parents abroad and the treatment outcome is not known to us so far.

Conclusion: To our knowledge this is the very first case of laboratory proven BCG infection following vaccination in children in Albania. Although BCG is considered to be a safe vaccine, it should be kept in mind that complications related to BCG do occur especially in children with cellular immunodeficiencies. Prevalence of BCG disease in Albania is not exactly known.

Disclosure of interest: None declared.

P251

Is noma an infectious disease? Is it transmissible?

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BMC Proceedings 2011, 5(Suppl 6):P251

Introduction / objectives: Noma is a devastating facial necrosis affecting young children in developing countries. The causative agents are not well identified, in particular the association of noma with specific microbiological agents and the risk for transmission.

Methods: Prospective matched case-control study conducted in Zinder, Niger, between September 2001 and October 2006. Epidemiological, socio-behavioural, and biological determinants were collected through interviews with children and their representatives and during clinical examinations. Conditional logistic regression was applied.

Results: A total of 82 acute noma cases and 327 controls were recruited. The noma epidemic curve declined during the study-period ($P=0.04$) with no seasonal effect ($P=0.74$). There was no intra-family case, but an older sibling rank was associated with a higher odds of developing noma ($OR \geq 3^{rd}$ position 3.51; 95%CI: 1.57-7.85). Noma was also associated with severe wasting (OR 7.79; 3.89-15.57), severe stunting (OR 5.22; 2.73-9.97), a higher number of past pregnancies in the mother (OR 1.19 for each additional child; 1.08-1.32), the presence for any other disease within the last 3 months (OR 3.52; 1.89-6.54) or family posses no chicken at home, as a proxy for poverty (OR 2.53; 1.32-4.82). No association was observed between noma and serological status to various viruses (EBV, VZV, HSV, CMV, Morbillivirus). Definitive microbiological data will be available at time of the meeting.

Conclusion: Noma is linked with poor general health status leading to a higher risk to develop opportunistic illnesses, which precipitates the occurrence of devastating facial lesions. No epidemiological evidence was shown for cross-transmission in this cohort- the largest reported to the best of our knowledge.

Disclosure of interest: None declared.

P252

Prevalence of HIV-infection in Saudi Arabia

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Introduction / objectives: Human immunodeficiency virus infection prevalence in Saudi Arabia was shown to be 0.02% in previous study. Following the annual incidence of HIV-infection can evaluate the degree of change in incidence of infection.

Methods: Obtaining the correct data from the National AIDS Program at Saudi Ministry of Health according to the annual report of HIV-positive patients.

Results: Between 1984 and 2001, it was found that 1285 HIV-positive cases were Saudis averaging 76 new cases per year. The reported HIV-positive person at the end of 2004 was 2005 cases. The rate of annual incidence of HIV-infection in Saudis was ranging 229-505 cases per year on 2001 - 2009. Between 2001 and 2009 the mean annual incidence of HIV-infection in Saudis was 342 cases per year. The last 8 years the new HIV infection in Saudis was 2734 cases only between early 2002 and end of 2009. The total number of HIV-positive Saudis on early 2010 was 4019 persons.

Conclusion: During the last 8 years showed significant annual increase in the number of HIV-infected people in Saudi Arabia. This cumulative increase will require better policies to deal with such rising incidence of HIV-infection.

Disclosure of interest: None declared.

HAND HYGIENE III: RUNNING A PROMOTION CAMPAIGNS

P253

How to use the WHO criteria to focus a hand hygiene campaign

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BMC Proceedings 2011, 5(Suppl 6):P253

Introduction / objectives: Proper hand hygiene is critical to prevent healthcare associated infections. Therefore, measurement of hand hygiene compliance is an important tool in infection prevention. After multi model hand hygiene campaign (HHC) compliance is known to remain low.

Methods: Between October and December 2010, after an intensive HHC of ten years in our 1894-bedded tertiary care centre, hand hygiene opportunities (HHO) as defined according to the 5 categories from the WHO were measured by direct observation. Compliance rates (CR) were

calculated as the number of hand hygiene activities (HHA) divided by the HHO.

Results: A total of 1007 HHO were documented: 134 in the protective isolation ward, 113 in the medical ward, 566 in the intensive care unit (ICU), and 161 in the surgical ward, resulting in CRs of 49% (66/134), 51% (58/113), 28% (159/566), and 51% (82/161), respectively. The CR in the ICU was statistically lower ($p < 0.001$) compared to the other wards and this was due to the absence of hand hygiene after glove use. In all wards except the protective isolation ward, CRs were statistically lower ($p < 0.001$) before patient contact (WHO indications 1 and 2) than after patient contact (WHO indications 3, 4 and 5).

Conclusion: Most increase in compliance can be achieved by focusing our new HHC on performing hand hygiene before aseptic tasks.

Disclosure of interest: None declared.

P254

Implementation of a multimodal approach to improve hand hygiene in a teaching hospital: change of paradigm

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BMC Proceedings 2011, 5(Suppl 6):P254

Introduction / objectives: Many factors have been involved with low compliance of hand hygiene strategy such as the lack of resources and cultural barriers. In order to improve the level of adherence, a comprehensive program was implemented since Oct 09.

The aim of this study was to evaluate the impact of a multimodal approach to increase the compliance to hand hygiene among health personnel of our institution.

Methods: The program was based on the concept that "hand hygiene is everyone's commitment" (paradigm change). A multimodal strategy was implemented using WHO recommendations. Alcohol-gel was used as universal method for hand hygiene. Measurements of adherence were carried out identifying the 5 WHO's opportunities through five cross-sectional studies. The results of each study were shown through a graphic chart to each hospital area in comparison with the rest of institution. Data from Oct 09 were compared with those of Oct'10.

Results: A total of 4618 observations were performed. The overall adherence to hand hygiene increased from 46.3% to 59.9% (diff: 13.6%, 95% CI 7.7% to 19.5 %, $p < 0.001$). Stratified by type of professional, both nurses and doctors increased their level of adherence (52.1 vs 68.7% [diff: 16.6%, 95% CI 8.3% to 24.9%, $p < 0.001$], 41.6% vs 57.9% [diff: 16.3%, 95% CI 6.6% to 26.0%, $p < 0.01$], respectively). Higher levels of adherence were observed in intensive care units (77%) in comparison with general wards (38%). The consumption of alcohol-gel increased from 49.9 liters per 1000 pt-days to 76.5 liters per 1000 pt-days (diff: 26.6%, 95% CI 18.4% to 34.7%, $p < 0.01$).

Conclusion: The implementation of a multimodal approach in our institution increased the adherence to hand hygiene among health personnel. The feed-back to each hospital area may have helped to raise the level of compliance.

Disclosure of interest: None declared.

P255

A multifaceted approach to a successful and sustainable hand hygiene campaign in a large tertiary academic medical centre

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BMC Proceedings 2011, 5(Suppl 6):P255

Introduction / objectives: Hand hygiene (HH) is essential to patient safety and is the single most important method to prevent the spread of infections. However, HH compliance of health care workers (HCWs) has been consistently low. In 2007, we implemented a comprehensive HH campaign, adapting the materials from the *Just Clean Your Hands* campaign of the Ontario Ministry of Health and Long Term Care

(MOHLTC). This study examines the components of this campaign, its impact and its sustainability in a large 1185-bed tertiary referral teaching hospital.

Methods: The comprehensive program has 2 phases: setup and maintenance. The setup phase includes obtaining strong commitment from hospital leadership, setting up alcohol-based hand rub at point of care, providing intensive education sessions to all areas of the hospital, establishing an audit and feedback process, and creating a poster campaign. The maintenance phase includes ongoing audit and feedback, analysis of data to direct program improvement and refreshing of promotional efforts.

HH audits of HCW-patient interactions were performed by trained auditors in all inpatient and long term care areas and higher risk out-patient areas using a standardized, validated audit tool.

Results: Before the campaign, the overall hospital average HH compliance was 43%. Immediately after the pilot setup phase, HH compliance rapidly and significantly improved to 62%. After the full setup phase had been implemented, the HH increased to 72%. In the maintenance phase, the HH compliance has continued to increase to 81% over the subsequent 2 years. This improvement is statistically significant.

Conclusion: A multifaceted campaign is effective in rapidly improving and sustaining HH compliance at a large tertiary academic hospital.

Disclosure of interest: None declared.

P256

Successful application of World Health Organization multimodal strategy for hand hygiene

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BMC Proceedings 2011, 5(Suppl 6):P256

Introduction / objectives: Hand hygiene is an effective means of preventing hospital-associated infection (HAI). Compliance among health care workers (HCWs) is the main strategic goal for the infection control committee as per the Ministry of Health collaboration with World Health Organization's (WHO) Global Patient Safety Challenge since October 2005.

Methods: The following steps were taken by the infection control team in A secondary/tertiary care hospital (>1000 bed) and in a psychiatry hospital (>230 beds), for the last 3 years; were we:

- Acknowledged the importance of HAI and hand hygiene and started the surveillance.
- Developed ongoing campaigns at national or sub-national levels to promote and improve hand hygiene among HCWs; where we ran two campaigns per year
- Made information available on HAI and hand hygiene for all HCWs through educational sessions, materials, newsletter, workshops and a designed website.
- Shared experiences with the WHO
- Used the WHO strategies, guidelines and tools to tackle HAI
- Promoted the highest standards of practice and behavior to reduce HAI;
- Encouraged the senior management support for implementation of interventions to reduce HAIs.
- Created a voluntary team of medical residents to participate in the audit.

Results: HCWs compliance with hand hygiene recommendations was low during the first Audit less than 10% (2007), with differences between doctors and nurses. Several activities introduced for HCWs during the whole year and on 5th of each month. A group developed a hospital campaigns using the WHO multimodal strategy and observational tools. Opportunities for hand hygiene were audited during three years period. The compliance were reviewed which showed a significant increase in the compliance above 70% in 2010.

Conclusion: The application of WHO multimodal strategy for hand hygiene helped in increasing the compliance of HCWs with hand hygiene, aiming to reach 100%.

Disclosure of interest: None declared.

P257

Random clinical trial to evaluate the effect of a multimodal intervention in hand hygiene in primary care in Madrid

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BMC Proceedings 2011, **5(Suppl 6):P257**

Introduction / objectives: Objective was to evaluate the effectiveness of multimodal intervention, in primary health care professionals, to improve compliance with practice of hand hygiene, based on WHO's 5 moments.

Methods: Double blind, parallel group clinical trial with control group (CG), randomized by cluster. Performed at 21 primary health care centers, during 2009-2010, with 214 health professionals.

Hand hygiene compliance level was evaluated at the moment basal and six months after the intervention, by a single external observer. Professionals ignored in which activity they were being observed, previously signed an informed consent.

Variables: related to WHO's 5 moments and with professionals (profession, sex, type of contract and years of experience).

Multimodal intervention carried out with intervention group (IG), consisted of a theoretical-practical workshop in four sessions, providing the visiting room with hydro-alcoholic solutions and reminder signs.

Statistical analysis: descriptive analysis, Student's t for independent samples, and the Mann-Whitney U or the Kruskal-Wallis test and multiple linear regression techniques have been utilized to analyze baseline compliance.

Results: Study was completed by 170 professionals: 84 (IG), 86 (CG), with no differences in the baseline characteristics. Professionals in the intervention group increased their level of compliance for hand hygiene by 21.6 points (CI95% from 13.83 to 28.48), compared with the control group. Moment 1 showed the highest increase in improvement (9.5 points). The level of compliance basal was 8.1% (CI95% from 6.2 to 10.1). More than 20 years of job experience is significantly associated with very low levels of compliance.

Conclusion: Compliance with hand hygiene can be improved with a multimodal intervention, fundamentally training. It provides a valid methodology to other health centers.

Disclosure of interest: None declared.

P258

Increasing uptake of hand hygiene education among health care workers via online learning at a Toronto teaching hospital

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BMC Proceedings 2011, **5(Suppl 6):P258**

Introduction / objectives: Education is a cornerstone of multi-modal strategies aimed to improve hand hygiene compliance among health care workers (HCWs). Major obstacles cited in the literature include limited time availability of HCWs and the reluctance of doctors to attend training sessions. A short, interactive online learning module was developed at St. Michael's Hospital to update HCWs on best practices related to hand hygiene indications during patient care. Increasing awareness on the transmission and incidence of health care acquired infections, the concept of 'patient environment', appropriate glove use as well as hand care were complementary learning points.

Methods: A formal marketing plan was devised to brand and promote the "quick and interactive" online learning module via: a) the hospital's intranet home page b) e-mails tailored to staff, physicians and management, c) daily electronic newsletter d) pay stub reminders e) branded promotional T-shirts, f) instructional mini personal hand sanitizers as well as g) raffle prizes.

The uptake of the course was tracked as each HCW was required to log in with their unique ID and password.

Results: Breakdown of various education session "modes" & uptake among HCWs

Fifteen 30 minute class-room style presentations= approx. 68 HCW (over 4 months)

Thirty 15 minute In-services at in-patient unit nursing stations= approx. 125 HCW (over 6 months)

10 minute Online learning module= 1,484 HCW (over 3 weeks)

Conclusion: The uptake among HCWs for hand hygiene education at St. Michael's Hospital significantly increased with the introduction and roll-out of an online learning module over a significantly less amount of time.

A formal evaluation is required in order to assess whether knowledge transfer of hand hygiene best practices occurred.

Disclosure of interest: None declared.

P259

Hand hygiene compliance in India

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BMC Proceedings 2011, **5(Suppl 6):P259**

Introduction / objectives: Healthcare workers (HCWs) hands are the most common vehicle for the transmission of healthcare-associated pathogens. Evidence-based guidelines for healthcare workers' hand hygiene practices exist, but compliance with these is internationally low. Monitoring hand hygiene compliance and providing healthcare workers with feedback regarding their performance are considered integral parts of a successful hand hygiene promotion program. But in India very few studies addressed the issue of hand hygiene compliance. The main aim of the study was to assess the hand hygiene compliance among different health care workers.

Methods: This was a cross sectional study. The infection control professionals randomly observed the compliance of hand hygiene practices of different health care workers during their routine patient care in different wards. The HCWs were unaware that they were being observed.

Results: In the present study 340 hand hygiene activates were observed. Alcohol based hand rub (69%) was the principle mode of hand hygiene among HCWs. Nurses (37%) & Doctors (28%) were the main participants compared to other ancillary staffs. Hand hygiene compliance before and after patient/environment contact among doctors, nurses and ancillary staffs were 66%, 62% and 54% respectively. Doctors, nurses and ancillary staffs were followed hand hygiene steps orderly in 69%, 56% and 51% of the times.

Conclusion: Hand hygiene compliance rate among doctors and nurse were high compared to ancillary staffs. Doctors followed Hand hygiene steps orderly on most of the occasions. Ancillary staffs need to be educated about hand hygiene to improve their compliance.

Disclosure of interest: None declared.

P260

Clean care is safer care: from a glonal challenge to a WHO patient safety programme

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BMC Proceedings 2011, **5(Suppl 6):P260**

Introduction / objectives: The First Global Patient Safety Challenge *Clean Care is Safer Care* (CCiSC) was launched in 2005 and is now a WHO Patient Safety Programme with the aim to prevent a frequent and major adverse event in care delivery?healthcare associated-infection (HCAI).

Methods: Efforts have focused on hand hygiene improvement using a three-pronged approach: 1) raising awareness of HCAI among health professionals and solutions for its prevention; 2) securing political commitment at governmental level to make HCAI prevention a health priority; 3) developing a range of technical tools to support hand hygiene programmes at the facility level, according to the WHO validated multimodal strategy for hand hygiene improvement.

Results: To date, 124 of 147 WHO member states have pledged their support to CCiSC to reduce HCAI. As an extension of the CCiSC work, the *SAVE LIVES: Clean Your Hands* annual global campaign was launched in 2009. In 2010, over 12,000 healthcare facilities worldwide signed up to the initiative. The accompanying technical toolkit has been widely used and adopted and often adapted to local conditions. In addition, 42 countries worldwide have implemented their own national hand hygiene campaign.

Conclusion: Future plans are to scale up CCiSC to include other areas of infection control with surveillance as the next focus. But efforts will continue to promote actively the importance of the sustainability of hand hygiene improvement.

Disclosure of interest: None declared.

P261

A nationwide inventory of the availability of alcohol-based handrub in Dutch acute care hospitals

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BMC Proceedings 2011, **5(Suppl 6)**:P261

Introduction / objectives: Although there is general consensus that hand hygiene is the most effective measure to prevent healthcare associated infections, compliance is unacceptably low. Easy access to alcohol-based handrub at point of care (within 2m of the bed) is a main component of WHO's multimodal strategy.

Methods: We performed a descriptive study of alcohol-based handrub availability across 24 Dutch acute care hospitals to verify if difficult access could explain the national low compliance rate (19%). In each hospital the proportion of patient rooms with dispensers and the proportion of patient beds with point of care dispensers on an internal medicine, surgery, pediatrics and intensive care unit (ICU) ward was measured as well as the handrub consumption of the entire hospital. Hospitals reported the interventions they applied to increase compliance.

Results: Handrub dispensers were present in 99.8, 100, 100 and 100% of patient rooms and at 50.8, 49, 57.1 and 83.8% of patient beds on the internal medicine, surgery, pediatrics and ICU wards, respectively. The average handrub consumption was 26.1 L/1000 nursing days (range: 8.6-51.7). No correlation was observed between handrub consumption and the percentage of beds with point of care dispenser. Of the 8 hospitals that reported doing interventions, 6 used written material and 7 used education, which is known to be not a very effective intervention.

Conclusion: Enhanced access to alcohol-based handrub at point of care is required. In addition, the other components of the multimodal strategy need to be implemented to reach a sustained improvement of hand hygiene compliance.

Disclosure of interest: None declared.

P262

Indicators of long-term sustainability of hand hygiene improvement and barriers in healthcare settings worldwide

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BMC Proceedings 2011, **5(Suppl 6)**:P262

Introduction / objectives: Implementation of the WHO multimodal hand hygiene (HH) improvement strategy was successfully tested in 8 pilot sites in 2006-2008 with a significant improvement in HH compliance and other indicators. Indicators of long-term sustainability and barriers were evaluated 2 years later.

Methods: Semi-structured telephone interviews with site coordinators were conducted in 2010 using a predefined set of questions to investigate the status of core activities of HH promotion and monitoring, barriers to improvement and indicators of long-term sustainability.

Results: All coordinators accepted to be interviewed. The following indicators of long-term sustainability were identified: extension of HH promotion hospital-wide in sites where only a limited number of wards were initially involved in implementation; regular repetition of HH training and preparation of new educational tools; poster refreshment and development of new reminders; continuation of HH compliance monitoring at least annually in 7/8 sites; national scale-up in 5/6 countries with no previous HH campaign. Barriers to long-term sustainability, especially in low-resource settings, were: resistance to behavioural change in some professional categories; high staff turnover and workload; understaffing; lack of dedicated human resources; discontinuation of support by leaders and of regular budget allocation, especially for alcohol-based handrub procurement.

Conclusion: Long-term sustainability of the HH strategy was demonstrated by the continuation and reinforcement of core elements over time. Some identified barriers raise concerns and indicate the need for further

improvement and some substantial changes, particularly in countries with limited resources.

Disclosure of interest: None declared.

P263

Translating an Afro-European partnership into tangible hand hygiene action

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BMC Proceedings 2011, **5(Suppl 6)**:P263

Introduction / objectives: WHO African Partnerships for Patient Safety (APPS) nurtures sustainable partnerships between African and European hospitals to improve patient safety. Through APPS, Hôpitaux Universitaires de Genève (HUG) is partnered with hospitals in Cameroon, Mali and Senegal.

Methods: Hospital representatives convened in 2009 to build the programme foundation, followed by hospital situational analyses to determine priority action areas. Among 12 patient safety action areas, reduction of health care-associated infection (HAI) was chosen as a common platform of action. Subsequently, 2-year partnership action plans were developed, finalized at a workshop in 2009 in Uganda. Hand hygiene (HH), the single most effective measure to reduce HAI, was the cornerstone of planned action.

Results: A broad range of HH improvement tools was made available through a patient safety resource map. African technicians were trained on alcohol-based handrub production. An initial batch of materials was provided for African hospitals to enable local production. A HH training workshop was held in September 2010 at HUG led by hospital infection control experts. African participants were designated HH project coordinator, trainer and observer. In-depth training on the WHO multimodal hand hygiene improvement strategy and WHO's hand hygiene observation method took place, accompanied by practical sessions on HH technique, displaying training films, and educational games. The workshop also provided an opportunity for collective brainstorming, exchange of knowledge and common issues, and sharing on-the-ground experience across two continents.

Conclusion: APPS has created a mechanism to translate inter-continental partnerships into tangible action on improving hand hygiene in order to reduce HAI.

Disclosure of interest: None declared.

P264

Using tools to engage health-care facilities (HCFs) in a global movement: World Health Organisation (WHO) Save Lives: Clean Your Hands (SL: CYHS) annual campaign

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BMC Proceedings 2011, **5(Suppl 6)**:P264

Introduction / objectives: Running a successful campaign is challenging. At a global level, SL:CYHS aims to engage all HCFs. The use of specific WHO tools was evaluated to understand if HCFs would also take action at the point of care around an annual campaign day.

Methods: In 2010, two new tools were issued on the WHO website: the Moment 1 tool and Hand Hygiene Self-Assessment Framework (HHSAF). Electronic communications were primarily used to promote their use to a large database of contacts. Web site access and download information were gathered by analysing WHO web statistics with Urchin software (Google Inc.).

Results: From April-June 2010 the Moment 1 tool was downloaded 7 693 times, a mean of 101/day. The HHSAF was downloaded 27 526 times from its launch on 5 May 2010 to end Feb 2011. The existing WHO 'how to handwash' poster was the only tool more popular at 45 978 downloads since launched in 2009. For a Moment 1 global observation survey, the first of its kind, more than 300 SL:CYHS registered HCFs from 47 countries took part. For the HHSAF, it is estimated that over 2 000 registered HCFs will submit data to WHO in 2011.

Conclusion: Despite reflecting different time periods, other than the 'how to handwash' poster downloads, which were potentially increased by the H1N1 pandemic, the HHSAF is the most popular download. The Moment 1 global survey in 2010 improved WHO's understanding of HCFs' move from commitment to action in support of this global campaign and local change; the HHSAF has facilitated further engagement of a considerable number of HCFs through. A fledgling global campaign can reach a wide audience and the availability of tools can support this.

Disclosure of interest: None declared.

P265

Survey of infection control measures and design of emergency rooms in Quebec, Canada: an overview of the actual situation

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BMC Proceedings 2011, 5(Suppl 6):P265

Introduction / objectives: Emergency rooms (ER) are considered the "front door" of hospitals and are facing overcrowding, high intensity of cares, non-optimal design and a quick turnover of patients and personnel. Very few papers in the literature discussed infection control (IC) measures in ER. This study evaluated the situation of IC in Quebec's ER.

Methods: An electronic survey covering design, hand hygiene, IC measures and housekeeping of ER was done using Survey Monkey software. The questionnaire was sent in September 2010 to IC practitioners of Quebec acute-care settings with >1000 admissions/year. Data were analyzed with Epi-Info 3.5.2.

Results: The survey was completed by 63/89 (71%) hospitals. ER had a mean of 22 beds (range: 5-52), including 30,3% of single rooms. Airborne isolation rooms (AIR) were present in 87% of ER (range: 0-8 AIR). The ratio of ER that had a proportion of toilet/bed between 0 to 40% was 85%. Hand hygiene stations were located next to 78,5% of beds. Audits on hand hygiene compliance were performed in 35/63 (55,5%) of ER within the past two years. The compliance rate was <50% in 90,6% of ER. A designated area in the waiting room to cohort patients presenting with infectious diseases symptoms was present in 87,1% ER. Surveillance of MRSA and VRE were done in 90,4% of ER. An IC committee specific to ER was implemented in only 4,8% of ER. Dedicated housekeeping personnel were present in 76,2% of ER.

Conclusion: In Qu  bec's ER, only 30% of beds were designed as single rooms and compliance to hand hygiene was low. More evidence-based data and guidelines are needed on IC in ER.

Disclosure of interest: None declared.

P266

Implementation of a patient participation strategy in a randomized controlled hand hygiene promotion study – a mixed-method qualitative and quantitative evaluation

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Introduction / objectives: An ongoing, ward-level cluster-randomized, controlled, multimodal hand hygiene (HH) promotion study includes a patient participation component (PP): patients and healthcare workers (HCW) remind each other of HH after personal invitation by HCW using an information pack (IP).

Methods: During implementation we interviewed the head nurses of the 19 PP wards at months 3 and 6. Their beliefs about PP, perception of the ward's uptake, promotional engagement, perception of facilitators and barriers, and corrective actions were discussed. Interview notes were analyzed inductively and independently by 2 investigators. Beliefs, uptake perception, and engagement were quantified on a 5-point scale. The proportion of patients receiving IP was used as a measure of ward engagement.

Results: Mean IP distribution incidence was 36% (SD, ± 30). Mean scores for beliefs, uptake perception, and engagement were 3.58 (± 1.0), 3.9 (± 0.6), and 3.55 (± 1.0), respectively, with a negative trend. Qualitative analysis identified the following barriers: HCW perception of unsuitable patient profiles, HCW fear of patient reactions, competing projects, high workload, HCW and patient turnover, and general work climate issues. Positive deviant conditions were: assistant nurse involvement, identifying suitable patients during handovers, and communication training of HCW with patients. We identified 2 outlier champion wards.

Conclusion: Implementation is slow in this challenging social behavior project. The mixed-method approach allowed efficient identification of the main issues and amendment opportunities.

Disclosure of interest: None declared.

P267

Active public involvement in healthcare associated infection (HCAI) research: developing collaborative projects

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Introduction / objectives: Partnership between service users and researchers is a cornerstone of the current research and development strategy for England's National Health Service and is considered by funders as essential throughout the entire research process. To promote and facilitate public involvement in the field of HCAI research, the HCAI Research Network (RN) formed a Service User Research Forum (SURF) to inform priorities and contribute to HCAI research. This paper shows how SURF is supported to develop its own research priorities into viable projects.

Methods: The HCAI RN has developed a robust process with SURF to identify priorities and develop feasible research questions, facilitate interrogation to assess viability and ethics and ensure potential benefits are defined. This enables lay researchers to contribute to literature reviews and desk research; determine appropriate funding; work in partnership with academic/ clinical researchers and undertake research team roles. The HCAI RN provides training and support for this process.

Results: In 2010, SURF worked collaboratively with clinical and academic researchers to submit a proposal exploring patient experiences of MRSA screening for funding. The group is currently developing a user-led project evaluating health professional education in HCAI.

Conclusion: Active service user involvement contributes diverse perspectives, ensures projects are relevant to patients and the public and empowers service users to make real contributions to the reduction of HCAI and drive change within healthcare settings. We continue to develop strategies to enable SURF involvement at all stages of research. Dedicated training and support ensures service users have the research skills and confidence to make their knowledge, experience and insights count in HCAI research.

Disclosure of interest: None declared.

HAND HYGIENE IV: EFFICACY AND TOLERABILITY OF HAND HYGIENE PRODUCTS

P268

Investigative study on the antimicrobial activity and effects of virucidal hand antiseptic on skin

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BMC Proceedings 2011, 5(Suppl 6):P268

Introduction / objectives: The efficacy and skin compatibility of virucidal hand rub was investigated.

Methods: The efficacy of several commercially available virucidal hand antiseptics against FCV was compared by quantitative suspension test. The efficacy of an acidic formulation VH (Alsoft V, Saraya Co., Ltd.) against various types of microorganisms was further investigated according to international standards such as ASTM or EN.

The influence on mouse skin after repeated use of VH was also examined. After 5 days of use simulated in clinical practical condition, physiological properties were measured. In addition, a test on skin irritation was performed electrophysiologically.

Results: Among the antiseptics tested, the acidic formulations showed efficacy against FCV even in short contact time of 15 seconds. VH also exhibited excellent efficacy against all the microorganisms tested.

After repeated use of VH, no significant difference in the gross appearance, TEWL, SC hydration and the number of epidermal fovea of mouse skin were observed. Skin bacterial count was lower than reference products. Regarding skin irritation, VH showed no peripheral nerve stimulation.

Conclusion: This study shows that some commercially available virucidal hand antiseptics could not demonstrate sufficient efficacy against FCV in 30 seconds. In order to achieve the efficacy in short contact time, it is considered critical to formulate alcohol solution with acidic pH. Also, our formulation VH indicated the excellent efficacy against non-enveloped viruses, and against broad spectrum of microorganisms. With its effects on skin, it is suggested that VH has favorable moisturizing and sustainable antibacterial effect.

Disclosure of interest: None declared.

P269

Advancement of the standard *in vivo* hand rub test methods: a critical comparison of the health care personnel handwash (ASTM E1174) and the hygiene handrub (EN1500)

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Introduction / objectives: Recognized standards for evaluating alcohol based hand rubs (ABHR) differ significantly in methodology and success criteria. Hand hygiene authorities including the WHO and U.S. CDC have recognized inherent weaknesses calling out the need for improved *in vivo* efficacy methods.

Methods: The European Standard EN1500 (Hygienic Handrub), ASTM Standard E1174 (Health Care Personnel Handwash), and a recently approved ASTM standard, ASTM E2755-10, were critically compared based on the written protocol and empirical evidence (i.e. actual performance in practice).

Results: All methods use gram-negative bacteria as marker organisms and the measured endpoint is reduction on hands after test article application. ASTM E2755 includes *Staph. aureus*, more representative of a hand transmitted pathogen in healthcare environments. Both EN1500 and E1174 have unrealistic hand contamination procedures which necessitate evaluation of unrealistic volumes of product at excessive contact times. E2755 employs a low volume contamination method for dry, relatively unsoiled hands, allowing ABHR evaluation at realistic volumes and contact times. Success criteria are significantly different: EN1500 uses an internal reference and ASTM methods use specific log reduction minimum endpoints.

Conclusion: Neither method approximates actual healthcare worker ABHR usage. None has success criteria based on evidence of clinical benefit or prevention of pathogen transmission. A single, globally recognized *in vivo* efficacy standard would be of significant value to the infection prevention community and is a vision worth working towards.

Disclosure of interest: J. Arbogast Employee of GOJO Industries, Inc., B. Okeke Employee of GOJO Industries, Inc., F. Brill Employee of Dr. Brill + Partner GmbH, T. Bradley: None declared, A. Fraise: None declared, M. Wilkinson: None declared, D. Macinga Employee of GOJO Industries, Inc.

P270

Efficacy of surgical antiseptic handrub containing PHMB

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Introduction / objectives: The efficacy and cytotoxicity of PHMB (polyhexamethylene biguanide) -containing surgical hand rub was investigated.

Methods: Alcohol proportion and bactericidal agents (e.g. CHG (chlorhexidine gluconate), BAC (benzalkonium chloride), PHMB and OCT (Octenidine)) were compared to determine suitability for surgical hand antiseptics. PHMB-containing handrub was then tested in accordance with European Norm (EN). To further evaluate the hand antiseptics or bactericidal agents, their cytotoxicity was investigated with normal human epidermal keratinocyte cells or 3D Human skin model (Vitro-life skin, Gunze).

Results: The mixture of IPA (isopropanol) and PA (propanol) showed superior efficacy to either IPA or EtOH (ethanol) alone, whereas, for the bactericidal agents, PHMB exhibited the better bactericidal efficacy but lower cytotoxicity. After performing several tests according to EN for hand antiseptic, the PHMB-containing handrub (Alsoft E, Saraya Co., Ltd.) meets EN1500 for hygienic handrub and EN12791 for surgical handrub requirements in relatively short application time 15 seconds and 1 minute, respectively.

Conclusion: The hand rub containing IPA, PA and PHMB (Alsoft E) exhibited the excellent bactericidal efficacy in relatively short time and lower cytotoxicity, suggesting it suitable for fast-acting surgical hand disinfection.

Disclosure of interest: None declared.

P271

Safety and tolerability of virucidal hand rubs: a randomized, double-blind, cross-over trial

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Introduction / objectives: Clinical trial to evaluate the safety and tolerability of different virucidal hand rubs.

Methods: In a randomized, double-blind, 4-period cross-over trial, healthy volunteers received 3 different virucidal hand rubs (P1-3) and a reference product (R) in a randomized sequence each over a period of 4 days (90 mL/d) with a wash-out period of 10 days. Primary endpoint was skin barrier function measured by transepidermal water loss (TEWL) in g/hm² at the end of the 4-day application period. Secondary endpoints were corneometry, skin status score, and adverse events (AE). TEWL and corneometry were analyzed in linear models. The effects were estimated as differences between agents with 95%CI and tested with a 2-sided level of 0.05.

Results: 22 subjects (7 males, 15 females) were randomized and started at least one period. TEWL was 22.5, 95%>CI [19.6,25.4], 16.3 [13.5,19.1], 16.4 [13.4,19.3], and 24.0 [21.1,27.0] after P1, P2, P3, and R; p<0.0001. Corneometry was 49.7 [40.7,58.6], 45.4 [36.9,53.9], 64.3 [55.3,73.2], and 48.9 [39.6,58.1] after P1, P2, P3, R; p=0.005. The median skin status score dorsal was 0.5, 0, 1, 0.5 after P1, P2, P3, R. The percentage of subjects who experienced at least one AE was 86%, 25%, 89%, and 56% with P1, P2, P3, R. The majority of AEs were skin reactions (no serious AEs).

Conclusion: Results were inconsistent, e.g. P3 showed low TEWL (= fair skin barrier function) but high skin status score and high number of adverse events (= impaired tolerability). Assessment of TEWL may be influenced by non volatile compounds in this setting and not be a suitable measure. Number of AEs was higher in products containing phosphoric acid (P1, P3). In general, number of AEs was higher than expected for all products requiring further improvement in hand rub development.

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P272

Prospective observational study to assess hand skin condition after application of alcohol-based hand rubs solutions

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Introduction / objectives: Deterioration in skin condition leads to reduced barrier function, changes in skin flora, and increased bacterial shedding. Thus, poor skin condition can increase the risk of infection transmission. The aim of this study was to assess the hand skin condition and dermal tolerance, among Health Care Workers (HCWs) after application of Alcohol-based hand rub solution (ABHRS).

Methods: 231 HCWs were included, 33.8% nurses, 22.1% nurse assistants and 14.7% hospital cleaners. (Mean age 40 years). The stratum corneum hydration, superficial sebum content and surface pH of the skin were measured on the back and the palm of the dominant hand before and after one application of ABHRS. *t*-test for paired samples was used to compare measurements of skin condition before versus after rub. A self-assessment questionnaire was administered in order to collect information about HCWs, skin problems and tolerance of ABHRS during daily use.

Results: The skin hydration increased significantly after application of ABHRS for the two sites of measurements ($p = .0001$). The mean of pH values did not change significantly on the back of hand, but there were a significant changes for the palm (-0.069 ± 0.41 , $p = .012$). Superficial sebum content decreased significantly after rub on the palm (-0.53 ± 1.56 , $p = .0001$), but no significant difference was observed for the back ($p = .076$). 73% of HCWs reported an excellent or good skin tolerance of ABHRS.

Conclusion: ABHRS are well tolerated and do not dry the skin; pH and superficial sebum decreased slightly, but not affected the skin barrier function. Values were also in the physiological range.

Disclosure of interest: None declared.

P273

ABHR efficacy revisited: influence of alcohol level and product application volume

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Introduction / objectives: Recent studies suggest that both alcohol level and product application volume significantly influence the efficacy of alcohol-based hand rubs (ABHR). The objective of this study was to re-examine the influence of these variables using test methods which more closely represent the use conditions of ABHR.

Methods: Efficacy studies were conducted according to ASTM E1174 or with modifications to the hand contamination procedure as follows: For ASTM E2755 studies, hands were contaminated with 0.2 ml of a concentrated challenge suspension to reduce soil load and eliminate post contamination hand wetness commonly associated with testing per E1174. For the "contact contamination" procedure hands were contaminated by touching an agar surface seeded with the challenge bacteria, a process that transfers minimal soil and moisture to the hands.

Results: Log₁₀ reductions of challenge bacteria increased as alcohol concentration was increased in 10% increments from 50% to 90% when tested according to E1174, but were statistically equivalent when the contact contamination procedure was used. Log₁₀ reductions produced by 62%, 70%, and 85% ethanol ABHR gels were also statistically equivalent when ASTM E2755 was used. Finally, log₁₀ reductions produced by ABHR were found to correlate strongly with the volume applied to hands ($P < 0.05$; slope = $0.84 \log_{10}$ units per ml).

Conclusion: These results strongly suggest that, when ABHR are evaluated under conditions that more closely simulate actual healthcare worker usage, the influence of alcohol concentration on the reduction of transient bacteria within the range of 60-95% ethanol is minimal.

These results also support previous findings that ABHR efficacy is strongly influenced by the volume of product applied to the hands.

Disclosure of interest: D. Macinga Employee of GOJO Industries, E. Campbell: None declared, S. Edmonds Employee of GOJO Industries, J. Rutter Employee of GOJO Industries, D. Shumaker Employee of GOJO Industries, J. Arbogast Employee of GOJO Industries.

HEALTHCARE WORKER'S SAFETY & EDUCATIONS

P274

Optimising infection prevention and control practice using behavior change: a systematic review

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Introduction / objectives: Despite significant investment in infection prevention and control (IPC), there has been little consideration of the effectiveness of behaviour change interventions or the application of behavioural theory (BT) or social marketing (SM) to influence healthcare workers' (HCWs) behaviour and to reduce healthcare associated infection.

Methods: This review used a systematic process to assess the effectiveness of intervention studies focused on behaviour change within IPC and the extent to which BT or SM has been applied. Exploratory studies that seek to understand influences on HCWs behaviour in IPC were reviewed. We searched MEDLINE, EMBASE, ASSIA, Business Source Complete, The Cochrane Library, PsycINFO, DARE and HMCIC for studies performed between 1999-2009.

Results: Twenty studies met the quality criteria. Few behaviour change interventions of sufficient methodological quality or adequate evaluation design were identified. Of the seven included intervention studies, few explicitly considered BT, used SM or addressed sustainability. Exploratory studies highlighted some key social and cultural determinants of HCW behaviour in IPC.

Conclusion: The quality of interventions aimed at changing the IPC behaviours of HCWs is poor and there has been limited application of BT or SM in methodologically robust study designs. We recommend that quality criteria be established and added to existing guidelines to ensure robust design, implementation and reporting of behaviour change interventions in IPC.

Disclosure of interest: None declared.

P275

Improvement of infection control services in Jeddah hospitals by program standardization and continuous auditing

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Introduction / objectives: A proper infection control program in the Ministry of Health's hospitals-Jeddah, Saudi Arabia has never been applied based on focused and aimed scientific plans. The objective of this study was to monitor the enforcement of a scientifically based infection prevention and control program via continuous auditing.

Methods: A standardization and continuous auditing program was implemented in the year 2009 in twelve hospitals. Three auditing visits were conducted throughout this year to estimate hospital-wide compliance of the required procedures and strategies using auditing sheets based on that year's target aims.

Results: The first compliance rate for the first visit in the first year was 42% which increased to 66% during the second visit and to 78% during the third visit. During the first audit there were deficiencies in: general

measures in infection control (43%), surveillance (31%), monitoring of infection control guidelines (81%), isolation practice (64%), infection control committee performance (66%) and education (46%). These deficiencies improved during the second audit as follows: (37%), (24%), (39%), (21%), (49%) and (25%) respectfully. During the third audit, deficiencies were as follows: (32%), (22%), (22%), (14%), (34%) and (9%) respectfully.

Conclusion: A standardized infection control program for ongoing monitoring led to a significant improvement in infection control practices in all twelve hospitals in Jeddah. Consequently, these results might suggest that such a program can be applied to other Ministry of Health hospitals in the Kingdom.

Disclosure of interest: None declared.

P276

No more Mr Nice Guy – implementation of mandatory seasonal influenza immunization for all personnel

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Introduction / objectives: In the US, immunization for many vaccine preventable illnesses are mandated as a condition of employment, but Influenza (flu) has not been mandatory. Despite 1986 Center for Disease Control recommendations that healthcare workers be vaccinated annually for flu, the US national average is 61.9%. Patient & employee safety / preventing nosocomial infections are central to quality care. So, we sought to achieve universal flu immunization for all personnel.

Methods: With firm commitment of leadership, seasonal flu immunization was mandated as condition of employment. A multidisciplinary task force guided interventions/policy changes. We launched an internal media blitz. Paper & electronic tracking systems measured compliance. We developed a formal exemption process. Nursing administration & pharmacy coordinated vaccination.

Results: Pre-mandatory immunization, our baseline 3-year flu vaccination rate was 65% (range 62-72%). In the 2 years since mandatory flu immunization was instituted we achieved a > 99% immunization rate. In 2009, 7795/7854 (99.2%) personnel received vaccine, 52 (0.7%) were exempted for religious/medical reasons, and 9 employees (0.1%) refused vaccination, choosing to terminate employment. In 2010, 8030/8091 (99.2%) were vaccinated, 60 (0.7%) were exempted, and 1 person (0.01%) chose to terminate employment.

Conclusion: 100% participation in flu immunization in the healthcare setting is possible and near universal flu immunization is achievable and sustainable. It is doubtful that these levels of immunization would be achievable if not as a condition of employment. We believe that patient/employee safety have been enhanced, and quality of care is improved.

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P277

Prevaccination screening of health care workers for immunity to measles, rubella, mumps and varicella in a developing country. What do we save?

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Introduction / objectives: Immunity to measles, rubella, mumps, and varicella (MMRV) is an important part of infection control among healthcare-workers (HCWs). To evaluate the cost effectiveness of prevaccination screening of HCWs against MMRV.

Methods: A structured survey form, including data of age, gender, job category, length of employment, history of MMRV infections and status of MMRV vaccinations, was applied to HCWs. Serologic screening for MMRV

was performed on HCWs using enzyme-linked immunosorbent assay (EIA). The cost of each test for MMR was €2.5 and €5 for varicella. In a cost-effectiveness analysis, MMR[®] (supplied by Ministry of Health from Serum Institute of India for €2.5) and Varilrix[®] (GlaxoSmithKline-cheapest vaccination in the marketplace-€25) vaccines were used.

Results: One thousand and two hundred fifty-five HCWs were tested. Of these, 798 (64%) were female and the age ranged from 19 to 60 years (median 30). The median length of employment was 5 (=1-47 years). Of the employees examined, 94% were immune to measles, 97% to rubella, 90% to mumps, 98% to varicella. The cost for screening and then vaccination was €9942.5 for MMR and €6815 for varicella. The cost for vaccination without screening was €2422.5 for MMR and €15900 for varicella. The cost of vaccination without screening was significantly expensive (cost difference: €9085) for varicella, however cheap for MMR (cost difference: €7520).

Conclusion: For the immunization against MMRV in HCWs, immunity rate, screening and vaccine cost and side effects should be considered in developing countries. Cheaper vaccines may be cost effective for vaccination without screening, however prescreening may be rule out side effects.

Disclosure of interest: None declared.

P278

Seven year experience with a mandatory training course within the Vigigerm[®] infection control program

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BMC Proceedings 2011, 5(Suppl 6):P278

Introduction / objectives: VigiGerm[®] is an infection control program built on social marketing principles at the University of Geneva Hospital (HUG). The 2-hour training course was introduced in 2003 and has been mandatory for all healthcare workers (HCWs) since.

Methods: All participants completed a 23-item questionnaire assessing their attitudes (A) towards and knowledge (K) of infection control at the onset and end of the course, and a course evaluation. We performed a descriptive analysis of all questionnaires from 2003 to 2010. Likert scales (1-7) were transformed to binomial values (1-5=0; >6=1).

Results: Of 10373 participants, complete responses were obtained from 9455 (91.4%): 42% nurses, 20% physicians, 26% nursing assistants, and 12% other professional categories. The proportion of participants providing correct responses to questions on hand hygiene, glove use, and mask use increased after the course from 86-97%, 69-93%, and 58-77%, respectively (all p<.001). Perceived high institutional safety culture (SC) and HCW accountability for infectious outcomes (ACC) changed from 20-57% and 55-87% respectively. Furthermore, there was a shift in baseline (pre-course) SC and ACC responses over time (2003-10) from 16 to 35% and from 50 to 72%, respectively (all P<.001). Clinical scenarios testing knowledge of isolation precautions (IP) increased from 0.5 to 10.4% (aggregate of 4 correct responses; p<.001). Course evaluation averaged at 6 of 7 points.

Conclusion: The course is highly appreciated by HCW and influences attitude and knowledge positively. Identification of correct IP remains challenging for HCWs. Interestingly, there was a spontaneous evolution in perception of safety culture and HCW accountability over the 7 years.

Disclosure of interest: None declared.

P279

Student nurses perceptions on hand hygiene: analysis of behavioral and environmental determinants

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Introduction / objectives: Hand hygiene compliance is poor among nurses. Hand hygiene compliance is influenced by education. Student nurses' compliance in clinical practice and perceptions towards hand hygiene have seldom been described.

Methods: We developed a questionnaire containing demographic data items (i.e. gender and year of education) and items to measure self-reported compliance (10 items, based on the latest WHO recommendations), attitude towards hand hygiene (7 items), perceived social influence (7 items) and observed environmental conditions during clinical practice (5 items).

Results: The questionnaire was filled out by 181 student nurses of the Faculty of Health Care Vesalius, University College Ghent. Students reported a compliance of 50% or below in the following situations: 'before and after direct patient contact' (28%), 'after glove removal' (29%), 'after touching patient surroundings' (65%). Students reported a positive attitude which remained at the same level during the three years. Social influence increased although not significantly (Kruskal-Wallis $P=0.388$). The presence of an observer or mentor during clinical practice was reported to increase social pressure. In general, students were satisfied with the environmental conditions (97%) and with the amount of attention the wards spent on hand hygiene (86%). However, students reported insufficient disinfectant on the carts (21%) and in the patient's rooms (31%).

Conclusion: Undergraduate student nurses reported poor hand hygiene compliance in several specific situations. The students' attitude towards hand hygiene was positive. Being observed during clinical practice increases social pressure. Some shortcomings in relation to the ward environment were identified.

Disclosure of interest: None declared.

P280

Field evaluation (FE) of the World Health Organization (WHO) interim guidelines (IG) on infection prevention and control (IPC) of epidemic and pandemic-prone acute respiratory diseases (ARD) in health care

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BMC Proceedings 2011, 5(Suppl 6):P280

Introduction / objectives: A FE was designed with the objective of assessing the feasibility and applicability of the IG and the use of implementation tools in healthcare facilities (HCFs) over an initial period of 6-9 months and to apply lessons learnt to improve further versions of the IG.

Methods: Definitions for feasibility and applicability were based on the AGREE instrument. The FE design was a parallel, two-arm before-after descriptive study in 2 convenience samples, Principal sites, invited by the 6 WHO Regional Offices and voluntary Complementary sites of selected HCFs, conducted over 4 phases. A suite of tools to assist implementation, assessment, training, education and feedback were provided. Returned feedback forms were entered into Excel (Microsoft Corporation 2003) and descriptive epidemiologic analyses were conducted.

Results: A total of 13 sites from 7 countries (4 WHO Regions) participated. The results suggested that the sites were well prepared with respect to having IPC protocols for ARDs (100%) and 92.3% sites had policies or IPC guidelines for HCF epidemic/pandemic planning available at the local and/or national level. For the surveyed HCFs, the follow-up FE revealed an overall increase ($p=0.01$) to 86.8% vs the pre-survey results of 71.9%, with 10/15 recommendations implemented 2° to the IG ($p=NS$). For the surveyed ICPs, the follow-up FE revealed an overall increase ($p<0.0001$) to 85.9% of 72.2%, with 12/32 implemented 2° to the IG ($p=NS$).

Conclusion: Although the implemented changes were not significantly attributed to be as a direct result of the IG, there was an overall significant uptake of the IG recommendations and it remains possible that the changes noted were indirectly influenced by IG.

Disclosure of interest: None declared.

P281

Appraisal of World Health Organization (WHO) infection prevention and control guidelines

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BMC Proceedings 2011, 5(Suppl 6):P281

Introduction / objectives: Several WHO guidelines related to infection prevention and control (IPC) of infections associated with health care

have been issued over the past decades. A review of all available WHO IPC-related guidelines was conducted.

Methods: All WHO IPC-related guidelines accessible through WHO website published until December 2009 were appraised, and the technical content of each document was appraised against current policies and standards promoted by WHO. **Definitions:** "active WHO document" is considered to be an official WHO document available on the WHO web site; classification of guidelines regarding alignment with current recommendations: (1) "valid", (2) "out of date".

Results: 87 IPC documents were evaluated, 12 non-relevant to IPC were excluded, and 31 guidelines produced by 11 Departments were identified and appraised. 13/31 (42%) guidelines were considered 'out of date' regarding Standard Precautions (8 documents), disinfection (6 documents), sterilization of medical equipment (6 documents), and preparedness for epidemics (3 documents). Outdated messages included ineffective and unsafe practices (e.g., disinfection of disposable sharps, fumigation of the environment with formaldehyde, use of personal protective equipment). Most 'out of date' guidelines (10/13) were issued before 2001 as compared to 'valid' ones (1/18) ($P=0.0001$).

Conclusion: The search targeted documents that are specific or closely related to the IPC field, but due to the cross-cutting nature of IPC this inventory may not include all WHO documents including IPC recommendations. The IPC field has rapidly evolved and the audience should look for most recent and evidence-based documents to guide practices.

Disclosure of interest: None declared.

P282

An education program for infection link staff in three Danish hospitals

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BMC Proceedings 2011, 5(Suppl 6):P282

Introduction / objectives: Prevention and control of Healthcare Associated Infections is a priority in the "Danish Quality Model for Public Health", and is part of the accreditation requirements from the Joint Commission International. In order to reduce the number of hospital acquired infections we trained 100 persons from all departments of the three local hospitals as Infection Link Staff.

Methods: - Use of an education program that is elementary and targeted to the every day running of each department

- Training of at least one person from all the clinical departments

- Holding a training seminar in infection prevention for all Infection Link Staff on three non-consecutive days with an observation study phase between day 2 and 3

Results: Infection prevention has been brought emphatically into focus. Department leadership and staff are satisfied and hygienic behavior is improving. It still is too early to observe the hoped for reduction of hospital acquired infections.

Conclusion: The education program needs to be basic and target the every day running of each department and the training of at least one person in all the clinical departments is important so that infection prevention measures can be assured on a daily basis. It is imperative that Infection Link Staff have the full support of Departmental leadership and it requires a sustained effort from the Hygiene Unit to maintain the standard of the Infection Link Staff, as this can easily become victim to sick leaves, overwork, etc.

Continuous education of the Infection Link Staff in the form of networking, receipt of information, participation in seminars, etc. is a must and spread of the concept of Infection Link Staff education to other hospitals is desirable as it appears to be a good way of implementing infection control.

Disclosure of interest: None declared.

P283

Programme stoprisk: all about standard precautions

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BMC Proceedings 2011, 5(Suppl 6):P283

Introduction / objectives: CCLIN Sud-Est offers a programme of innovative actions supporting the implementation of standard precautions: StopRisk is a quality and security improvement initiative for healthcare establishments. The programme started in 2009 and will

continue until 2012. It answers two priority themes defined by the national programme of nosocomial infection prevention 2009/2013:

- promotion of a shared culture of quality and safety raising awareness and training of professionals.

- detection and pre-emption of emerging pathogenic agents by reinforcing prevention of cross transmission, in particular observance of standard precautions.

Methods: To encourage training of personnel, communication aides and teaching tools are made available to healthcare establishments, training bodies and homes for the elderly. Three specific pages are thus freely accessible on the web. All aides are presented there, are regularly updated and may be downloaded.

The evaluation tool : self-evaluation audit was chosen to become a national audit in 2011.

Registered establishments benefit from the mailing of posters, leaflets and pamphlets. Completing a follow-up questionnaire allows these establishments to validate their participation.

Results: User satisfaction was as much as 4.2/5 for communication aides and 4.1/5 for teaching tools. Almost 8,000 professionals and more than 1,000 users took part, with an impact factor for the professionals of up to 3.7/5. 218 establishments have until now followed the programme, of which 98 have a validated participation.

Conclusion: Standard precautions constitute the bedrock of risk reduction policy for personnel and patients. Training and awareness are considered as must-haves to support their observance. The StopRisk programme definitely helps healthcare establishments go this way.

Disclosure of interest: None declared.

P284

Bi-regional training course for staff managing healthcare-associated infection (HAI) with minimal resources

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BMC Proceedings 2011, 5(Suppl 6):P284

Introduction / objectives: To prevent and control Healthcare-Associated Infection (HAI), it is necessary to have adequately trained staff and substantial financial resources. The aim of this training was to train personnel at various levels in the healthcare system in multifaceted infection control practices specifically for situations where resources are limited.

Methods: The training programme consisted of lectures, interactive group work using the PRR (Prevention, Preparedness, Response and Recovery) model on infectious diseases, a skills test on Personal Protective Equipment (PPE), and a written test. Each participant was required to complete the assessment checklist and an action plan for developing effective infection control in their countries.

Results: 69 health care professionals from 16 countries were trained. In their home countries, 37 (53.6%) worked in hospitals; 31 (44.5%) worked in Ministry of Health agencies, and 6 (8.7%) were on teaching faculties of universities. The highest score on the written test was 46 out of 50 and the lowest score was 27 out of 50. All the participants could answer two questions correctly about urinary catheter. Participants strongly agreed that the course was relevant; they were satisfied with the training method.

Conclusion: We will further consolidate the training material into a toolkit and establish a network with our course participants in order to support and facilitate their work in their home countries. Infection Control Elluminate is held every two weeks to share and review their work.

Disclosure of interest: None declared.

P285

Microbial resistance or team resistance?

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BMC Proceedings 2011, 5(Suppl 6):P285

Introduction / objectives: Errors in the process of drug therapy has been an issue for the change in the epidemiological profile of microorganisms, causing

antibiotic resistance. Whereas full-time care of the nursing staff in patient care, was aimed to analyze the errors which undoubtedly may be preventable with measures of interventions and reflect on nursing performance.

Methods: The study is an integrative review in which 13 were selected articles concerning this topic through the electronic databases SciELO, MEDLINE and LILACS.

Results: Studies show that bacterial resistance is increasing in parallel with antibiotic use, it is estimated by the World Health Organization (WHO) that 25 to 33% of patients use antimicrobial drugs during their hospitalization. Although the choice of antibiotic is a doctor's concern, the administration of drugs is carried out by nursing staff who are nursing assistants and technicians being supervised by nurses.

Conclusion: The process is simple but common errors found in the studies were: patient error, error in dosage, route error, unauthorized drug error and error of time being the most prevalent. The misuse of such substances affect the microbial ecology, diminishes the possibilities for therapeutic treatment of infectious processes, generate long hospitalizations and expenditures. The quality of nursing practice is impaired by long working hours, shifts, reduced staff, many functions and services, yet the nurses must strive and offer safe practice. The knowledge of the drug and its use in surveillance, recognition of error, and improvement courses are essential to prevent medication errors and therefore minimize microbial resistance. There is a paradigm extensive to be addressed since most errors are preventable.

Disclosure of interest: None declared.

P286

Clinical education in reducing contamination rate in blood culture collection

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BMC Proceedings 2011, 5(Suppl 6):P286

Introduction / objectives: At the Institute, blood cultures are drawn by doctors. Since 2009, more than 5% of blood cultures grew organisms as contaminant and was a concern to the Infection Control Committee. Our target is to reduce to 3% to meet the standard set by the American Society of Microbiology. The objectives of the clinical education are to enforce best practices in blood culture collection and to use 2% chlorhexidine as a skin decontaminant.

Methods: Our data revealed the highest contamination rates were from the pediatric wards. In August 2010, an education campaign was conducted on blood culture sampling techniques. We collaborated with the pediatricians and observed current practices. A hospital-wide Continuous Medical Education, "Towards Best Practices in Blood Culture" was conducted in October. The working group developed a training tool with visual protocol placed on blood collection trolleys.

Results: We found adherence to proper technique of blood sampling and skin decontamination were not always followed. The collection of blood cultures were through indwelling catheters, as well as inadequate volume of blood collected and contact time of antiseptic were not observed. The clinical education on these challenges brought the rate down from 7% in August to less than 3% after the education. The rate is less than 3% from October 2010 to March 2011.

Conclusion: Clinical education of doctors play pivotal role in reducing contamination rate. It is imperative doctors are aware of proper cleansing of the site and adherence to the recommended techniques. The infection control team and the microbiology laboratory continue to monitor the contamination rate, conduct ward observations on collection procedures and feedback to sustain this initiative.

Disclosure of interest: None declared.

P287

Risks of accidents at work in health professionals

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BMC Proceedings 2011, 5(Suppl 6):P287

Introduction / objectives: Work accidents are events that occur in the environment of workers according to their activities. The work is an

important human activity which brings a gain both professional and personal, but submitting fails as well. This study aims to analyze the main occupational risks that health professionals are subjected in their work activities, and reflect measures that can prevent these accidents at work.

Methods: A method integrative review of the literature through the selection of articles in databases such as Medline, CINAHL and Lilacs, using as key words "accident", "work" and "health", totaling 12 publications in the last ten years.

Results: The result was obtained several aspects related to workplace accidents, among them: there are general estimates that each year approximately two million women and men die as a result of occupational accidents and work-related diseases. Health professionals are exposed to a number of risks, such as chemical, physical, biological, psychosocial, ergonomic, mechanical and actual accidents. According to the scholars of the topic in question biohazards are the main generators of health and risk premiums for these workers, because once in contact with bodily fluids from customers such as blood, there may be transmission of pathogenic microorganisms, and the virus HIV, hepatitis B and C, the main of them.

Conclusion: It is important then, to emphasize that preventive measures should be adopted in preventing contamination through accidents, such as vaccination, use of personal protective equipment (PPE), tools for professionals and compliance with standard precautions. It is therefore crucial health professionals pay attention to as possible causes of accidents in their workplaces and, through simple measures such as use of PPE can significantly reduce these risks.

Disclosure of interest: None declared.

P288

Occupational accidents among the nurses

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BMC Proceedings 2011, 5(Suppl 6):P288

Introduction / objectives: This is a cross sectional study designed to define factors which affect the frequency, distribution, types and notification of occupational accidents in the nurses working in Gulhane Military Medical Academy.

Methods: In this study, 504 of 570 nurses were reached. All of these nurses were applied a questionnaire related with occupational accidents. An observational study was made for occupational accidents, which they experienced 2009, were performed. The accidents were detected either by using a notification form or by periodical observations during the period. Arithmetic mean and frequency analyses were used for analyzing the data and chi-square test was applied for comparison of the groups. In the analysis $\alpha=0,005$ value was chosen as error margins.

Results: According to results of study; 43.1% of the nurses declared they experienced an occupational accident in the last year, 53% declared individual protective equipment was partially supplied. The 50% of the participants stated only a moderate level of safety precautions was provided due to their occupational risks. In a three-month period, frequency rate of occupational accidents was 8.1 %, and density rate was 24/1000 per 100 hours. Sharp injury accident was the first with 70.7%. The most frequent exposure type was the needle-stick injury of hand fingers. Regarding the accident as unimportant was the main reason for ignoring declaration. No attempt for medical advice was made for thirty (73.1%) accidents. The risk for occupational accidents was increased with the overtime working ($p=0.039$). The nurses experiencing occupational accidents realize the preventive measures for occupational risks to be at moderate level ($p=0.011$).

Conclusion: In conclusion, the educational level of the nurses for occupational health and safety are not adequate. Occupational health and safety should be under the supervision of a board, which must include must include experts.

Disclosure of interest: A. Özarslan Other MSN.

P289

Q-fever and delivery: a risky business?

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Introduction / objectives: Since 2007, the Netherlands is facing a large ongoing Q-fever outbreak with > 4000 cases of acute Q-fever reported. Q-fever is a zoonotic disease with (almost) only animal-to-human transmission. Pregnant women with Q-fever develop placentitis with highly infectious birth-products which may result in human-to-human transmission during delivery. In the absence of guidelines, a Q-fever protocol was developed and prospectively evaluated.

Methods: All pregnant women with Q-fever were included. All were treated with antibiotics. During delivery strict isolation measures were taken. After delivery the room was cleaned, ventilated and strict isolation ended. A combination of contact- and droplet-isolation during personal hygiene of the mother was continued as lochia may still be infectious.

Results: In total 11 women were identified. All gave birth to healthy babies. Q-fever PCR on birth-products and umbilical blood were negative except for one case who received inadequate antimicrobial treatment. All babies had maternal antibodies which disappeared over time. Breast milk was found PCR negative; therefore breastfeeding was allowed. No human-to-human transmission (no clinical cases of Q-fever) occurred during these deliveries.

Conclusion: While the combination of antibiotic treatment and strict isolation measures during delivery was effective in preventing human-to-human transmission in our cohort, the psychological burden of the measures for the patients and their family was extremely high. Effective antibiotic treatment seems to eliminate the bacterial load of human birth products, but isolation measures should be continued until our findings are confirmed in a higher number of cases.

Disclosure of interest: None declared.

P290

Elderly condom use and perception: a barrier to family planning and mitigation of HIV/AIDS in high risk urban slums in Nigeria

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BMC Proceedings 2011, 5(Suppl 6):P290

Introduction / objectives: As HIV/AIDS continues to pose a public health challenge Africa, the pandemic cuts across borders. It affects all the age groups including the geriatrics, despite engagement in risky sexual activities which increases HIV/AIDS infection. However, limited attention is paid to this population in mitigating the pandemic. This study therefore examined condom-use and perceived HIV/AIDS infection among geriatrics in Nigeria.

Methods: The study was cross-sectional in design. A multi-stage sampling procedure was used to select 400-geriatrics. Pre-tested questionnaire developed, using information obtained from 10 Focus Group Discussion (FGD), was used to collect information. FGD data were analyzed thematically, while questionnaire data were analyzed using descriptive and statistically.

Results: Twenty-five percent of the participants had extra-marital sex since they attained elderly age. However, among this subgroup that had extra-marital sex, few (6.8%) used a condom. More males (5.3%) than females (1.5%) used condom during the last extramarital sex. Low level of condom-use was attributed to condom not worthwhile (34.5%) and opinion (50.0%) condom not made for the elderly. Moreover, FGD participants viewed sex could not lead to pregnancy and majority (60.3%) posited patronizing traditional healers and few (10.3%) use of herbs/ concoction could prevent HIV/AIDS. Similarly, non-condom use was due to confidence in traditional herbs, perceived to protect against STIs including HIV/AIDS.

Conclusion: Engagement in risky activities among elderly is a growing HIV/AIDS challenge. Condom-use is misconstrued probably due to knowledge gap. Without urgent measures to enable them protect themselves, development efforts will be in jeopardy. Investing in geriatric SRH is cost-effective intervention in mitigating HIV/AIDS pandemic.

Disclosure of interest: None declared.

SLIDE SESSION: MULTI-DRUG RESISTANT GRAM-NEGATIVES II

P291

Acinetobacter Baumannii isolates: epidemiology, antibiogram and nosocomial status studied over a 25 month period in a tertiary care hospital in India

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BMC Proceedings 2011, **5(Suppl 6)**:P291

Introduction / objectives: The emergence of *Acinetobacter baumannii* as an epidemiologically significant nosocomial agent based on its epidemiology, antibiogram patterns and clinical correlation was explored in a 25 month study at a tertiary care hospital in India.

Methods: The *Acinetobacter baumannii* isolates over a twenty-five month period (Dec'08-Dec'10) were studied retrospectively for their antibiotic patterns, pathogenic status and epidemiology with special reference to nosocomial acquisition.

Setting: Superspeciality Tertiary care Indian hospital.

Results: *A. baumannii* were isolated in 354 samples out of 3036 gram negative isolates (11.6% prevalence) from the entire hospital in the 25 month period. Maximum isolates were from respiratory secretions (59.8%) followed by blood (18.6%). Prevalence of *A. baumannii* rose to 29.5% (269 out of 909 gram negatives isolates) in ICU. The nosocomial status of *A. baumannii* was revealed in its contribution to 39.3% VAP, 38.7% CA-BSI, 12.6% SSI and 16.9% CA-UTI. Overall resistance of *A. baumannii* for carbapenems was 89% from all hospital isolates. ICU isolates showed higher resistance (92.9%) as compared to IPD (83.8%) and OPD (47.0%).

Conclusion: *A. baumannii* is mainly an ICU bug, showing 75.9% prevalence (269 isolates out of 354). Overuse of carbapenems in the ICU setting probably led to selection pressure and high level resistance of *Acinetobacter* to them. Hence implementation of antibiotic policy for judicious use of antibiotics should be stressed on. Also, one must prevent the nosocomial spread of *Acinetobacter* by appropriate infection control measures.

Disclosure of interest: None declared.

P292

Increasing trends of Acinetobacter Baumannii infections in Emilia-Romagna, Italy

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BMC Proceedings 2011, **5(Suppl 6)**:P292

Introduction / objectives: Estimation of occurrence of *Acinetobacter baumannii* isolates from the antimicrobial surveillance system of Emilia-Romagna, Italy, 2005-2009.

Methods: Data were collected through the laboratory based regional surveillance system. All isolates of *A. baumannii* isolates from blood, urine and respiratory samples were included in the analysis. Duplicates from the same patient/sample source within a 28 days period were excluded.

Results: Rates of *A. baumannii* bacteraemia significantly increased between 2005 and 2009, from 0.1 to 3.2 cases/100,000 inhabitants per year. The observed increase was due to carbapenem-resistant isolates, while the number of carbapenem-susceptible isolates remained substantially stable over the study period. Importantly, the occurrence of carbapenem-resistant isolates showed a steep five-fold increase between 2008 and 2009. These isolates belonged to an epidemic strain detected in several departments of 4 hospital trusts in the Region. Similar trends were observed for urine and respiratory isolates. The total number of isolates in blood, urine and respiratory specimens, including both colonizing and infecting strains, increased from 51 in 2005 to 826 in 2009, with rates rising from 1.5 to 19.0 isolates/100,000 inhabitants per year.

Conclusion: The temporal trends of *A. baumannii* infections are driven by carbapenem-resistant strains. A regional-wide outbreak of carbapenem-

resistant *A. baumannii* infections involving 4 hospital trust was observed in Emilia-Romagna in 2009.

Disclosure of interest: None declared.

P293

Distribution of carbapenem resistant Acinetobacter Baumannii and Pseudomonas aeruginosa and ESBL-producing organisms colonization among intensive care patients

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BMC Proceedings 2011, **5(Suppl 6)**:P293

Introduction / objectives: Infection with carbapenem resistant *A. baumannii* (CR-AB) and *P. aeruginosa* (CR-PS) as well as ESBL-producing organisms have caused high rate of mortality. This project was aimed to survey the prevalence of drug resistant organisms colonization in critical care patients as a part of infection control program.

Methods: Perianal swab, urine (from Foley's catheter) and endotracheal catheter (ET) were collected from patients who were admitted to intensive care units of a 1000-bed hospital. Isolation of CR-AB and CR-PS was using EMB agar containing 12 ug/ml of either imipenem or meropenem. The MacConkey agar containing 1 ug/ml of cefotaxime was used for screening of ESBL-producing organisms. The MIC of these organisms was performed using THANF customised panel (Sensititre, UK).

Results: A total of 81 isolates was detected from 39 patients. There were 53, 22 and 6 isolates of ESBL-producing organisms, CR-AB and CR-PS, respectively. Perianal was found to be the most common site for colonisation with ESBL-producing organisms (45/60 isolates) while 8 of 14 isolates from ET were CR-AB. All CR-AB isolates resisted to nearly all tested antibiotics. However, all isolates were susceptible to colistin and tigecycline with the MIC₉₀ at ≤ 1 and 1 ug/ml, respectively. In contrast, the ESBL-producing organisms remained susceptible to all tested carbapenems. Nevertheless, 68% of these isolates resisted to fluoroquinolones.

Conclusion: This project is a part of implementation of hospital-acquired infection control policy. The data demonstrated the existing of various multiple-drugs resistant organisms in critical care patients which would be a challenging task for infectious control.

Disclosure of interest: None declared.

P294

Abstract withdrawn

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P295

Epidemiology of the first outbreak of carbapenem-resistant Klebsiella pneumoniae in Saudi Arabia

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BMC Proceedings 2011, **5(Suppl 6)**:P295

Introduction / objectives: We describe our experience in detecting and containing the first documented CRKP outbreak in Saudi Arabia (SA).

Methods: A prospective investigation of all cases identified with carbapenem resistance during the outbreak period and six months prior.

Results: During March 2010, a cluster of 6 patients with CRKP was detected. Patients with CRKP were placed under strict contact isolation. Admission and periodic active surveillance cultures showed a downward trend of CRKP clinical cases over the following months to zeros in July and August. All patients had prolonged hospital stay before CRKP detection and the majority had recent history of carbapenem use (75%),

colonization/infection with other MDROs (75%), surgical procedures (80%), indwelling devices (83%), and mechanical ventilation (75%). About 33% of patients with CRKP had clinical infection and 58% died during the current hospitalization. PFGE results identified a dominant clone during the outbreak, Figure 1.

Conclusion: Infection control practices are not enough to eliminate the emergence of resistant pathogens. More active interventional methods including an antimicrobial stewardship program would be essential to combat the emergence of multidrug resistant organisms.

Disclosure of interest: None declared.

P296

Molecular epidemiology of KPC-producing *Klebsiella pneumoniae* clinical isolates in hospitals in North-Western Tuscany

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BMC Proceedings 2011, 5(Suppl 6):P296

Introduction / objectives: The emergence and spread of carbapenem-resistant *Enterobacteriaceae* represents a major clinical and public health challenge, especially concerning those organisms that produce *Klebsiella pneumoniae* carbapenemase (KPC)-type b-lactamase. In this study, we examined the molecular epidemiology of KPC-producing *Klebsiella pneumoniae* strains, isolated during sporadic or epidemic cases in different hospitals of North-Western Tuscany (NWT).

Methods: Starting from April 2010, an outbreak of clinical infection caused by multiresistant *Klebsiella pneumoniae*, occurred in the University Hospital of Pisa and in other hospitals from the surrounding area; during this period we isolated 57 *Klebsiella pneumoniae* strains in our hospital and 23 from other health-care facilities; all strains, isolated mostly from different patients hospitalized over protracted periods of time, showed reduced susceptibility to carbapenems and were assayed for KPC detection.

Results: 60 out of 61 tested strains produced KPC type 2; molecular typing results indicated the spread of a prevalent clone during the outbreak in Pisa. The PFGE method allowed to identify 7 variants clonally related (pt A1-A7), sharing the same MLST sequence type (ST 258).

Conclusion: Molecular characterization confirmed the higher discriminatory power of PFGE compared to MLST and it may be useful in local and short-time outbreaks; however MLST, providing unequivocal and comparable data, remains the gold standard for molecular typing.

Disclosure of interest: None declared.

P297

Burden of multidrug-resistant organisms in Hungary

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BMC Proceedings 2011, 5(Suppl 6):P297

Introduction / objectives: Infections caused by multidrug-resistant organisms (MDROs) increase morbidity, mortality, lengths of hospital stay and health care costs, therefore surveillance and infection prevention and control measures are crucial.

Methods: The National Bacteriological Surveillance System (NBS) in Hungary was established with the aims to monitor resistance rates and trends of the most important pathogens in invasive isolates, in all inpatient and in outpatient isolates. The database of NBS includes more than 65% of all positive results of clinical bacteriological samples published by Hungarian laboratories. We monitored resistance rate trends for most frequent nosocomial pathogens between 2003 and 2010.

Results: The most prevalent MDROs in Hungary proved to be Methicillin-resistant *Staphylococcus aureus* (MRSA), 3rd generation cephalosporin resistant *Klebsiella pneumoniae* (CR-KP) and 3rd generation cephalosporin resistant *Escherichia coli* (CR-EC). The rate of MRSA in invasive isolates

increased from 15% in 2003 to 26% in 2010. CR-KP rate in invasive isolates was 10% in 2003 and increased to 49% in 2010, while CR-EC in invasive isolates increased from 1% in 2003 to 21,5% in 2010. A similar steep increase in resistance rates has been observed in all inpatient and outpatient isolates for all the three pathogens.

Conclusion: During the last several years, the prevalence of MDROs in Hungarian hospitals has increased steadily. As hand hygiene is the most simple, efficient and cost-effective measure to prevent healthcare associated infections, we launched our National Hand Hygiene Campaign in March 2011. The aims of our campaign are to promote and improve hand hygiene in Hungarian hospitals and hereby to reduce hospital infections and MDROs in Hungary.

Disclosure of interest: None declared.

P298

Reporting of a surveillance system of multidrug-resistant organisms in an Italian hospital

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Introduction / objectives: Healthcare facilities are monitoring Multidrug-Resistant Organisms (MDROs) because of their increasing incidence. A surveillance system for MDROs isolated from routine clinical cultures was set up in a teaching hospital in Central Italy.

Methods: Since January 2009, daily, Hospital Hygiene Service personnel collects MDROs microbiological data. Data are automatically entered in a software, continuously updated. Only the first MDRO isolate recovered from a patient is considered. The monthly report includes: newly recovered MDRO isolates; incidence rate of MDRO infection/colonization (No. of first MDRO isolates per patient for each unit/1000 patient days); statistical process control charts.

Results: From 01/01/2009 to 31/12/2010, 1160 MDROs were isolated; the most represented MDRO was ESB *E.coli* (n=216; 18.6%) followed by MRSA (n=178; 15.3%) and *A.baumannii* (n=158; 13.6%). 26% (n=302) of the MDROs isolated came from Intensive Care Units (ICUs). The mean MDROs incidence rate was 1.96 and 10.68/1000 patient days when considering the whole hospital and the ICUs, respectively. Analyzing the rates over time, an extremely fluctuating trend was observed: the ICUs MDROs rate varied from a minimum of 4.73 to a maximum of 20.88. No outbreaks were documented and the warning and control limits were never been exceeded. Among the possible factors contributing to this phenomenon, the sampling rate (No. of all samples sent to the microbiology laboratory/patient days) was analyzed, but no significant changes over time were found.

Conclusion: Our data highlighted the changeable trend of MDROs rates; a more accurate study is ongoing to assess what kind of variables can influence the spread of MDROs (staff? mini-clusters?) in order to provide the best preventive strategies.

Disclosure of interest: None declared.

P299

Serratia Marcescens outbreak on a general pediatric ward in Benin

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Introduction: The consequences of infections with *Serratia marcescens* can be severe, so strategies for prevention are important.

Objective: Our study aimed to examine the resistance in this bacterium and the main factors increasing the risk of cross contamination.

Methods: 6-months surveillance was conducted in the pediatric unit in Benin, from June 15th to December 15th, 2009. We examined

various specimen obtained from hospitalized children and 940 samples taken from hands of medical personnel, and various hospital surfaces for *Serratia marcescens* presence. Susceptibilities against antimicrobial agents were tested by the disk diffusion method according to NCCLS guidelines. Aggressive infection control measures were instituted.

Results: 324/790 (41%) patients were studied; 123 (39%) were infected by *Serratia marcescens*, including septicemia 65 (52.8%). 121 children were colonized 1 month later after admission. From hospital environment, 108/940 (11.50%) isolates were obtained. Antimicrobial susceptibility testing revealed 56% strains displaying multiresistance. Comparison of resistance patterns in isolates blood cultures with those from hands of personnel showed similitude in 92% of cases. Infected patients were cohorted and placed on contact precautions. Investigation by the infection control team revealed that the distributors of antiseptic were the main path of *Serratia marcescens* dissemination.

Conclusion: New infection control policies and engineering plans were initiated on the basis of our results. Antimicrobial resistance is particularly harmful to infectious disease management in low-income countries since expensive second-line drugs are not readily available.

Disclosure of interest: None declared.

Note: Also presented as P349.

P300

Is multi-drugs resistant *Acinetobacter baumannii* epidemic spread related to reduced susceptibility to biocides?

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Introduction / objectives: Aim of this study was to assess the role of active extrusion in mediating decreased susceptibility to biocides in the persistence and spread of multi-drugs resistant of *A. baumannii* strains isolated in intensive care units of a tertiary-care teaching hospital.

Methods: 67 clinical and 24 environmental strains isolated from 2007 to 2010 were genotyped by PFGE, MLST and REP-PCR. Multiplex PCRs were performed for identification of the *ompA*, *csuE* and *bla*_{OXA-51like} sequence type groups. The antimicrobial susceptibility was determined and the presence of carbapenemase-encoding genes was analysed by characterization of the *bla*_{OXA} genes. Chlorine susceptibility was analysed according to BS EN 1040:1997

Results: The cross-analysis of genotyping methods allowed to group strains into 4 clones, only the clone A belonging to the Group 1 corresponding to European II clonal complex and the clone B belonging to Group 2 clonal complex European I. Since 2008, a new variant of clone A has emerged as the predominant clinical and environmental strain, resulting positive for the presence of the carbapenemase OXA-58 plasmid-mediated and showing reduced chlorine susceptibility *in vitro*

Conclusion: Multi-antibiotic resistance may not be the only strategy applied by *A. baumannii* to spread and persist in healthcare setting, but also the increased resistance to biocides

Disclosure of interest: None declared.

P301

Indian superbug: analysis of laypress reports

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BMC Proceedings 2011, 5(Suppl 6):P301

Introduction / objectives: Following the publication on New Delhi Metallo β Lactamase (NDM) in Lancet, Indian lay press highlighted various issues related to it, during Aug-2010. The present report aim to provide the information disseminated in the press.

Methods: Lay press materials related to Indian superbug and NDM published in 2 leading newspapers were collected daily. Consensus of 3 of the 5 was considered for categorisation. Simple descriptive statistics was used for analysis.

Results: In the Newspaper The Hindu and New Indian Express, 19 and 10 items were disseminated respectively. The matters were educative remarks of professionals, community response, political interactions, pharmaceutical comments, statements of policy makers and economical aspects including Medical Tourism.

Conclusion: The lay press reports brought out the existing suboptimal status of infection control policy, misuse of antimicrobials in India and the need for surveillances. Despite extensive press reports, practitioners & prescribers were neither bothered nor did changed their attitude.

Disclosure of interest: None declared.

CLEAN AND STERILIZED: ENVIRONMENTAL CONTROL & STERILIZATIONS

P302

New approaches to enhance environmental cleaning in an acute tertiary hospital

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Introduction / objectives: Environmental contamination with nosocomial pathogens on the near-patient surfaces and equipment has been associated with its indirect transmission. Thorough, regularly scheduled cleaning and disinfection of the environment is essential to break this transmission. Environmental hygiene is a priority for all healthcare facilities. Unfortunately, despite regular cleaning following patient discharge with a multi-drug resistant organism, the environment may still harbor these organisms.

Methods: A multidisciplinary team was formed to look into different ways to improve environment hygiene. The project was carried out in a 36-bedded medical ward from Jun to Dec 2010. The project looked into enhancement of the environmental cleaning by process re-design. The used of two bucket methods of cleaning the environment with micro-fibre cloths that were well soaked with Mikro Quart or phenolic instead of spraying the disinfectant on the cloths. The 3-days education workshops were tailored to the language and cultural needs of the staff. The topics covered "Highly Touch" surfaces, environmental hygiene and audit methods and finding. Effectiveness of the intervention was evaluated using a fluorescent marker, "Glo-germ" powder at random points in the ward. A checklist was used to monitor the trend of progress. The immediate feedback on the audit finding and action plan was developed for compliance failure to the staff and competency was monitored by direct observation.

Results: The environmental audit showed an improvement from a median of 64% to 95% following the above intervention ($P < .001$). However, no significant improvement in the nosocomial MRSA infection before and after intervention this could be the period is too short.

Conclusion: The project intervention has spread hospital-wide and enhances using disposable cloths to reduce time in rinsing and prevent contamination.

Disclosure of interest: None declared.

P303

Differences in the correlation between microbiological air sampling and particle counting in operating theatres and hospital cleanrooms

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Introduction / objectives: The process of environmental monitoring in cleanrooms of clinical pharmacy and operating theatres is difficult, the measurement of bio burden is time consuming and the result is available several days after the operation. This study examines the correlation between

the number of airborne bacteria and particles in operating theatres and cytostatic compounding cleanrooms in order to evaluate if applying solely particle monitoring is sufficient for hygienic-microbiological risk assessment.

Methods: Over six months 570 air bacteria and particle counts were collected simultaneously at various times during the operation and production of cytostatic infusion with the TSI Optical Particle Counter in three particle sizes (0.5µm, 1µm and 5µm) and a slit type air sampler with five different agars.

Results: No association between airborne bacteria and particles p -value >0.05 was found in operating theatres ($r=0,203$) and cleanroom B ($r=0,157$). In contrast, a high correlation between airborne bacteria and particles was found in cleanroom class C ($r=0,758$). The correlation increased with increasing number of particle counts ($>5000/m^3$). In cleanroom class A no airborne bacteria count.

Conclusion: The results of the present study indicate that particle monitoring can not replace microbiological monitoring. The correlation in class C is without relevance for the cytostatic preparation, since in this cleanroom no processing of critical infusion takes place. The current method of combining particle measurements with microbiological monitoring is at present the only efficient method for hygienic-microbiological risk assessment.

Disclosure of interest: None declared.

P304

Predictors of stethoscope contamination following a standardized physical exam

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Introduction / objectives: The relative contribution of stethoscopes in microbial cross-transmission in comparison to the examiners' hands has not been well described. The aim of this study is to compare stethoscope versus hand contamination following a physical exam and identify predictors of stethoscope contamination.

Methods: Following a standardized physical exam using sterile gloves and a sterile stethoscope, bacterial contamination of the following regions were assessed using contact plates: stethoscope diaphragm, stethoscope tube, fingertips, thenar region, hypothenar region and back of physician's dominant hand. Total aerobic colony count (ACC) were determined on digital photographs using a counting tool.

Results: A total of 56 patients (62% males; median age, 66) were recruited. Median (IQR) contamination (in ACC/25cm²) of examiner's dominant hand and stethoscope were as follows: fingertips: 835 (IQR, 332-1638), stethoscope diaphragm: 173 (IQR, 36-535), stethoscope tube: 116 (IQR, 34-321), hypothenar region: 16 (IQR, 8-59), thenar region: 15 (IQR, 4-71) and dorsum of hand: 3 (IQR, 1-16). The stethoscope diaphragm and tube were significantly more contaminated than the thenar or hypothenar regions (Wilcoxon ranksum test: $p<0.001$). There was no difference between the level of tube and diaphragm contamination. Diaphragm contamination was strongly associated with the patient's level of skin contamination ($p<0.001$), the patient's BMI ($p=0.01$) and the degree of humidity of the patient's skin ($p<0.001$).

Conclusion: Our results suggest that stethoscopes' diaphragm and tube are significantly contaminated following a physical exam and identify predictors of heavy contamination. These findings suggest the need to decontaminate stethoscopes following each use.

Disclosure of interest: None declared.

P305

Best practice approach to the risk management of Legionella infection in health care facilities

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Introduction / objectives: Aim of this study is to summarize and re-evaluate our eight year experience in the application of a water safety plan (WSP) in a 1500-bed teaching hospital.

Methods: WSP is based on a strategy integrating surveillance, maintenance, continuous chlorine-based disinfection and end-point filtration in critical areas. The strategy includes also molecular typing of the isolates and virulence genes expression analysis to detect the occurrence of adaptative changes in strains colonizing the water system. Recently, monochloramine treatment was applied in selected areas.

Results: Before the disinfection-filtration strategy, Legionella was isolated in 67% of samples (54/81), 79% of these samples exceeding 10³ CFU/L. After eight-years of integrated strategy, Legionella was still present but the positive supply points were reduced to 22% (54/241) in the last year, and the samples exceeding 10³ CFU/L were cut down to 18%. All isolates were identified as *L. pneumophila* sg1, two predominant and persisting clones, one of which showing increased chlorine tolerance. Long-time exposure to chlorine enhanced the ability to express more promptly some virulence genes involved in intracellular protozoa infection. The application of end-point filtration in high-risk areas is therefore required until a new effective disinfectant is introduced. Following the substitutions of chlorine dioxide by monochloramine, eradication of planktonic Legionella was observed although long-time effects have to be evaluated.

Conclusion: Standard environmental surveillance methods may not be sufficient to determine the most effective disinfection method and should be accompanied by evaluation of the susceptibility to sanitising agents.

Disclosure of interest: None declared.

P306

Mortality of hospital or community-acquired Legionnaires' disease (LD): a prospective study

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Introduction / objectives: The clinical aspects and outcome of hospital (HA) and community-acquired (CA) cases of LD might be different. We explored these topics in 267 patients with LD hospitalized in France.

Methods: 20 HA cases and 247 CA, all being aged 60 and older infected with *Legionella pneumophila* serogroup 1 included in a French multicentric prospective study of LD (April/06-June/07) were compared. A confirmed HA case was defined when the entire incubation period (10 days, d) or more occurred during hospital stay, and a probable HA case was a patient hospitalized between 2d to 10d before onset. Cox regression was done to identify predictors of 30-days mortality (based on relative hazard [RH]) and survival probability was calculated using Kaplan-Meier method.

Results: In the 20 HA, 12 (60%) were confirmed cases. No difference between the HA and CA groups was observed at admission for sex, age, smoking and alcohol habit, diabetes, respiratory, digestive, and neurological signs and intensive care unit (ICU) stay. Cancer/malignancy (45% [HA] vs 10% [CA], $p<0.001$), steroid therapy (35% vs 6%, $p<0.001$), classified in Fine score risk class IV-V (70% vs 47%, $p=0.04$), and mortality (45% vs 9%, $p<0.001$) were more prevalent in HA cases. The probability of survival at 30d was 50%, and 82% in HA and CA respectively ($p<0.001$). The RH of death for HA was 4.2 (95% CI 1.9-9.2; $p<0.001$) adjusted for age, ICU stay and renal failure.

Conclusion: The risk of death was higher in HA LD. Severe underlying diseases might explain such outcome. These results emphasized the need of a prompt appropriate treatment when LD is suspected in hospitalized patients.

Disclosure of interest: None declared.

P307

MRSA on surface: is it possible to control?

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Introduction / objectives: The prevalence of Methicillin-resistant *Staphylococcus aureus* (MRSA) in generally is low, however may become easily resistant to multiples antibiotics. The aim of this study was to compare two disinfectants: Peractac Acid 0.1% and Etilic Alcohol 70% on surfaces contaminated with MRSA.

Methods: This is a case control study, developed on a flowchart. Six sterile glasses surfaces (40x30cm) were contaminated with a suspension with 10^4 cfu/ml MRSA by spreading with a sterile spatula and left dry for 10 min. The efficacy of disinfection products were measured by imprinting rodac plates with Trypticase Soy Agar holding for 1min against the surface, before and after the disinfection procedure. The glass surface was divided in three parts and each part was cleaned three times. A sterile microfibre cloth (40x38cm) made by 10% polyester, 20% polypropylene and 70% viscose were folded three times, total sixteen sides, but using nine sides only; they were moistened with 50ml of 0.1% Peracetic Acid or Etilic Alcohol 70% to clean three surfaces each. Furthermore, sterile gloves were used and had their imprints (both hands) made on rodac plates, holding for 15s. Plates were incubated at 37°C for 48h.

Results: The median of surface contamination before and after disinfection with Peracetic Acid was 3.55 cfu/ml and 0 cfu/ml, for Etilic Alcohol, 4.26 cfu/ml and 0 cfu/ml respectively. Imprints of gloves after both disinfections had no growth (0 cfu/ml). The test showed a bacterial load reduction although a non-significant ($p > 0.05$) result comparing solutions.

Conclusion: Proceeding disinfection with Peracetic Acid 0.1% or Etilic Alcohol 70% associating adequate technique had successful bacterial load reduction which contributes for environment control. Peracetic Acid has a good cost benefit however the microfibre cloth was degrading after 5 times.

Disclosure of interest: None declared.

P308

Dutch surveys bedpan management (1990 & 2010): progress in correct use of washer disinfectors

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Introduction / objectives: In the Netherlands bedpans are regarded as semi-critical items unlike Spauldings scheme (1968), where bedpans are categorized as non-critical items. Washer-disinfectors (WD) were used incorrect for a long time. A survey in 1990 showed poor final cleaning and disinfection results. The Dutch Working Party Infection Prevention made guidelines for WD (1998), and in 2006 the International Organization for Standardization (ISO) introduced the Standard 15883 for WD: Part 3 specifies requirements intended to be used for emptying, flushing, cleaning and thermal disinfection of bedpans. I repeated the survey in the Netherlands in 2010.

Methods: A survey was sent to Consultants Infection Prevention in 120 Dutch hospitals. The questions covered the following data: kind of bedpans, methods of emptying, cleaning and disinfection, awareness and use of national or international guidelines for WD and the validation and maintenance of WD. Final questions about the role for bedpans or WD as a source for outbreaks.

Results: The response rate in 2010 was 77/120 hospitals (64,1%). Guidelines improved practice and manual stopped. Maintenance and validation of the WD showed good improvements. 94% responders never searched for WD or bedpans causing outbreaks or Healthcare Associated Infections (HAI) 6,5% reported outbreaks with the following Microorganisms: *Clostridium difficile*, *Norovirus*, *Pseudomonas aeruginosa*, *Salmonella species* and *Acinetobacter baumannii*. Nobody published these results or wanted to share these events.

Conclusion: Validated well maintained WD improves patientsafety, contributes to occupational health and prevent staff from unpleasant jobs. Although bedpans can contain loads of pathogens which can be easily spread and transmit, the majority never searches for (handling) bedpans and WD as a source for HAI. More study is needed for validated data about this risk.

Disclosure of interest: G. Van Knippenberg-Gordebeke Consultant for MEIKO washing technologies.

P309

Ensuring infectious safety of colonoscopy

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Introduction / objectives: The growing prevalence of infectious diseases among patients, including HIV infection, increases the risk of

transmission of an infection during endoscopic procedures. In 2009 the first 3 cases of HIV transmission through colonoscopy were reported in the USA.

Objective: Studying of infectious danger of colonoscopes, processed in the manual and automated way.

Methods: Microbiology (determination of total bacterial contamination, lgCFU/ml).

Materials: Swab samples taken from instrumental channels of colonoscopes immediately after the procedure (sample 1), after mechanical brushing of channels (sample 2), and after completing high-level disinfection (HLD) or a complete reprocessing cycle in the Automatic Endoscope Reprocessor (AER) ASP Johnson & Johnson (sample 3). Swabs taken from 48 colonoscopes were studied.

Results: Bacterial contamination of instrumental channels (samples 1, 2, and 3) in 17 colonoscopes after their use, brushing, and processing in AER was 8.7 (8-10), 4.74 (3.32-6.3), and 0 lgCFU/ml, respectively. Bacterial contamination (samples 1 and 3) of 16 colonoscopes processed in AER only was 8.87 (8-9.7) and 3.8 (2.7-4.85) lgCFU/ml, respectively. Bacterial contamination (samples 1, 2, and 3) of 15 colonoscopes cleaned manually was 8.99 (8-10.4), 5.2 (3-6.7), and 2.9 (2.7-4.1) lgCFU/ml, respectively.

Conclusion: Processing of colonoscopes in the AER, after preliminary brushing of channels, is the most reliable and effective. In 2008, we have proved that the endoscopes after use on HIV - infected patients represent essential infectious danger. HIV was isolated in the MT-4 human T-lymphoblastoid cells in 33 of 35 (94.3%) samples taken from instrumental channels of endoscopes directly after use and in three samples (8.6%) after completing HLD. All cases of ineffective cleaning were associated with violations of national standards.

Disclosure of interest: None declared.

P310

Hospital point-of-use water filtration to prevent exposure to waterborne pathogens

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Introduction / objectives: Hospital water systems have regularly been shown to serve as a reservoir for waterborne pathogens such as *Legionella* spp, *Mycobacteria* spp and fungi, all able to cause life-threatening infections especially in immunocompromised patients. In this study, the suitability of new point-of-use water filters was evaluated in a clinical setting.

Methods: During a routine control of hospital water, contamination with *Legionella* spp. was detected. To protect the patients from exposure to *Legionella*, shower heads were replaced by point-of-use shower filters (H2OK medical filters, Norit Filtrix, The Netherlands). The efficacy of 4 shower filters was tested during 5 weeks. Water samples were taken with and without use of the shower filter and were analyzed for the presence of *Legionella*, heterotrophic plate count (HPC), and fungi. After 5 weeks of use, shower filters were examined using scanning electron microscopy (SEM).

Results: 96% of the samples taken without the filter were positive for *Legionella* whereas all filtered water samples were *Legionella* free. Although other bacteria were present in the filtered water, the HPC was significantly reduced compared to the unfiltered water. *Fusarium oxysporum* and *Fusarium solani* were regularly detected in samples taken without shower filter but were never observed in filtered samples. SEM analysis showed a variety of structures on the inner side of the filter membranes while the outside of the membrane did not show any changes compared to an unused control filter.

Conclusion: The point-of-use filters proved to be highly effective in eliminating potentially pathogenic *Legionella* and *Fusarium* species from the showering water. The effects were seen over the complete 5 week study period.

Disclosure of interest: None declared.

P311

The influence of environmental temperatures and air humidity in the maintenance of the sterility of materials sterilized in different wraps

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Introduction / objectives: One of the variables which interfere in the maintenance of sterility in the materials is the storage. There are many official and not-official recommendations for temperature and air humidity control in the storage area, however without any theoretical or experimental basis. Some hospitals do not have a system that makes the control of temperature and humidity possible, and, in most cases, the sterilizing chambers are next to the storage area, constantly releasing heat and water vapour. Considering that one of the functions of the wraps is to maintain the sterility of the content, even under adverse conditions, the recommendations to have an environmental control in the storage area, a priori, would have a secondary importance. For these reason the doubt about the real importance of the temperature and humidity in the contamination of the materials stored after the autoclave sterilization arise.

Methods: Therefore, an experiment was developed in which boxes with surgical instruments and cylinders carriers were packed in cotton sheets, crepe paper, SMS and surgical-grade paper, sterilized, and intentionally contaminated externally with *Serratia marcescens* 10⁶ and stored in an environment with temperature around 35°C and air humidity around 75%. This group was compared with another group, the negative control, stored in temperature around 20°C and air humidity around 60%. After a period of 30 days of storage, the carriers were removed from the boxes and incubated.

Results: No bacterial growth was detected in any of the samples.

Conclusion: The experiment results allowed concluding that the high temperature and high air humidity do not interfere in the barrier efficiency of the packs.

Disclosure of interest: None declared.

P312

The management of potential exposures to Cretzfeld-Jakob Disease (CJD) via endoscopy

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Introduction / objectives: We describe the case of a 68-year-old male with autopsy-confirmed sporadic CJD (CJDs) who had undergone 2 colonoscopies prior to this diagnosis.

The involved endoscopy centre had multiple colonoscopes and gastroscopes that are cleaned and disinfected in the same automatic washers/disinfectors (AWD). There was no system in place to track the use and disinfection of individual endoscopes.

Four questions arise:

- Is it necessary to dispose of colonoscopes potentially contaminated by CJDs?
- Is it necessary to dispose of the AWD where the endoscopes were washed?
- Is it necessary to dispose gastroscopes at risk of contamination during the disinfection process in the AWD?
- Is it necessary to inform the patients who were exposed to these endoscopes ?

Results: We estimated that this situation occurs approximately 17 times each year in Switzerland. To answer these questions requires data on the presence of CJDs prions in the colon, the risk of contamination of the endoscopes, the risk of prion transmissions to other patients via the endoscopes, and the procedures of cleansing and disinfection. Finally, it is also necessary to take into account psychological, financial and ethical

implications for the endoscopy centre and the patients exposed to the potentially contaminated endoscopes.

Conclusion: This complex situation highlights the need for guidance recommendations in this area.

Disclosure of interest: None declared.

P313

Microbial load in instruments used in surgeries classified as clean

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Introduction / objectives: The number of orthopedic surgery, especially surgery of total hip and knee, have been more frequent due to technological advances. This study aims to determine the microbial load in the instruments used in clean surgeries, quantifying and identifying the genus and species of microbial growth.

Methods: Orthopedic surgical instruments were immersed, after use, in sterile water, sonicated in ultrasonic washer and consecutively shaken. Then, the lavage was filtered through a 0.45 micron membrane, the result was incubated in aerobic medium, anaerobic medium and medium for fungi and yeasts.

Results: In clean surgeries, results showed that 47% of used instruments had microbiological growth in the range of 1 to 100 CFU/instrument. The most prevalent organism was *Staphylococcus coagulase negative* (28%), followed by *Bacillus subtilis* (11%). This study refuted the hypothesis that clean surgeries happen in micro-organismsfree surgery field.

Conclusion: The microbiological findings reinforce the importance of antibiotic prophylaxis, practice already well established for this category of surgical procedure.

Disclosure of interest: None declared.

P314

Efficacy of prion decontamination of medical instruments using alkaline and enzymatic detergents

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BMC Proceedings 2011, 5(Suppl 6):P314

Introduction / objectives: The recent confirmation of Alzheimer's disease transmissibility, together with the large amount of data regarding the infectious nature of prions and other protein misfolding diseases, highlights the need for reliable protein decontamination of all reusable medical instruments.

In order to decontaminate medical instruments of potentially infectious proteins to sterilisation assurance levels similar to current sterilisation techniques, the decontamination protocol should not only remove but, preferably, break up (hydrolyse) the infectious protein into small, water soluble fragments of less than 3-5 KDa.

Currently, the proteins are routinely removed during the instruments exposure to either alkaline or enzymatic detergents during washing.

Methods: Using straightforward stoichiometric equations and available literature data combined with our own results on kinetics of enzymatic and alkaline protein hydrolysis we assessed the quantities of dissolved and surface proteins that could be hydrolyzed during a standard CSSD wash cycle.

Results: We estimate that, during a common CSSD wash cycle, a formulated multi-enzymatic detergent with validated enzyme activity can cleave 200-1000 times greater number of peptide bonds than a comparable alkaline detergent.

We discuss numerous adjustments to the results that take into account protein folding, chemisorption on the wide spectrum of instrument surfaces, availability of cleaving sites, proteolysis resistance, etc.

Conclusion: A reliable removal of potentially infectious proteins and peptides from medical instruments is technically achievable via a standard 10-min, 60C CSSD wash with enzymatic detergents containing

validated protein cleaving properties. The alkaline detergents, at realistic use levels, cannot assuredly hydrolyse proteins.

Disclosure of interest: None declared.

P315

Ozone sterilization of the produces for health care: integrative review of literature

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BMC Proceedings 2011, **5(Suppl 6)**:P315

Introduction / objectives: An integrative review of the literature with the objective of searching for evidences to subsidize incorporation of the ozone as sterilizing agent of products for health.

Methods: Using the key words ozone and sterilization, the search was conducted in MEDLINE, SCOPUS, COCHRANE, COMPENDEX, INSPEC bases and ENGINEERING RESEARCH DATABASE.

Results: Between 1990 and 2008, five publications that tested the ozone as sterilizing were obtained. All the researchers used the same investigation type (laboratory experiment) and they achieved sterilization by ozone, although with varied scope and tested products, besides diversity of methodological procedures.

Conclusion: Considering the incessant technology changes of products, the wide diversity of designs and raw material, the discoveries denote the ozone a promising method, but still in initial phase of investigation. More experimental studies are necessary, in way to subsidize wider evidences about their possibilities and limitations.

Disclosure of interest: None declared.

P316

Sterility maintenance assessment of moist/wet material after steam sterilization and 30-day storage

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Introduction / objectives: Moist/wet materials stored after autoclaving are considered contaminated and not recommended for use. Aiming to support decision-making in emergency situations, this study evaluated the maintenance of sterility in moist/wet material after being submitted to steam sterilization and stored for a period of 30 days.

Methods: As carriers to be incubated in culture medium for proof of sterility, 1600 porcelain cylinders were attached in surgical instruments. The surgical instruments were inserted into boxes following the recommended surgical care practices. 40 surgical boxes packed in nonwoven cloth covering Spunbound, Metblouwn, Spunbound (SMS): half (the experimental group) were placed in an autoclave but the drying phase was interrupted, yielding moist/wet materials and the other half (the negative control group) underwent the complete cycle. The external parts of each surgical box were deliberately contaminated with *Serratia marcescens* and subsequently stored for 30 days.

Results: The presence of moisture within the surgical boxes were confirmed by differential weight of the boxes before and after autoclaving. After storage, the boxes' contents were submitted to sterility tests and no microbiological growth was observed.

Conclusion: The presence of moisture inside the surgical boxes did not interfere with maintaining their sterility after deliberated external contamination and 30-day storage. This study did not intend to contradict the current recommendations, but only bring scientific evidence to assist in decision making for emergency situations.

Disclosure of interest: None declared.

P317

Influence of type of uniform and days of usage in microbiological contamination of nurses uniform in a university hospital

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BMC Proceedings 2011, **5(Suppl 6)**:P317

Introduction / objectives: Nurse uniforms can act as a reservoir of infections, with the areas around the pockets, cuffs and aprons the most contaminated. The aim of this study is compare the contamination of Standard nurse's uniform consisted of a dress, pinafore apron with the "scrub dress" type of uniform, as well as to measure the influence of the number of shifts as uniform was used in its contamination.

Methods: Microbiological cultures were collected from uniforms of 88 nurses (58 using traditional uniform and 30 using scrub dress) in an university hospital, during their work in one month period. Cultures were obtained using Count-tact plates (BioMérieux) plates (25 cm²). The culture media were incubated for five days at room temperature. After the incubation period bacterial count and type of bacteria colonizing the uniform were evaluated by microbiologist. Reading was provide in cfu colony forming units. Student T , and correlation were computed with SPSS v.17.

Results: The average count was 42,82 fcu/cm². There was no differences in the count between both types of uniform.(P=0,504). There was a positive correlation between the number of days and microbiological count. (r=0,224, P=0,036). The average count was 44,36 cfu/cm in those nurses using the uniform for 1 or 2 shifts, and 65,20 cfu this difference was statistically significant. (P=0,031).

Conclusion: There are no differences in microbiological contamination between standard or scrub uniform. The main differences in contamination appeared in those nurses that used the same uniform for more than 2 shifts. Hospital should provided nurses with enough uniforms to change before every shift or at least every 2 shifts.

Disclosure of interest: None declared.

PUBLIC HEALTH & PUBLIC SAFETYS

P318

Prohibit WP2 – systematic review of national guidelines in European countries

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BMC Proceedings 2011, **5(Suppl 6)**:P318

Introduction / objectives: The European Commission (FP-7) funded project PROHIBIT (Prevention of Hospital Infections by Intervention and Training) was established in 2010. WP2 of PROHIBIT aims to analyse existing national guidelines, practices in surveillance and public reporting of healthcare associated infections (HAI) in Europe.

Methods: The ECDC-HAI surveillance National Contact Points (NCP) and experts in 34 countries (27 EU member states, whereby UK counts as 4 countries, Croatia, Iceland, Norway and Switzerland) were invited to complete a questionnaire and give information about existing national guidelines for prevention of surgical site infection (SSI), ventilator-associated pneumonia (VAP), catheter-associated urinary tract infection (CAUTI), catheter-associated blood stream infection (CA-BSI) and *C. difficile* infection (CDI). The NCPs were requested to state where the guidelines could be found in print or online. Stated websites were searched and compared to answers. In cases of mismatch NCPs were personally contacted for clarification.

Results: End of March 2011 32 NCPs (94%) completed the questionnaire. 14 countries have guidelines on all 5 topics. 7 countries have 4 guidelines, 1 has 3 and 4 have 1. 5 countries have no national guidelines. Scientific level of supporting evidence and strength of recommendation are stated in 51% of the guidelines. In most countries identification of

relevant documents was only possible by personal communication with NCPs. Scope, structure and detailing of recommendations vary widely.

Conclusion: Evidence-based, national guidelines for prevention of HAI are still to be developed in many European countries. In the majority of countries finding the currently valid guidelines may be difficult for users.

Disclosure of interest: None declared.

P319

WHO first global patient safety challenge in Hong Kong – successful implementation in a territory-wide healthcare system

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BMC Proceedings 2011, **5(Suppl 6)**:P319

Introduction / objectives: Hand hygiene is the single most important measure for preventing healthcare associated infection. In Hong Kong the WHO hand hygiene program was launched in a territory wide healthcare system.

Methods: In 2006, hand hygiene (HH) was piloted in 4 hospitals that included intervention and control wards. The promotion program included education, placement of Alcohol Hand Rub (AHR) at point of care and posters. In 2009, the program was extended to 74 out patient clinics, 14 Tradition Chinese Medicine clinics and 8 long-term Care Facilities.

In 2008, “clean care is safer care” was implemented in 38 public Hospitals. A huge banner sized 9 x 15 meter was posted at the headquarter building. Same design was also put up across all hospitals. New designs were changed annually.

Results: Compliance rate of control wards was 22.16% at baseline that increased to 25.27%. For test wards it was 23.8% that significantly increased to 55.7% and Chi-square test was <0.05.

For the 74 out patient clinics, 14 Tradition Chinese Medicine clinics and 8 long-term Care Facilities, the overall compliance was 91%, 90% and 80% respectively.

AHR was also measured as a surrogate marker of hand hygiene compliance. The amount used was found to have steadily increased from 3.2 L in 2007 to 12.9 L per 1000 patients bed days in 2010 and the correlation will be done when the data of 2011 is available.

Conclusion: The WHO Hand Hygiene program can be successfully implemented in different kinds of healthcare by a concerted territory-wide effort.

Disclosure of interest: None declared.

P320

Monitoring the emergence of antibiotic resistance using the technology of the DebugIT platform in the HEGP context

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BMC Proceedings 2011, **5(Suppl 6)**:P320

Introduction / objectives: This work takes part in the European DebugIT project which goal is to build a technical and semantic information technology platform able to share heterogeneous clinical data sets from different hospitals for the monitoring and the control of infectious diseases and antimicrobial resistances in Europe. The aim of the study is to compare the incidence rates of antimicrobial resistance at the HEGP hospital obtained in real-time by the DebugIT platform to those established by the yearly-performed analysis processed by the microbiologists of the HEGP hospital.

Methods: The INSERM database covers seven years of anonymized microbiology data and represents an image of the HEGP EHR data. To be able to semantically integrate the data with other European peers, we went through several steps of data normalisation and quality works. These tasks led to the setup of semantic data providers (hospitals) that were integrated at a European level. We built a common view of our domain knowledge upon which we aligned our semantic data providers. We compared the incidence rates of antimicrobial resistance produced by the DebugIT platform at the HEGP hospital to a gold standard produced yearly by the experts.

Results: Despite different data processing methods (e.g only microbiologists de-duplicate data in case of repetitive antibiograms on different isolates), the results were highly similar (maximum 2% variability of the antimicrobial resistance incidence rates).

Conclusion: This study shows the adequacy of the control capabilities of the DebugIT platform and the maturity of the semantic integration methods developed by the project consortium for the setup of a pan-European surveillance network.

Disclosure of interest: None declared.

P321

Evaluation of Africa-Europe patient safety hospital partnerships: a framework

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BMC Proceedings 2011, **5(Suppl 6)**:P321

Introduction / objectives: Evaluation is critical to continuous improvement. African Partnerships for Patient Safety (APPS) has 3 core objectives – partnership strength, patient safety improvement and patient safety spread – for which an evaluation framework was necessary. Action on health care-associated infections (HAI) provides a common platform of activity.

Methods: To mitigate expected challenges to evaluation implementation in African contexts, end-users contributed heavily to framework development, providing contextual awareness and building ownership. Indicators for each of the three objectives were identified, scrutinized and refined. Capture tools were sourced or developed. A three-step process was used: first, expert-led literature review; second, expert consensus; and third, consultative selection of key indicators with end users (African APPS hospitals). Available HAI tools were incorporated into the framework.

Results: A three-pronged evaluation framework emerged. Six emergent domains of partnership strength (with associated facets for each domain) constituted the basis of evaluating this first core objective. A “3-2-1” approach emerged in evaluating hospital patient safety improvement focused on HAI (3 structure; 2 process; & 1 outcome indicator). An initial 20 measures of spread fell into two broad categories (initial spread activities & ongoing relationships). An evaluation handbook was developed to provide a single source of necessary tools for each of the three objectives.

Conclusion: We iteratively developed an evaluation framework for a broad-based patient safety programme in a resource-constrained setting. Simplicity was the focus throughout the process. Each of the three framework components can be used separately or in tandem in other settings and programs. Early APPS experiences in framework utilization can guide this.

Disclosure of interest: None declared.

P322

African partnerships for patient safety: a catalyst for change in Ethiopia

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BMC Proceedings 2011, **5(Suppl 6)**:P322

Introduction / objectives: African Partnerships for Patient Safety (APPS) stimulated such national action National action on infection control in Ethiopia – key steps are outlined.

Methods: As the result of patient safety sensitization presentations given about the APPS partnership between Gondar Hospital and Leicester Hospital, the Federal Ministry of Health (FMOH) was inspired to begin an extensive pilot program of its own. Technical support was given to the FMOH to clarify specific short and long term patient safety priorities. Existing FMOH infrastructure and partners were identified to provide a platform for training and monitoring & evaluation.

Results: Patient safety was established as a FMOH priority in the 5 year plan (2010-2015) with specific activities:

1. An Ethiopian FMOH National Patient Safety Program was established prioritizing 4 patient safety action areas in 3 pilot university hospitals. A FMOH technical working group was re-invigorated to cover both patient safety and infection control.
2. FMOH hospital management guidelines revised to include patient safety action areas.
3. National Nursing Standards of Care training material revised to include patient safety.
4. National production of alcohol based hand rub was initiated.

Conclusion: APPS catalyzed national patient safety action in Ethiopia, resulting in a rapid nationally led integration of patient safety strategy, policy, training, and harmonization of support activities. This potentially sustainable national patient safety program can be replicated elsewhere.

Disclosure of interest: None declared.

P323

Hospital patient safety situational analyses: Cameroon, Mali and Senegal

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BMC Proceedings 2011, 5(Suppl 6):P323

Introduction / objectives: Hôpitaux Universitaires de Genève partners with hospitals in Cameroon, Mali & Senegal via African Partnerships for Patient Safety (APPS). Baseline hospital patient safety understanding is largely unknown in African settings. APPS is framed around 12 WHO AFRO action areas; prevention of health care-associated infection is a common platform.

Methods: First, APPS developed a situational analysis tool at a cross-country workshop to define questions for systematic data collection on 12 patient safety action areas. Second, each APPS hospital formed teams to conduct analyses. Third, an external expert worked on-site with each team to validate findings. Finally, results were shared at a second cross-country Workshop, forming the basis for action.

Results: Each hospital constructed a detailed patient safety profile. Key findings on infection prevention and control (IPC) were highlighted. First, although each hospital had reliable running water, two hospitals could not confirm a clean supply; no hospitals had access to alcohol based hand rub or single use towels and two hospitals did not have reliable soap supply. Second, IPC activities were in place in hospitals but with no full time IPC doctor or nurse. Third, hospital policies/guidelines existed for technical areas in each hospital. Fourth, capacity & systems for IPC surveillance was variable, routine notification of infectious disease in place in two hospitals. Fifth, no hospitals had antibiotic use policies. IPC findings defined APPS action.

Conclusion: The tested tool can be used in African hospitals as a basis for patient safety action. This may be applicable to other developing world settings.

Disclosure of interest: None declared.

P324

Low compliance and need for changes in national isolation guidelines for group 1 nationally notifiable communicable diseases in Korea

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Introduction / objectives: The national guidelines for group 1 nationally notifiable communicable diseases (cholera, typhoid fever, paratyphoid fever, shigellosis, and enterohemorrhagic *Escherichia coli*

(EHEC) infection) recommend a universal isolation of the patients and screening for fecal shedding after finishing antibiotic therapy in Korea. This study was performed to evaluate the adequacy of the isolation guidelines.

Methods: We compared Korean guidelines with those of other countries. We also evaluated clinical and microbiological characteristics for confirmed cases and compliance with the guidelines in 20 Korean hospitals nationwide from 2000 to 2010.

Results: Isolation and screening for fecal shedding was selectively applied according to type of disease, patient status, and their occupation in foreign guidelines. Among 535 confirmed cases (15 cases of cholera, 232 typhoid fever, 81 paratyphoid fever, 175 shigellosis, and 32 EHEC infections), only 3.7-26.7% of each disease were strictly compliant with the guidelines in Korea. Prolonged fecal shedding ≥ 7 days and secondary attack was more frequent in shigellosis and EHEC infection than in other diseases.

Conclusion: This study shows that the present isolation guidelines were not realistic in Korea. Therefore, more detailed guidelines are necessary in Korea, which can be selectively applied for highly communicable diseases such as shigellosis and EHEC infections and for patient groups with high risk of secondary attack.

Disclosure of interest: None declared.

P325

Reducing infections through commissioning

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Introduction / objectives: The DH (England) Cleaner Hospitals Programme (CHP) had a major impact on reducing cases of MRSA bacteraemia and *C. diff.* infections in NHS acute hospitals. Mandatory surveillance data and CHP feedback indicate that pre-48 and 72 hour MRSA and *C. diff.* cases reduced at a slower pace. Commissioning organisations (CO) were key in driving acute care reductions in HAI through contract indicators but the nature of primary and community care (PCC) made it difficult to achieve similar outcomes. This study explored: innovation in commissioning to reduce HAI across the healthcare economy (HCE); challenges in reducing priority organisms in PCC; strategies to engage non-acute providers to bring about reductions in HAI.

Methods: A case study method was used. The CHP team provided data of four CO with difficulty in reducing priority organisms and four that appeared to be having greater success. A purposive sample was selected to provide insights from rural, urban and metropolitan CO. Data were collected using individual and focus group interviews with key informants and reviews of documentation. Data were analysed using a framework process.

Results: Barriers to engaging PCC practitioners in initiatives to reduce HAI include: limited levers to drive PCC improvement activity; practitioner contracts; weak evidence that priority organisms are acquired in non-acute care; lack of shared learning. Mature cross-HCE groups seeking system wide solutions such as antimicrobial prescribing and elective screening for MRSA were more successful. Timely use of national and local surveillance and audit data to alert CO to potential problems and guide intervention was key.

Conclusion: Commissioning for HAI reduction across the HCE is challenging. There is evidence that separating CO from provider activity might be of benefit. There is less infection prevention resource and activity within PCC to drive improvement.

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P326

A new case management concept to decrease the rehospitalisation rate in heurischemic

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BMC Proceedings 2011, **5(Suppl 6)**:P326

Introduction / objectives: The treatment of patients suffering from the neuroischemic diabetic foot syndrome (DFS) comprises arterial revascularization (e.g. below-knee bypass surgery), minor amputations, debridements, as well as long-term specialized wound care. Following premature discharge to the homecare sector, the quality of postoperative care is often inadequate. Many patients are readmitted. We studied the influence of a trans-sectoral case management (CM), ensuring outpatient care according to our clinical standards, on the readmission rate, length of hospital stay (LOS) and the hospital's costs/benefit situation.

Methods: DFS patients after implementation of the CM (Case Management Group (CMG); n=202; 2007-2008) were compared with a historic control group (HCG; n=190; 2005-2006). All patients had high maintenance foot wounds as well as healing incisional wounds following bypass surgery. Both groups were matched for the principal diagnosis, a patients clinical complexity level (PCCL) of 4, and G-DRG-related flat rate. From the 202 CMG patients evaluated, 54 received long-term trans-sectoral care by the CM.

Results: The rehospitalization rate in the CMG was significantly reduced versus the HCG (9,8% vs.16,7%; p=0,041). The reduction of the revolving door effect in the CMG significantly improved the costs/revenue situation for the hospital. The LOS was unchanged.

Conclusion: The implementation of a hospital-based trans-sectoral CM significantly reduces the rehospitalization rate in patients with neuroischemic DFS requiring bypass surgery. Hospital economics are improved.

Disclosure of interest: None declared.

P327

Use of a dashboard based on rapid viral tests results for predicting and managing clinical services

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BMC Proceedings 2011, **5(Suppl 6)**:P327

Introduction / objectives: Viral culture results (VCT) correlates well with the intensity of clinical services but they are not available real time. Rapid viral tests results (RVT) are available on the same day and can be used for real time predictions. This study reports the use of RVT for such prediction for a period of 145 weeks in Hong Kong (HK). Two acute hospitals successfully use them to manage the winter Influenza surge of 2009.

Methods: Viral cultures are provided by the government Public Health Laboratory Centre (PHLC). The public hospitals accounting for 91% of hospital beds in HK provide RVT's by immunofluorescence and is done in five hospital laboratories. Since May 09, PCR is also available for the diagnosis of nH1N1. Admissions data is obtained from the public hospital computer system. Two hospitals when alerted by the summary of the

RVT results initiated a program to manage the influenza surge by rapid discharges, doctor's visits to old age homes to reduce hospital admissions and doctors rights of admission to any ward with available beds.

Results: The RVT results (% positive) correlates closely with the number of weekly positive cultures of the PHLC for the 145 weeks (r=0.85; p<0.001). There is significant correlation of RVT for Influenza and admissions for children (Influenza A: r = 0.94, p<0.001) and the elderly (Influenza A: r=0.77, p<0.001). During the winter surge, % of admissions in the 15 acute hospitals is statistically similar with a mean of 12% each. The two acute hospitals with surge management have an occupancy rate of 81% and 84% while the others have a mean of 105% (p<0.001, chisquare).

Conclusion: The RVT for Influenza is a good predictor of clinical services intensity and can help in managing the surge in clinical services.

Disclosure of interest: None declared.

P328

HIV status among women with mental illness

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Introduction / objectives: Mentally ill women (MIW) are sexually exploited. Despite, their HIV Status is less studied. Present report aims to study the HIV status of MIW and highlight the difficulties encountered while handling them.

Methods: HIV status was screened by standard methods recommended by National AIDS Control Organization, INDIA for 50 young women with various mental illnesses. Difficulties encountered while handling them were elicited with the help of care takers. The data were analysed by simple descriptive statistics.

Results: The age of the subjects varied from 19 - 34, with the median 25 yrs. They were wandering on the road & were sexually exploited for their basic needs. Cheap & easy availability, sexual perversion, substance abuse, Lack of family support, inability to stress condom usage to partners leads to dissemination of HIV in the society. HIV was positive (64%) among them & CD4 count was low as much as 14%. Highly Active Anti-Retroviral Therapy (HAART) could not be initiated due to non-acceptance, non-cooperation, running away from shelter/ rehabilitation home, non-compliance of drug intake, & issues related to underlying disease. They were neither aware of condom nor did they practice any protective measure.

Conclusion: As handling MIW has multiple problems there is a need for 1 to 1 counselling to protect them, which will prevent the spread of HIV and initiate HAART therapy for them. The authorities and the public should be made aware of this mode of dissemination of HIV and measures should be taken to prevent them.

Disclosure of interest: None declared.

Cite abstracts in this supplement using the relevant abstract number, e.g.: Jeyaseelan Senthinath *et al*: HIV status among women with mental illness. *BMC Proceedings* 2011, **5(Suppl 6)**:P328