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Abstracts



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ABSTRACTS

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Oral Presentations

O1 **Back to the future: 25 years of IFIC**

Anna Hambræus

Vaxholm, Sweden

IFIC activities focus on education, networking and assisting in areas with minimal resources.

In 1989 IFIC had 12 member organizations. The first major educational achievement "Infection Control: Basic Concepts and training 1995" comprised 35 pages. It was a consensus document and boldly stated that if these recommendations were in conflict with existing national regulations the users should be encouraged to discuss the need for change. The first IFIC conference took place 1997. There were no parallel sessions and much time for discussions. The most heated concern was alcoholic hand rub, mainly accepted only in Europe. The newsletter, in many places the only IC journal, was in paper and distributed via mail.

Thanks to the support from its member organizations and patron members and the idealistic work by health care professionals in all IFIC activities IFIC has grown and now comprises 70 member organizations. "Infection Control: Basic Concepts" has expanded to 380 pages with interesting new chapters; a text book and no longer a consensus document. IFIC conferences cover a variety of topics and the IFIC website is of major importance for communication.

After revisiting the past it is time to go back to the future. Education is no guarantee for compliance; adult learning is an important issue. Infection control and the concepts of patient safety develop at different paces around the world, as does change in health care systems. The role of the infection control professional

changes accordingly and calls for discussions and may be tailor made solutions.

Incidences and consequences of surgical site infections and central-line associated bloodstream infections

O2

William Rutala

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Healthcare-associated infections (HAIs) are the most common complication affecting hospitalized patients. This presentation will examine the incidence and consequences of SSIs and CLABSIs. In the past several years there have been many efforts to reduce these infections. To prevent SSIs there have been several initiatives to include: national quality partnerships that address core measures (e.g., delivery of prophylactic antibiotics with 1 hour prior to incision, appropriate prophylactic antibiotic selection, antibiotic discontinuation with 24 hours post-op, appropriate hair removal); and pre-admission shower with an antiseptic (e.g., chlorhexidine gluconate). Bloodstream infections are a serious complication of indwelling vascular catheters. Fortunately, CLABSI have experienced a very significant reduction in the past 10 years in the United States (e.g., ~10 CLABSI/1000 catheter days to 1 CLABSI/1000 catheter days). The prevention measures that have occurred in the past decade have focused on the implementation of a bundle (hand hygiene, maximal barrier precautions, chlorhexidine skin antisepsis, optimal catheter site selection, and daily review of line necessity) but has also included new strategies such as implementation

of new technology demonstrated to reduce HAIs (e.g., CHG patch).

With improvements in medical devices, standardization in key care processes using checklists or bundles with provider feedback, and a greater understanding of the science of infection prevention, safer healthcare in the 21st century is becoming a reality.

O3 Prevention of ventilator associated pneumonia – sifting the minefield of guidelines

Egil Lingaas

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Ventilator associated pneumonia (VAP) is one of the major healthcare associated infections (HAIs) and commonly causes morbidity and mortality in mechanically ventilated patients. It is probably also the HAI which is the most challenging to diagnose, and this makes evaluation of preventive measures notoriously difficult. Furthermore, the selection of end points for evaluation of infection prevention may significantly impact results. For example, many studies have reported reduction of VAP incidence, but no significant effect on mortality or duration of hospital stay. Also, a change in diagnostic criteria has by itself been reported to significantly reduce the incidence of VAP. Thus, despite the publication of many guidelines for prevention of VAP over the last decade, there are still many unanswered questions and much debate over which preventive measures are effective. Some examples of unresolved issues are elevation of the head of the bed, continuous aspiration of subglottic secretions, silver coated endotracheal tubes, oral care with chlorhexidine, type of endotracheal suctioning and the implementation of “ventilator bundles”. For a definite answer to these and other questions regarding prevention of VAP, we need a revision of the surveillance definitions.

Antibiotic stewardship in intensive care units

O4

Judith Richards

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The reduction of antibiotic resistance is now a key aim in infection prevention and control. Strategies based on antibiotic stewardship programmes have included a combination of approaches, including prescribing formularies, restricting the use of certain drugs, prescribing audits, etc.

The aim of this session is to discuss if intensive care units should be considered special cases, and if so, which arguments support this assertion.

Approaches to the management and control of the use of antimicrobials in intensive care units will be reviewed, with an attempt to assess and evaluate the impact of the different measures proposed.

Pseudomonas

O5

Tim Boswell

Nottingham University Hospitals, UK

Pseudomonas aeruginosa and other environmental pseudomonas are frequently encountered opportunistic pathogens, with infections occurring most commonly in intensive care units, neonatal units, burns units and haemato-oncological units. These pathogens are intrinsically resistant to many antimicrobials, and may become further resistant to broader-spectrum anti-pseudomonal antibiotics. There are numerous reports of outbreaks of multiply and extremely antibiotic resistant strains of *P. aeruginosa* in the literature.

There has been renewed interest in the environment as a possible source for pseudomonas infections, particularly in relation to water systems, taps, and wash hand basins. Recent outbreaks of *P. aeruginosa* within neonatal intensive care units in Northern Ireland and elsewhere in the UK have resulted in new UK guidelines, and there is increasing evidence

that some of these opportunistic infections can be prevented by halting transmission from environmental sources to patients.

In Nottingham we have encountered a variety of problems with extremely antibiotic resistant *P. aeruginosa* particularly within haematology and intensive care. The main environmental reservoir appeared to be the drains of sinks and showers, and epidemiological evidence linking the sink drain to patients was determined by a case control study and observation of clinical practice. Other pseudomonas issues have included an outbreak of transmission of meropenem resistant *P. fluorescens* within the bone marrow transplant unit, traced to the drinking water supply, and a cluster of *P. aeruginosa* infections within the neonatal unit possibly linked to a contaminated water supply.

The lessons from these incidents will be presented alongside the new UK guidelines and the infection control implications discussed.

O6 Investigation and management of an outbreak of multidrug resistant *Acinetobacter baumannii*

David Enoch

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Multidrug-resistant *Acinetobacter baumannii* resistant to carbapenems (MRAB-C) has become endemic in many hospitals. We describe an outbreak of MRAB-C that occurred on two intensive care units using ORION criteria (Outbreak Reports and Intervention studies of Nosocomial infection). All patients colonised or infected with MRAB-C were included. Enhanced infection control precautions were introduced in Phase 1 of the outbreak. The adult neurosciences critical care unit (NCCU) was partially closed in Phase 2 and strict patient segregation, barrier nursing and screening thrice weekly was introduced. When control was achieved, NCCU was reopened (Phase 3) with post-discharge steam cleaning and monthly cleaning of extract and supply vents.

There were 19 cases, 16 on NCCU and three on the general intensive care unit (ICU). Mean age was 52 years, with six cases being female. All patients were mechanically ventilated and ten had either an extraventricular drain or intracranial pressure monitoring device in place. Four patients developed a bacteraemia, with one further case of ventriculitis. Nine patients had no clinical evidence of infection and four were identified initially on screening. Ten patients were treated; there were eight deaths. Environmental samples showed heavy contamination throughout NCCU.

MRAB-C affects critically ill patients and is associated with high mortality. This outbreak was controlled by early involvement of management, patient segregation, screening of patients and the environment, and increased hand hygiene environmental cleaning and clinical vigilance. A multidisciplinary approach to outbreak control is mandatory.

Extended spectrum Beta-lactamase producers

O7

Peter Wilson

University College London Hospitals, UK

Extended spectrum Beta-lactamase producing Gram negative bacilli are becoming increasingly common as the result of antibiotic use, a network of human, animal and environmental transmission and some successful clones e.g. ST-131. Ciprofloxacin resistance is common among these strains. CTX-M 14 and 15 are widely carried by returning travellers. Urinary infection in long term inpatients presents the greatest risk, although some food animals such as chicken have high levels. As a result use of carbapenems has increased and new transmissible metallo-carbapenemase producing organisms have emerged. Screening for these organisms is usually possible with simple disc agar tests. Treatment can be difficult and there are only a few alternatives to carbapenems. Screening, hand hygiene and limited use of cephalosporins and quinolones are the mainstay of control. However, decolonisation is ineffective and selective gut decontamination remains controversial. A joint HIS/BSAC/BIA working party is currently formulating advice on control and treatment.

O8 Improving hospital hygiene in Mongolia: the MeshHp project

Walter Popp

University Hospital Essen, Germany

Mongolia is a vast country between Russia and China with a small population of about 2.7 million people. Hospital hygiene is on a rather low level at the moment. Main problems are infectious diseases and above all a high rate of hepatitis carriers in whole population as well as hospital staff. As part of a German-Mongolian cooperation of both Ministries of Health, a project was initiated in 2010 to improve hospital hygiene in some pilot hospitals in Ulaanbaatar, Mongolia. Some success has been achieved after two years like vaccination of hospital staff against hepatitis B, using alcoholic handrub on wards and training of staff. Upcoming issues will be improving disinfection and sterilisation of medical products, start with therapy of hepatitis antigen carriers in healthcare staff and improving microbiology labs.

O9 Promoting healthcare-associated infection control through hand hygiene: an experience in Mali

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Princess Grace Hospital Centre, Monaco

Healthcare-associated infections (HAI) affect hundreds of millions of patients annually worldwide, particularly in developing countries.

WHO has issued evidence-based recommendations for hand hygiene in healthcare settings and developed access to alcohol-based handrub.

In Monaco, we have been travelling to Bamako, Mali for 4 years with student nurses under the Croix Rouge Monegasque responsibility. Each year, a group of 9 students accompanied by a nurse-teacher and a physician spend 2 weeks in CS COM in Bamako. Our objectives are focused on hand hygiene.

At our first travel, we brought hydro-alcoholic bottles and sent 200 cartons by shipping, representing 6 to 8

months of need. We taught the personnel when and how to use them. The reaction was enthusiastic and most of the personnel would use them. When we left, many bottles of hydro-alcoholic gels remained. The next year when we returned, they had no more gels but as soon as we provided new bottles, they used them again. We decided to help them produce their own bottles and met a pharmacist in charge of producing hydro-alcoholic gels in the two university hospitals of Bamako helped by the WHO program. Nevertheless, CS COMs were not included in the WHO strategy. We had to face difficulties, especially related to the inability of finding or manufacturing bottles...

When we returned in 2010, we observed the same commitment to our recommendations but also the same difficulties in terms of supplying. To date, problems of terrorism in Mali have unfortunately prevented us from going back to Mali.

Help from high resource countries in low resource countries – what you can do and what you should avoid **O10**

Edith Fischnaller

Non-profit company of the Sisters of St. Francis, Olpe; Central Section of Hygiene and Cap Anamur Cologne (NGO), Germany

In the high resource countries like Germany the health system is far good compared to some other countries all over the world. It is good to bring knowledge and other resources to countries that need better resources. For right of good health-service and the assets to it is no doubt. But how to do, what mistakes can be made, what can be avoided.

It is a difference, if the situation in low resource countries is an emergency situation under difficult circumstances, or in low developed countries, trying to build up a health system with international or national standards, laws and control, or others. Some problems are similar, some always are repeated and some are very special. On the example of an international NGO it will be shown on different examples and projects, what problems can be come out of and how can or

should be avoid them. There are different ways to do it. The focus will be on hygiene (hospital hygiene, safety water, food, waste and other main problems). Dr. Edith Fischnaller is specialist in hygiene and environmental health, working as a hospital-hygenist of different hospitals and other health-places of a bigger catholic cooperation. She worked some years in different countries, like Angola, Mozambique, Uganda, Sudan, Ethiopia, Afghanistan, Haiti and Pakistan. Since 8 years she is the leading voluntary of the NGO and visited all the projects, she is training the staff before going in the projects or when they are there, negotiating with the counterparts and the partners of the ministries.

O11 Reuse of medical devices

Adam Fraise

University Hospital, Birmingham, UK

Medical device reprocessing is covered by legislation in many countries. In Europe the Medical Devices Directive applies whereas in the US there are federal laws to comply with. In addition individuals who reprocess medical devices have responsibilities under health and safety legislation as well as a potential civil law liability for negligence.

The Medical Devices Directive is a complex piece of legislation which exists to ensure that medical devices do not compromise the safety and health of patients. Under the directive a device designated as 'single-use' must not be reused because this may affect the safety, performance and effectiveness, exposing patients and staff to unnecessary risk. Nevertheless, reuse of single use devices is quite common.

Manufacturers must provide instructions for reprocessing a reusable medical device, including information on cleaning, disinfection, packaging and method of sterilization. Further information on these requirements can be found in the International Standard ISO 17664. Unfortunately some manufacturers do not provide adequately detailed information on the reprocessing requirements for reusable devices.

The use of disposable medical devices has environmental implications and the European Waste Directive applies. Landfill for infectious clinical waste is banned under the directive while clinical waste has to be incinerated. Incineration is an expensive process and can result in costs of up to £1000 per tonne. Furthermore the incineration of disposable medical devices increases carbon emissions.

O12 Accelerated death of pathogens on dry copper alloy touch surfaces compared to moist surfaces

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We have previously described the antimicrobial properties of copper alloys against many healthcare associated pathogens, simulating wet fomite contact which has become the basis of the USEPA approved test for antimicrobial solid surfaces: high concentrations of pathogen are killed in <2 hours. However, hand contact of dry touch surfaces is the more likely route of cross contamination and spread in hospitals, requiring rigorous hand cleansing with alcohol-based rubs or soap and water by healthcare workers and visitors. Clinical studies have identified shortcomings with these, necessitating a re-evaluation of surface decontamination procedures. Accordingly we have developed a dry surface test to investigate whether pathogen death on dry surfaces is faster or slower than on moist surfaces. The data obtained show that contact with dry copper alloy surfaces, but not stainless steel, results in even faster death of pathogens, taking only several minutes to kill 10^7 cells/cm². Detailed analyses with metal chelating and quenching agents reveal that accelerated death involves not only the direct effect of released Cu(I) and Cu(II) ions but also Fenton reaction Cu(I)/Cu(II) redox cycling producing potent reactive oxygen species including hydroxyl radical and superoxide anions, which depolarise and permeabilise the outer and inner membranes of Gram-negative bacteria, destroy respiration and DNA of all bacteria. These mechanisms work continuously, affording 24/7 protection of touch surfaces. Incorporation of copper alloy touch surfaces into the healthcare environment, supported by the results of recent USA hospital trials,

provides a valuable adjunct to current hygiene control and cleaning practices.

O13 **How important is the clinical environment in combating healthcare-associated infections? Copper in clinical trials now clearly shows the linkage between environment and reduced risk of infection**

Michael Schmidt

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In the United States, the implementation of *Medicare's Never Events* policy and the passage of the *Affordable Care Act* have heightened the importance of practices that increase patient safety. Bacteria resident within the built environment can be quickly transferred to patients and healthcare workers resulting in colonization or the subsequent development of nosocomial infections. With increasing frequency the use of bundled interventions have been found to be effective for the control of Central Line-Associated Bloodstream Infections (CLABSIs) and Ventilator-Associated Pneumonia (VAP) in hospital. However, lower CLABSIs infections rates were only seen when compliance with the bundle was high. Evidence continues to mount demonstrating the effectiveness of copper surfaces to continuously limit the concentration the bacteria responsible for these infections within the built environment. Recently we have shown that risk mitigation of the environmental burden resulted in a concomitant mitigation of the HAI rates for patients treated in rooms with a limited number of strategically placed antimicrobial copper touch surfaces. Building upon the observation that copper and its alloys can mitigate the HAI rate through a reduction in microbial burden the complexities of appropriately applying antimicrobial copper touch surfaces within the healthcare environment will facilitate a discussion of how controlling the concentration of bacteria can augment current efforts with bundled interventions to enhance patient safety. The resulting insights provided should facilitate an understanding of the need to use a comprehensive approach taking full advantage of emerging infection control solutions to fight HAIs in a pragmatic and aesthetically satisfying way.

Reducing healthcare-associated infections with simple interventions using copper alloys: improving outcomes in a time of austerity

O14

Panos Efstathiou

Hellenic College of Orthopaedic Surgeons, Greece

Identification of key healthcare environment surfaces to upgrade using copper alloys is a mixture of experience, practicality and common sense. An ongoing dialogue with the supply chain is also important as capabilities and possibilities change over time. This latter is especially the case where products come from a number of different sources.

The cost of a copper intervention, as part of a complete decontamination bundle, is relatively easy to monitor so any financial benefits should be readily calculable. However the care environment is dynamic and complex and patient profiles can change from day to day so establishing the balancing benefit data for a single intervention is problematic.

However it has been possible to show financial as well as clinical benefit to the hospital. It has also been possible to show an improvement of patient outcomes but calculating the ongoing benefits, whilst they are apparent, is outside the scope of this study.

European Network (EUNETIPS) Symposium: Link professionals in healthcare facilities

O15

Walter Popp

European Network to Promote Infection Prevention for Patient Safety (EUNETIPS), Essen, Germany

In 2008, some European national societies for hospital hygiene / infection control and prevention met to improve cooperation on European level. Since 2012, EUNETIPS (European Network to Promote Infection Prevention for Patient Safety) is a legal entity with 18 member societies and actual 6 applications. Many EUNETIPS societies were involved in the TRICE project which was initiated by ECDC, led by Silvio Brusaferrero and performed in 2010 in order to get informations

about hospital hygiene / infection control and prevention in European countries.

During IFIC congress, EUNETIPS will organise a session about "Link professionals in healthcare facilities" with the following contributions:

- Rose Gallagher (United Kingdom): Introduction and EUNETIPS survey results (link professionals)
- Short presentations about situation of link professionals in:
 - Denmark (Anni Juhl-Jørgensen),
 - France (Chantal Léger),
 - Germany (Walter Popp),
 - Romania (Monica Licker) and
 - The Netherlands (Leo Ummels)
- Silvio Brusaferrò (Italy): Discussion and main results of TRICE project.

There will be enough time for discussion.

O16 Hygienic management of enterohemorrhagic *Escherichia coli* in an university hospital in Germany

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During May and June 2011 an outbreak of enterohemorrhagic *Escherichia coli* (EHEC) occurred in Germany. More than 4000 patients were infected, 800 of them developed a hemolytic uremic syndrome (HUS) as a severe complication. 44 patients died.

Hospitals in the most affected regions of Germany (Lower Saxony, Hamburg, Schleswig-Holstein) were overcrowded; routine care was not possible any more. Reports in the press led to great concern in the general population, also in less affected regions, so many people with diarrhea visited, in order to exclude EHEC-infections, a hospital.

We describe the management of these patients with suspected infectious diarrhea at a university hospital, which is specialized on treatment of immunocompromised patients.

One important measure to handle the surge of contagious patients was to establish a multidisciplinary coordination team under leadership of the Department of Nephrology and the Department of Hospital Hygiene.

Suspected infectious patients were separated in a modified emergency room. A new ward for infectious diseases was established to isolate in-patients.

Campylobacter spp., *Clostridium difficile*, and other infectious diseases have been the final diagnosis for 39 % of the patients with diarrhea. 13 patients showed an EHEC-infection; 10 of them developed HUS and 8 of these 10 patients were treated with plasmapheresis. Fortunately, our hospital was not as affected with EHEC as expected. But the history of the EHEC-outbreak shows that also highly developed countries like Germany may reach their hospital capacity very fast in case of an outbreak.

O17 Single rooms - important measures to prevent *Clostridium difficile* infection in hospitals?

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Background:

A main objective for a hospital infection control team is to prevent hospital acquired infections. When new hospital buildings are planned or old hospital buildings are renovated the infection control team is often involved to ensure that the hospital environment is designed so that this objective may be fulfilled. Two new university hospitals have been constructed in Norway in recent years, both of them with a high number of single rooms. The bacterium *Clostridium difficile* is the most common cause of nosocomial diarrhoea. In recent years there has been renewed focus on this type of infection due to emergence of severe nosocomial outbreaks in many countries.

Aims:

To investigate whether the incidence of *C. difficile* infection (CDI) among hospital admitted patients is associated with increased access of single rooms in hospitals.

Methods:

Descriptive retrospective epidemiologic approach to investigate the incidence of CDI based on laboratory confirmed cases in four university hospitals during the period 2001–2010, in relation to number of single rooms and isolation room.

Results:

We found no association between the incidence of CDI and increased access to single rooms in this study. However, there were considerable differences in the incidence of CDI between the four hospitals, and a higher number of isolation rooms in the hospitals with lowest incidence of CDI.

Conclusions:

Although the proportion of single rooms increased in several of the hospitals during the study period, we were unable to show any association between single rooms and reduction in CDI among hospitalized patients.

Hospital acquired infection surveillance with intelligent information technology – is it feasible and does it make sense?

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In Europe and other developed regions, healthcare authorities demand healthcare-associated infection (HAI) surveillance in hospitals for quality management and patient safety reasons.

Dilemma:

HAI-surveillance is a time-consuming task for highly trained experts, and unavailability of suitable workforce meets with increasing financial constraints. Therefore, the challenge is to obtain reliable surveillance results without urging on doctor’s or nurse’s sparse time resources for documentation of surveillance data. We took this challenge by developing and implementing intelligent information technology (IT) software for extracting and interpreting HAI related surveillance information from structured clinical data held in electronic patient data management systems of intensive care units (ICUs). The software is called MONI and builds on a medical knowledge base with computerized knowledge about all relevant clinical entities plus processing algorithms that evaluate, aggregate, and interpret medical data in a stepwise manner until it can be mapped into the given HAI definitions. Fuzzification of clinical signs and other infection-relevant entities allows for interpretations that closely resemble human reasoning. Comparative clinical studies revealed high precision of MONI surveillance diagnoses (sensitivity >90%, specificity >99%). With this software, 85% expert time can be saved compared to conventional surveillance. It is also suited for day-to-day follow-up of infections and for clinical decision support in ICU. Though some argue

this is much too sophisticated especially for developing countries, IT development and use is common and rapidly growing worldwide. HAI surveillance with intelligent software might be reasonable and feasible also in developing regions.

O19 Screening policy in control of healthcare associated infection – a time for the discussion

Suzana Bukovski

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Antimicrobial resistant human pathogens are rapidly increasing. We are facing with rising emergence of multidrug resistant microorganisms nowadays. At the same time the discovery and development of new antimicrobial drugs have slowed dramatically particularly for Gram-negative bacteria.

In the recent years MDR organism control programs have been introduced into health care facilities and guidelines for prevention of transmission of MDR organism. To have a control program for MDR organism became an ethical question. Prompt identification of MDR infected patients is the core of management and treatment of the patients and of the control of healthcare associated infection (HCAI). The rationale control program for MDR organism includes routine active surveillance followed by contact precautions and decolonization measures. There is a consensus that AS should be performed for patients who are transferred from other hospitals, for patients who are related by proximity to an index patient, if there is evidence of transmission of an MDR organism within a patient care unit, or if a pathogen with a new resistance pattern that threatens the ability to treat infection with it has been identified. But paucity of evidence and low quality evidence of systematic reviews leave screening policy more as additional precautions than as standard measure and sometimes more in theory than in praxis. The mobility of patients also would demand new look on the position of screening in the HCAI bundle locally.

An opportunity to learn from different strategies that have been adopted is offered. The discussion should be open and broaden.

O20 Human airway and intestinal bacteria in the Danish child care environment

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Background:

Pre-school children have in average 6-8 disease episodes per year and mostly because of airway infections and gastroenteritis. These spread not only by direct contact, but also indirectly via toys, nursery pillows etc.. There is little knowledge about the type and prevalence of human airway and intestinal bacteria on these surfaces. This study investigates the prevalence of these bacteria in Danish child care center environments.

Methods:

15 predetermined spots from 23 Danish nurseries were analyzed during winter 2012. After incubation, human airway and intestinal bacteria were isolated and identified. The predetermined spots were situated in the toilet, play room and kitchen and were, among others, toys, tables, nursing pillows and kitchen tables.

Results:

All samples were polymicrobial, but mostly grew low-pathogenic bacteria such as *Bacillus* spp., *Acinetobacter* spp. and CNS. Human airway bacteria was found in 51 samples (15%). Intestinal bacteria was found in 42 samples (12%). The most prevalent intestinal bacteria were *Enterobacter* spp. and *Pantoea* spp., whereas the dominant findings in airway bacteria were Non-hemolytic streptococci. The sites with the highest prevalence of coliform bacteria were kitchen tables and sinks as well as different spots in the toilet. Most airway bacteria were found on toys, tables and pillows in the playroom.

Conclusion:

27% the samples contained airway or intestinal bacteria. Most of these were low-pathogenic, but can be used as indicators of fecal and nasopharyngeal contamination. In this perspective the main bacteria hotspots appear to be toys, tables and surfaces in the toilets and kitchens.

O21 Hand disinfection skills in students and long-term care facility health care workers

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Introduction:

As stated in the WHO's patient safety program, alcohol-based hand rub is a key element in prevention of HAIs [WHO, 2006]. However, if HCWs do not use appropriate technique, performance of hand hygiene with alcohol-based hand rub fails to eradicate transient nosocomial pathogens [Widmer et al., 2007].

Methods:

Ninety-two students following vocational secondary education and sixty-six long term care facility (LTCF) HCWs were admitted to a hand rub skills test during class and a refresher course. The individuals' hand rub technique was videotaped and then scored by two trained infection professionals. Correctly performed hand rub steps (n=9) were rewarded with one point.

Results:

The mean score for all respondents was 4.55 (SD 1.40, n=158), the student group's score was 4.70 (SD 1.46, n=92), the HCWs' 4.29 (SD 1.24, n=66). Four hand rub steps were performed by less than 50% of participants: (1) backs of fingers to opposing palms with fingers interlocked: 13.1%, (2) rotational rubbing with clasped fingers of right hand in left palm and vice versa: 19.4%, (3) duration of the entire procedure: 20-30 seconds: 20.6%, (4) Apply two doses of the product in a cupped hand: 45.6%. The mean duration of the hand rub was 15 seconds (SD 7s., min 4s./max 41s., n=158).

Conclusion:

We identified several hand rub skills gaps in students and HCWs. These lead to poor disinfection of the nail bed and fingertips but also to insufficient application time and volume used. This causes a potential threat to antimicrobial efficacy.

Environmental cleaning without chemicals in clinical settings

O22

Elizabeth Gillespie

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Introduction:

Environmental surfaces are considered to play an important role in transmission of healthcare-acquired pathogens. Some healthcare facilities have introduced new cleaning and disinfecting products to improve cleaning outcomes. Our health service chose to remove chemicals and physically remove pathogens using an environmentally friendly methodology.

Methods:

We conducted a trial of cleaning and disinfecting environmental surfaces using microfibre cloth and steam technology. We developed specific cleaning protocols for acute care and aged care settings. An extensive training program was implemented with both infection control and cleaning services participation. Visual assessment, bioluminescence, microbiological testing and use of fluorescent markers were employed in monitoring patient rooms and bathrooms.

Results:

Microfibre cloth and steam was demonstrated to be an effective and efficient cleaning and disinfection methodology for environmental surfaces. It was possible for all high touch points in the clinical setting to record results below 24 reflective light units (RLU). Vancomycin resistant enterococcus was removed using this cleaning method. There were demonstrated opportunities for time savings, occupational health and safety risk reductions, water reductions and simplification of cleaning methods.

Conclusion:

This cleaning methodology has been shown to be successful, most importantly, with the cleaning staff. Savings have been made with chemical use, dry cleaning of window drapes and labour (time) costs. A staged implementation of this cleaning methodology has been introduced across the entire health service.

O23 Visualising the patient zone in a crowded intensive care unit in Viet Nam

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Objective:

To demonstrate the challenges of identifying two virtual geographical areas: the patient zone and the health-care area according to the WHO 5 moments for hand hygiene, in an over-capacity filled intensive care unit (ICU) and general ward in a tertiary health care facility in Viet Nam.

Methods:

Overt observation using the WHO hand hygiene audit form was conducted in ICU and infectious diseases ward at Bach Mai tertiary hospital. Health care worker (HCW) movements based on clinical practice and patient touching were detailed diagrammatically and indications for hand hygiene as per the WHO 5 moments for hand hygiene were identified and labelled according to the movements.

Results:

Within an over-crowded health care setting the patient zone and the health-care area merge into one. It is difficult to visualise, determine and define the patient zone as immediate surroundings including equipment, surfaces and even beds (within wards) are often shared by more than one patient. HCW movements between patients are frequent and interchangeable due to the close proximity of all patients. Limited space means that HCWs multi-task and prefers using one set of

gloves and hence avoiding hand hygiene.

Conclusions:

The fusion of patient and health-care area zones poses difficulty with conducting the 5 moments for hand hygiene observations. These observations suggest that the 5 moments need to be adjusted to fit the contextual needs of health care facilities that may have less than ideal working conditions.

How to improve antibiotic prescribing
O24

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In spite of vast scientific and public literature on deleterious effects of antibiotic overuse the warnings that these drugs should be used with caution have little influence on prescribing in practice. A number of interventions are proposed to improve antibiotic prescribing in hospitals and the community but there are many barriers in their implementation. Only multi-faceted interventions on different levels targeting policy makers, prescribers and consumers seem to have impact on reducing antibiotic prescribing for inappropriate indications in the community. Such an approach is recommended by the European Commission, the European Centre for Disease Prevention and Control (ECDC) and many professional societies and expert groups. Approximately 90% of antibiotics are prescribed in ambulatory care but life threatening infections caused by multiply resistant bacteria are seen mostly in hospitals, intensive care units in particular. With often serious underlying conditions hospital care associated infections pose a particular challenge for correct diagnosis and treatment. Due to the ubiquitous present bacterial microbiota infections are usually overcalled and antibiotics overprescribed. In such complex patients optimal treatment that aims to prevent and cure infection while minimizing toxicity and emergence of resistance, can only be achieved through hospital antimicrobial stewardship programs in which establishment of multidisciplinary antimicrobial management teams (AMTs) plays a central role. Crucial members of AMTs should be

infectious diseases doctors, clinical microbiologists and clinical pharmacists or clinical pharmacologists but their role as consultants in antibiotic prescribing in some countries is not yet fully recognized.

O25 How to improve hand hygiene

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Health care-associated infections (HAI) are a major patient safety issue worldwide . We present an overview of Bulgarian experience on implementing hand hygiene (HH) as a core preventive intervention to reduce HAI and MDR strains cross-transmission; the patient's role in the process and how this is supported by national regulations, attitudes of medical staff, education programmes and campaigns.

A survey based on WHO Self-assessment Framework on HH with 39 hospitals was organized as part of national HH campaign 2011-2012. The highest percentage of sAdvanced score was observed in section "Training and education "-36% and "Reminders at workplace" - 20%. The Basic score have the largest proportion in "Institutional safety climate for HH"-44% and "Evaluation and feedback"-41%.

The questionnaire survey on patients' knowledge and intention to support strengthening HH in hospitals was done. The association between patients' characteristics and their intention to ask nurses and physicians whether they washed hands shows lower involvement proportionally to increased age, with 72% less intention to ask for patients aged between 45 -60 and 89% less for age group 61 - 75, as compared to younger age group. The patient knowledge level about HAI proved to be quite advanced with 44.1% being able to correctly name the type of infection patients acquire in hospitals, 73% considering HAI a serious problem and 67.8% worried about the HAI contracting risk.

The development of future HH promotion strategy include patients education, involvement in safe care; institutional safety climate for HH improvement, enhancing health care providers and patient dialogue.

Hand hygiene in outpatient care

O26

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Very limited data are available on the burden of health care-associated infection (HAI) occurrence in outpatient care but the transmission risk is usually considered to be lower than in hospitals. However, several HAI outbreaks have been reported and studies demonstrated that healthcare workers' hands can be contaminated and colonized by potentially harmful microorganisms. In addition, recent studies show that lapses in infection control practices are very common in outpatient settings, e.g. ambulatory surgery. Based on this and on the demand from the field, the World Health Organization (WHO) developed guidance on strategies to adapt and implement hand hygiene recommendations in these settings, as well as in home care and long-term care facilities. Systematic literature reviews on the transmission and infection risk, especially hand transmission, and on hand hygiene practices in these settings, were conducted. Surveys involving international experts and consultations of country experts were also undertaken. The presentation will outline the results of these investigations and the concepts proposed to apply the WHO Multimodal Hand Hygiene Improvement Strategy and the My Five Moments approach in healthcare settings where patients are not admitted as inpatients to a hospital. A range of practical examples of situations occurring in outpatient settings will be explained by referring to requirements for hand hygiene best practices. Finally, country examples of implementation and adaptation of these concepts and their translation into practical tools and strategies will be shown.

O27 Hand hygiene in home healthcare and in everyday life

Sally Bloomfield

London School of Hygiene and Tropical Medicine, UK

A range of recent events have shown that home and everyday life hygiene is a key part of public health strategy to reduce spread of infectious disease both in healthcare settings and in the community. Prevention through hygiene is also recognised as a strategy to reduce antibiotic prescribing and the spread of antibiotic resistant strains in the community. If hygiene promotion is to succeed, an effective code of practice is required. 'Targeted hygiene' is a risk-based approach developed by the International Scientific Forum on Home Hygiene which focuses on identifying critical control points in the chain of infection transmission and targeting hygiene at these points to break the chain of infection transmission. Hand hygiene is central to all aspects of hygiene including food hygiene, respiratory hygiene, healthcare at home etc. Reducing infection risks means getting people to wash their hands properly and at the appropriate time. Use of alcohol hand sanitizers provides an effective alternative to improve compliance in situations where there is increased risk, or where access to soap and water is limited.

O28 The effectiveness of infection control in Pauls Stradins University Hospital

Agita Melbarde-Kelme, Uga Dumpis

Pauls Stradins University Hospital, Riga, Latvia

A rapid increase of multiresistant microorganism incidence was observed at the clinic infection control organization change made last years at the hospital and hygiene surveillance at the ICU was initiated. The ICU staff members did not receive any information on hand hygiene observations for first 6 months. After those 6 months an intervention campaign was launched including personnel education, expressing instructions, improving skills and display of reminding texts at each ward. In 2011 measurements of the use

of hand rub solutions at all wards of the hospital were taken and compared to the frequency of personnel education courses between different units.

Methodology:

The educational sessions were compulsory and included lectures, practical examples, situation analysis and test at the end implemented courses at each hospital ward. The hand hygiene in ICU observations was divided into 3 phases. First phase of 6 months covered passive personnel surveillance without any intervention activities. The surveillance protocol was developed by World Health Organization (WHO). After 6 months additional theoretical and practical staff training was organized including analysis of different situations and results making remarks when noticing any noncompliance. In December 2011 measurements of hand disinfectant use at the units were made estimating their use on patient days.

Results:

During the trial 435 hand hygiene observations were made. During phase I the average hand hygiene compliance indicator was 8.6%. After intervention the average hand hygiene compliance indicator was 42.7% and a credible compliance increase was observed ($p < 0.05$). The average hand hygiene compliance indicator was 56.5% and the highest indicator observed was 87.6%.

After performing measurements of the use of hand disinfection solutions it was recognized that it is higher at the units with intervention and more frequent trainings, however it differs a lot from 0.7 till 62.5 ml/patient per day.

Discussion:

No trials on hand hygiene in Latvia were made until now and are currently continued only at the intensive care unit. During the trial it was observed that personnel have wrong understanding about hand hygiene. Trials proved the effectiveness of the intervention and the role of the control activities.

O29 High transmissibility of carbapenem resistant *Klebsiella pneumoniae* in an ICU
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Introduction:

Carbapenem-resistant strains of *Klebsiella pneumoniae* (KPC) are increasingly reported as challenging pathogens causing hospital outbreaks in ICUs. Outbreak description late August 2011, a patient was admitted to our ICU from North Africa with war wounds. He was isolated under normal contact precautions; a wound swab isolated KPC. He died after 3 weeks from his injuries. Two weeks later a group of 10 patients from the same country were directly admitted to our ICU. Due to lack of space, some could not be isolated. Subsequent wound and rectal swabs identified KPC in 9 patients. All were then cohorted with contact precautions. Rectal screening of all other ICU patients identified one asymptomatic carrier who was also cohorted. A KPC infection emerged in another patient within the same week. Timeline analysis suggested cross-transmission between patients in adjacent beds. Infection control measures were stepped up to include twice weekly rectal screens of all ICU patients. Discharges were quarantined in a step-down ward before transfer to other wards. Daily information sessions to all hospital staff emphasised hand hygiene, strict contact precautions and restricted carbapenem use. Visiting doctors were kept to the minimum possible, while ensuring compliance to hand hygiene and bare below the elbow policy when visiting ICU patients. Isolation areas were terminally decontaminated using H₂O₂ fogger. Alcohol rub consumption doubled but, due to staff limitations, low nurse-to-patient ratios were often unavoidable; these ranged from 0.6 to 0.94. After the initial group of foreign patients were discharged, KPC screening continued. New rectal carriers continued to be identified, albeit less frequently. Clinical cases were not subsequently detected. During the ICU outbreak several KPC cases were reported in other wards but PFGE tests showed they were unrelated possibly indicating that KPC was not being identified by the lab prior to this event.

Conclusions:

Our experience highlights the challenge posed by KPC in ICU settings. Aggressive screening as well as improved compliance with contact precautions and reduced carbapenem use, was not enough to control spread. 100% hand hygiene is practically impossible when ICU nurses need to care for more than 1 patient as happens when nurse:patient ratio is low. However the measures prevented the strain from spread to the rest of the hospital.

Face masks: how often do we need to change them?
O30
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Aims and objectives:

Health care personnel wear facemasks during work schedule. They have dual role protecting personnel from infective microbes and preventing dispersal of microbes from workers' oropharyngeal flora to environment. Study designed to determine the efficacy of face-masks in achieving reduction in dispersal of bacteria. The study conducted at multispecialty ophthalmic hospital further intended to document difference between fabric and two ply disposable masks.

Method:

Thirty healthcare workers - doctors, nurses and personnel working in operation theatres (OTs) participated. All study subjects worked in OTs at the institute where fifty to hundred surgeries are performed daily. These personnel work in OT environment for period of six - eight hours daily. Samples collected in separate side room in OT complex. Prior to wearing mask participant was sampled by cough plate method holding blood agar plate approximately 12 cms from mouth. Personnel were asked to generate distinct phonation. The subject was then asked to wear the face mask, continue his routine work and report to

study centre for further sample collections at 30, 60, 90, 120 and 150 minutes producing roughly sound of same magnitude. The study was conducted using fabric masks with thread count roughly between 180 - 200 per sq inch and was repeated next day on all study subjects using commercial two ply disposable masks.

Results:

The bacterial counts before wearing the mask were 5.36+4.38 and 5.7+2.99 for fabric and two ply disposable masks respectively and were 0.96+1.06 (P<0.001) and 0.7+0.87 (P=0) at 30 min; 2.33+1.42 (P<0.001) and 2.36+1.03 (P=0) at 60 min; 3.23+1.54 (P=0.007) and 4.16+1.78 (P=0.011) at 90 min; 5.63+4.02 (P=0.67) and 4.9+1.98 (P=0.161) at 120 min and 7.03+4.45 (P=0.019) and 5.6+2.21 (P=0.951) at 150min respectively. The counts neared pre-wear level by two hours. There was no significant difference between fabric and two ply disposable masks.

Conclusion:

Facemasks significantly decrease bacterial dispersal from wearer to surrounding environment. Efficacy of facemask is limited and after two hours of continuous use they become almost ineffective. The moisture generated could be contributing factor for this observation. Washable and reusable fabric face masks used in low resource settings are as effective as two ply disposable face masks. These must have a thread count around 180 - 200 per sq inch. The face masks must be changed after use for two hours.

O31 The Senegalese experience in implementing “standard precautions” in limited resource settings

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In Senegal, the recommendations from the National Program to Fight Nosocomial Infections (PRONALIN) have been translated into an operational roadmap and proposed to all care facilities. The activities of the roadmap are based on organizational measures, but also on basic technical processes within the framework of “standard precautions”. A training supervision with a performance rating grid is conducted by the

PRONALIN every six-months to estimate, correct and direct activities for a continuous improvement of the implementation of the roadmap.

Results of the first national supervision: a national performance rate was 21.07% with wide differences among regions and among facilities.

Results of the second national supervision currently in progress: the national performance rate is about 40% after touring 10 of the country's 14 regions, and variations significantly decreased.

All situational analyses conducted for the standard precautions processes (hand hygiene, waste management, biocleaning of premises and BEA management) revealed low performance (inadequate or basic) levels. All difficulties are reviewed: lack of human and material resources; instability and lack of executive staff; lack of experience in working conditions as the use of multidisciplinary teams and the quality improvement approach. The indispensable perspectives are presented: supplying technical tools, as well as material and human resources, pursuing training supervisions and partnerships with the numerous national programs that now understand that they are cross-fertilizing with the PRONALIN, the USAID Healthcare Improvement Program, HIV, TB, EPI, Safety Injection, Reproductive health, etc. All these well funded programs can bring additional means for the activities.

O32 Prevention and care of TB in a medical out-patient department: designing, implementing and evaluating a workplace TB control programme in South Africa

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Introduction/aims:

Healthcare workers (HCW) are at greater risk of exposure to Tuberculosis (TB) than the general population. Pelonomi is a large regional hospital in

Free State province where 60 new TB patients are registered in the medical out patient department (OPD) each month. This study aims to assess gaps in knowledge and practice and to improve infection control by making recommendations for policy and practice to protect HCWs and patients from nosocomial transmission of TB.

Interventions:

Anonymous, self-administered questionnaires assessing knowledge and practice regarding TB infection control were distributed to all staff in OPD (n=22). A workplace assessment checklist to assess managerial, administrative, environmental and personal protective equipment items was also conducted. These tools were used to identify gaps in infection control practices, document areas for improvement and implement change management processes.

Results:

Most questionnaire respondents were female (71%), many were nurses (33%) and a large proportion has worked in the facility for several years (median =18 years, range=2-42 years). Only 24% reported that they are screened annually for TB. Approximately half of respondents (47%) answered questions related to personal protective equipment (PPE) correctly. Impressively, 78% stated that they knew when and how to control hazards at the source, however, only 33% answered questions related to hand hygiene correctly. Nineteen percent of respondents knew when and how to use other PPE such as eye protection. Questions assessing infection control practice demonstrated inadequate and inappropriate use of N95 respirators when caring for patients with TB. However, 84% of respondents reported that they ask coughing patients to practice respiratory etiquette. Observations recorded during the workplace assessment confirmed findings from the practice section of the questionnaire, and additional managerial and administrative factors limiting implementation of infection prevention and control measures (i.e. lack of training) were also identified.

Conclusions:

HCWs surveyed do not possess the knowledge necessary to protect them from TB in the workplace. Needs assessments using tools such as workplace assessment checklists and worker knowledge, attitudes and practice questionnaires are useful ways to inform the development and implementation of new TB infection control programs, services and educational initiatives.

What are we surveying? It's all about definitions

O33

Egil Lingaas

University Hospital, Oslo, Norway

Surveillance of healthcare-associated infections (HAIs), i.e. data collection, epidemiological analysis and dissemination of surveillance finding is an important component of an effective infection control program. But surveillance data are also increasingly used for benchmarking, and in many countries public reporting of infection rates has become mandatory over the last few years. For all purposes, it is of paramount importance that the data are valid and reproducible and that data collectors are able to identify infections consistently. Therefore, use of uniform definitions is critical both for internal hospital use and for comparison between institutions, as well as for submitting data to aggregated national or international databases and to scientific journals. The most extensively used definitions are those developed by Centers for Disease Control and Prevention (CDC), USA. They were initially issued more than 40 years ago, and have later been revised several times, the most recent modification being implemented January 1st 2012. In 2002 the World Health Organization launched a set of simplified criteria to be used in facilities with limited access to sophisticated diagnostic techniques. European Centre for Disease Prevention and Control (ECDC) has also recently published definitions which to some extent differ from those of CDC. The definitions used will therefore influence the results. Also, due to their complexity, appropriate training of data collection personnel is critical to ensure reliability and reproducibility.

O34 Process surveillance**Judith Richards**

Faculty of Medicine, University of East Anglia, Norwich, UK

Well designed health care surveillance programmes are essential in underpinning all other aspects of an institution's infection prevention and control programme. While outcome surveillance provides the necessary data regarding the end result, process surveillance verifies that procedures and agreed standards are being adhered to. Process surveillance has been likened to ongoing audit of practice, and has several key elements:

Areas chosen for these types of surveillance can be taken from the infection prevention and control programme, thus becoming immediate and relevant. They are based on validated evidence, and help to provide instant feed back to clinical practitioners.

The advantages and disadvantages of process surveillance will be reviewed in detail, and examples of possible areas for audit will be provided.

The incorporation of standards into bundles, and the use of liaison personnel to deliver process surveillance activities will be explored.

resources. In addition, surveillance data can be used to compare infection rates between healthcare facilities, to convince the clinical team to adopt recommended practices, and to help evaluate infection control measures.

However, surveillance is an expensive and time consuming business. It requires trained infection control personnel, IT support, admin clerical staff for recording data, a statistician and good microbiology laboratory support. Therefore, it is essential that before embarking on any type of surveillance, the objectives must be clearly defined from the very outset.

Different methods of surveillance exist and the type of surveillance method depends on local factors, i.e. the type and size of hospital, case mix and availability of resources. Continuous surveillance of an entire healthcare facility is expensive, requiring resources and a well-organized reporting system. Total surveillance is not cost effective and should not be performed. Targeted surveillance aimed at high risk areas and/or type of infection/procedure is more cost effective and manageable and should be used in all healthcare facilities.

This presentation will discuss the practicability on how to conduct surveillance, and will also discuss the limitations and pitfalls associated with outcome surveillance.

O35 Outcome surveillance**Nizam Damani**

Craigavon Area Hospital, Portadown, Northern Ireland, UK

The surveillance of healthcare associated infections (HCAs) can be performed by counting outcomes (outcome surveillance) and monitoring processes (process surveillance). Basic surveillance is an essential component of all infection control programmes with the aim to identify outbreaks and to establish the endemic/base rate of infections. The data can be used to identify preventable infections so that resources are targeted in high priority areas requiring minimum

Using audit tools to improve patient care in the UK – a practice perspective **O36****Patricia Cattini**

Infection Prevention Society / Royal Brompton and Harefield NHS Foundation Trust, London, UK

The process of audit became popular in the 1990s with the creation of 'Clinical Audit Teams' in trusts throughout the UK. The concept of the audit cycle for mapping process outcomes was very suited to infection prevention and control and was implemented enthusiastically. An early example of a widely used audit tool was that devised by the then ICNA West

Midlands branch. This tool was adapted and used by teams throughout the UK to demonstrate compliance with policies and direct action for improvement.

With the introduction by the Department of Health (England) in 2005 of 'Saving Lives', there has been a shift in focus to use of 'high impact interventions (HII's) which are essentially care bundles which if adhered to will lead to a specified outcome. The Saving Lives HII's focused on high risk procedures such as intravenous line insertion and prevention of ventilator associated pneumonia, which if targeted for improvement would literally 'save lives'.

The latest evolution in audit from IPS is a suite of audit tools which are designed to enable detailed measurement of all aspects of practice and the environment thus establishing baseline compliance with standards and allowing identification of areas for improvement. The tools are available through the IPS and will help infection prevention practitioners to achieve our goal that 'no person is harmed by a preventable infection'.

The speaker will give examples of audit tools and show how they have been used in practice.

O37 **Quality improvement and the development of quality improvement tools – how does this differ from audit?**

Neil Wigglesworth

Public Health Wales, Cardiff, Wales, UK

If quality is defined using The Institute of Medicine criteria: safe, effective, patient-centred, timely, equitable and efficient, then quality improvement is, arguably, any approach, including traditional audit, that seeks to effect improvements in these areas. Currently however; 'quality improvement' is taken to encompass a number of strategies and approaches, often drawn from other industries/sectors, such as systems thinking, a focus on the reliability of processes (reducing variation), small tests of change and process measurement and change. This thinking influenced the development of the Infection Prevention Society (IPS)

Quality Improvement Tools, as tools that can facilitate the measurement of infection prevention processes and 'measurement for improvement'. This presentation will briefly introduce some quality improvement approaches and discuss the nature of measurement in this context, comparing this with traditional clinical audit and approaches to change. In addition there will be a brief overview of the IPS tools including scope, structure and how to access them. Other presentations will discuss identification of the evidence base that informs these tools and their use in practice.

Using quality improvement tools safely - how do you use evidence to inform content? **O38**

Claire Kilpatrick

Infection Prevention Society, Glasgow, Scotland, UK

Despite the lack of traditional high quality evidence for infection prevention, there exists a critical need to ensure recommendations, based on the body of evidence that is available, are issued for use in practice. These have often been informed by expert opinion and have included a multitude of 'practice actions' thought to be critical in infection prevention. To add to this quagmire of information, during the past decades concerns have also been highlighted regarding guidance not always being successfully translated into practice even when it is available.

One way of improving the content and implementation of guidance into practice is by the identification of a concise set of key recommendations which if applied will improve practice and outcome. This is the foundation of 'care bundles' and other quality improvement tools which rely on both available evidence and decisions being made to provide, in this instance, a short set of effective infection prevention steps. The IPS among others recognised the importance of providing such valuable guidance covering the priority areas for prevention of prevalent healthcare associated infections and a vital step has been to undertake a methodical approach to informing the content. This presentation will describe approaches that can be taken as well as evidence controversies behind some content of infection prevention bundle recommendations.

O39 The global approach to combat antimicrobial resistance

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The discovery of antibiotics and other antimicrobials has dramatically changed human and veterinary medicine, preventing and curing infections, saving millions of lives. Through the natural process of adaptation, bacteria and other microorganisms eventually become resistant to antimicrobial treatment. However, the rate at which resistance emerges is greatly accelerated by the overuse and misuse of antimicrobials. As currently available antimicrobials lose their effectiveness, and only very few new products are being developed, many types of infection are becoming life threatening again and surgical procedures hazardous.

The impact of antimicrobial resistance is enormous, not only through increased health care costs, but also loss of income and loss of lives. As such, antimicrobial resistance is not only a medical issue, but also a social and economical one. In addition, the emergence of antimicrobial resistance does not respect borders, man-made or between animal species, therefore requiring an international effort and a comprehensive or "One Health" approach.

The World Health Organization (WHO) is renewing its efforts to combat antimicrobial resistance globally and assist countries with the development and implementation of national strategies. Using its convening power, WHO is leading the effort to coordinate international and intersectoral planning and make better use of existing resources, experience and expertise. WHO promotes action to strengthen surveillance and laboratory capacity, promote rational use of medicines, enhance infection prevention and control, assure access to essential medicines, foster innovation, perform research and develop new tools. This is urgent, for: No action today, no cure tomorrow.

O40 Combating antimicrobial resistance: a country perspective

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²State University of Medicine and Pharmacy "Nicolae Testemitanu", Chisinau, Republic of Moldova

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Background:

Antimicrobial resistance (AMR) is a public health problem in the Republic of Moldova that affects the quality of life and increases the medical and social costs.

Methodology:

The epidemiological data of nosocomial infections and the laboratory results of clinical samples from the different health care settings there were analyzed.

Results:

The analyses of the laboratory results of the clinical samples from the different health care settings demonstrate the higher AMR in *K. pneumoniae* (70 - 90%), *P. aeruginosa* (66.5%), *E. coli* (63.2%), and *Acinetobacter* spp. (60 - 93%). About 60% of the investigated strains have AMR to 6 and more antibiotics. The higher AMR was determined to the penicillin (77 - 97%) and cephalosporin (83 - 95%). In the clinical samples from the infectious units the multi - resistance to antibiotics was established for *Shigella* spp. - to 13 antibiotics; *Salmonella* spp. - to 12 antibiotics, *Staphylococcus* spp. - to 9 antibiotics. In the new cases of TB registered in the Republic of Moldova, MDR - TB increased from 0.5% in 1995 to 26.1 % in 2011.

Conclusions:

There is an irrational use of antimicrobial medicines in the health care settings of the Republic of Moldova that provides favorable conditions for AMR to persist. Infection prevention and control in hospitals;

surveillance on AMR and antimicrobial consumption in human medicines; awareness on the appropriate use of antimicrobials have to be improved. The National Strategy on combating the AMR based on the WHO and EC recommendation has to be approved.

O41 **Developing strategies to limit emergence and spread of antimicrobial resistance in health care settings**

Sergey Eremin

World Health Organization, Geneva, Switzerland

Using the World Health Day 2011 policy package framework, WHO is engaging with various partners in combating antimicrobial drug resistance (AMR). One of the main immediate targets is to reduce AMR emergence and spread through strengthening of infection prevention and control in health care (HC). In July 2012, the WHO experts and members of the Global Infection Prevention and Control Network (GIPCN) defined the scope of new WHO Guidelines on Limiting Antimicrobial Resistance Emergence and Spread in Health Care Settings, including the identification of areas of potential controversy and key questions for critical literature reviews.

In order to limit the spread of AMR, it is most important to ensure that standard infection control precautions are applied, and that infection prevention and control (IPC) programmes are implemented in a systematic way, with all core components included. The current widely adopted “disease-specific” approach (when individual species and even strains of drug-resistant organisms are targeted) is essentially flawed and involves practices that remain controversial. Developing WHO recommendations on the additional precautions will require a comprehensive assessment of the available evidence and ensuring that the process to develop the recommendations is clear and transparent.

Minimizing the risk of emergence of resistant microorganisms in HC requires implementation of antimicrobial stewardship programmes which should allow selecting appropriate drugs and optimizing their doses and duration while minimizing adverse effects and selection pressure.

Antimicrobial stewardship and counteracting microorganisms spread are essential elements of IPC strategies to combat AMR in HC, and they should be informed by AMR surveillance.

Multiresistant bacteria - up the creek without a paddle!

O42

Gunnar Kalmeter

Clinical Microbiology, Central Hospital, Växjö, Sweden

Antimicrobial resistance development is accelerating. It is in all species and for almost all antimicrobial agents. It threatens modern healthcare and it sabotages economically viable treatment alternatives in low-resource countries. We are so far unsuccessful in staying the problem. Mankind is not really closer to accepting the harsh measures necessary to severely curtail the easy access to and use of antibiotics in human and veterinary medicine. There are no real new antibiotics on the horizon. Reversability of antimicrobial resistance through limiting the use of the drugs has limited if any success. We seem to continue to pollute our environment during the processing of waste in manufacturing processes. Preventing the spread of resistant or even exceptionally resistant bacteria in society or across borders fails. However, there is evidence that we can prevent the spread of multiresistant bacteria in healthcare but it is costing us - blood, sweat and tears and it is not cheap. It goes into the organisation of health care, the building of health care facilities, the education and breaking of habits of staff, and into the prudent use of antibiotics. The question is, are we too late? Are we up the creek without the paddle?

Five years of survey of healthcare associated infection indicators in Croatian hospitals

O43

Smilja Kalenic

University of Zagreb School of Medicine, Croatia

Healthcare associated infection (HAI) prevention and control (P&C) was regulated in Croatia by first ordinance issued 1994, revised till now 3 times. In

2005 MoH started yearly survey of HAI P&C indicators on questionnaire sent in January for the preceding year to all hospitals, according to the 2002 ordinance. Structure indicators surveyed are: composition of infection control committee (ICC) and team (ICT), hospital programme, yearly plan, protocols. Process indicators are: meetings of ICC and ICT, education, audits, alcohol consumption, sharps incidents, vaccination against HBV and influenza. Outcome indicators are: SSI, ICU infections, CDI, MRSA, other MDRO, and outbreaks. In 2006, only 50% of hospitals had proper ICC and 40% proper ICT, while in 2010 this was 60% and 75%. Educated nurses in 2006 had 55% of hospitals, while in 2010 the number decreased to 45% as the new nurses took the position. All hospitals had yearly plan of activities. Rare hospitals organized education in HAI prevention for new employees, and all hospitals perform periodically such education for hospital staff. In 2010, 80% of hospitals performed at least some audits. In 2006 only 70% of hospitals reported sharp incidents, while in 2010 all hospitals reported it. In 2006 only 40% of hospitals reported SSI, and about 50% ICU infections, while in 2010 more than 60% reported SSI and ICU infections, but there are huge differences in rates between hospitals. Yearly survey of indicators and a feedback to hospitals had an impact in improving structure and processes in HAI P&C in Croatia.

O44 Education for hospital acquired infection prevention and control: from the beginning

Ana Budimir

University of Zagreb School of Medicine and University Clinical Centre Zagreb, Croatia

Since the very beginning of infection control education in Croatia, there were several types of education for professionals in HCAI prevention and control:

1. Continuing medical education courses-organized in early 1990-ties by the Croatian Society for Medical Microbiology and Parasitology (a 2-3 day course in the field of HCAI prevention and control for microbiologists); The Reference Centre for Hospital Infections (RCHI), in 1999 initiated a program of education, in the form of short 2-3 day

courses in specific topics in infection prevention and control, for nurses and physicians.

2. Basic course for nurses- in 2005 the RCHI organizes a comprehensive "Basic education of nurses for infection control", with 300 hours. By the end of 2010, three courses have been held, and 66 nurses (62% of all infection control nurses in Croatia) passed these courses. A certificate, valid for recertification as a general nurse and recognized by the Nurses Chamber, is issued on completion. In our courses, several nurses from Bosnia&Herzegovina and from Macedonia were participating.
3. Master diploma for nurses: in the School of Nursing in Zagreb a master program for the prevention and control of HCAI is existing.
4. PhD for physicians- PhD degree in infection control with number of young professionals, mainly microbiologists, but also a few surgeons have either completed or are currently working on their thesis in the field of infection control.
5. Since 2012, a 300 hour course for infection control professionals based on TRICE competences, started at University of Zagreb School of Medicine.

Point prevalence survey (PPS) on healthcare-associated infections (HCAIs) and antimicrobial use in acute care hospitals

O45

Zrinka Bošnjak

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In 2009, ECDC developed a plan to survey prevalence of infections associated with health care (HAI) and the use of antimicrobials in acute care hospitals in Europe. The aim of this surveillance is to assess the prevalence of HAI and the use of antimicrobials, a description of patients, invasive procedures, infections, prescribing of antimicrobial drugs according to the type of patients, departments and clinics and compare it throughout the EU countries. Importance of surveillance is the comparison of results at local, regional, national and EU level. The criterion for participation is that the institution is an acute care hospital. The surveillance included patients admitted to the department before 8:00 a.m. and not discharged from the ward at the

time of the survey. Patients who were temporarily away from the ward (e.g., for medical imaging, endoscopy, surgery) still had to be included in the survey. Day case admissions, outpatients (including patients attending the hospital for haemodialysis) and patients at the accident and emergency department were excluded. Data were collected in two ways: standard and light according to a standardized form for point prevalence surveillance (PPS), which was formulated and approved by the ECDC. Hospitals entered their data directly into an adapted version of the ESAC WebPPS. Observation period of our PPS was from 01-07 to 13-07-2010. The patient-based protocol should be preferred for the ECDC EU-wide PPS of HAI and antimicrobial use as it allows collection of detailed data and subsequent analyses of risk factors for HAI and antimicrobial use.

O46 **Environmental source of a multi-resistant *Pseudomonas* in a Swedish burns center**

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Background:

Shortly after the reopening of the Burn Center in a completely new ward in May 2010, a severely burned person of Mexican origin was admitted. This patient was colonised with a multi-resistant carbapenem-resistant *Pseudomonas aeruginosa* harbouring a metallo-beta-lactamase of the SIM-type. During subsequent three months five more patients were colonised with a multi-resistant *P. aeruginosa*.

Method:

The outbreak investigation included finding epidemiologic links between patients. Environmental samples were taken from surfaces in the operation theatre, shower room and the portable radiograph using a modified method described before.¹ Taps in the shower room and patients rooms, sinks and showers were sampled. Isolates were genotyped by arbitrarily-primed PCR. All personnel were educated in hand hygiene, all nursing routines and cleaning routines were reinforced.

Results:

Epidemiological links existed between the shower room and the operating theatre. Environmental cultures were positive in the operating theatre. When cleaning procedures were reinforced the strain disappeared from the environment and no other patients have been positive for the outbreak strain since August 2011.

Discussion and conclusion:

There is a risk of transmission of bacteria between patients when wards are moved to new premises. New routines must be implemented based on the new localities. The current outbreak was explained by insufficient behavioural and cleaning routines in the operation theatre. The prime importance of hand hygiene to prevent transmission between environment and patients is emphasised.

References:

1. Levin PD, et al. Contamination of Portable Radiograph Equipment With Resistant Bacteria in the ICU. *CHEST* 2009; **136**: 426-432.

O47 **Detection of Carbapenemase resistant *Acinetobacter baumannii* international (European) clone II lineage in surgical intensive care unit - Clinical Center Skopje**

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Institute for Microbiology and Parasitology, Medical Faculty Skopje, Macedonia

Acinetobacter spp. has great capacity to survive in hospital environment, and good transmission between patients from human or environmental reservoirs. This microorganism has also capability of very fast acquisition drug-resistance. Carbapenems are the drug of choice in these cases, but according to CDC Atlanta resistance to carbapenems has increased from 9 %. In 1995 to 40% in 2004. The goal of the study was to confirm first isolated carbapenemase-resistant strains of *Acinetobacter baumannii* isolated from patients in surgical ICU by PCR detection of carbapenemase resistance genes and to check clone lineage.

Eight strains of *Acinetobacter baumannii* isolated from intubated patients in surgical ICU in Skopje have

been isolated by classical microbiological procedure and confirmed by VITEK technique. Carbapenemase-resistance has been detected by disc diffusion and automated VITEK antibiotic susceptibility testing.

PFGE has shown three distinct strains among the tested representatives designated as UKIM01AC-1 (5 strains), UKIM01AC-2 (two strains) and 642/2 (one strain).

All representatives of UKIM01AC-1 were PCR positive for bla (OXA-23-like), in addition to the bla (OXA-51-like) gene which is intrinsic in *Acinetobacter baumannii*. All isolated strains belong to European clone II lineage.

O48 **Impact of a multifaceted intervention to improve hand hygiene adherence (HHA) in an intensive care unit of adults (AICU) of Argentina**

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British Hospital Buenos Aires, Argentina

Introduction:

Hand hygiene is an effective tool for preventing health care associated infections (HCAI). Despite this, adherence is often poor.

Objective:

To assess the impact of the implementation of a multifaceted intervention to improve HHA in an AICU.

Material and methods:

A quasi experimental study in the AICU of a university, high complexity acute general hospital. A multidisciplinary team planned and implemented the interventions according to the Guide for the Implementation of Multimodal Strategy for Improving Hand Hygiene (WHO), over the following measures: specific interviews for barriers detection, signed letters of institutional commitment (leadership), rounds of strengthening workplace safety climate on all shifts with institutional leadership. Baseline measurement: October 2009; start of the intervention: November 2009; last post-intervention measurement: April

2012. HHA rate was calculated according to WHO methodology. Chi square test with Yates correction was used for compare test results.

Results:

HHA basal and last post intervention rate were respectively: 48.9% (IC 95% 43.44-54.38) and 93.5% (IC 95% 87.6-96.88). Chi square test with Yates correction: 73.15 $p < 0.0000001$. The improvement of HHA, attributable to the intervention, was 44.65%.

Conclusions:

The implementation of multimodal strategies suggested by the WHO was highly effective in improving the HHA.

Containment programmes with limited resources – injection safety

O49

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Background:

Injection safety has been associated with mortality and morbidity from the transmission of infections/diseases which can be prevented with containment programmes that encourage best practices especially where the burden is highest in low resource countries. Sharps management in the healthcare facilities is important in controlling needle stick injuries and subsequent infection control among healthcare workers, waste handlers and the communities at large.

Intervention:

Low resource countries' programs are cost effective along the World Health Organization technical approaches in a sustainable way by working with and through government structures and relevant stakeholders for policy development and implementation. Training and capacity building of relevant stakeholders, skill improvement for intervention, supplies of seed stock of safe injection commodities, behavioral communication and changes to effect new skills, appropriate healthcare waste

management and support monitoring and evaluation to guide intervention to effect an impact. Investors are encouraged to manufacture injection safety commodities in-country to support the intervention including sharp containment. Community interventions are done through existing credible structures to reduce unnecessary injections and healthcare waste management done with agreed minimum best practice standards at health facilities' level and working also through communities' involvement.

Challenges:

Health system is generally weak and there are attrition of trained personnel due to brain drain and healthcare workers behavioral change is rather gradual.

O50 What are the pitfalls for implementing antimicrobial stewardship?

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Antibiotic resistance is now recognized globally as a major public health threat. In Africa these are not limited to the usual bacterial agents like multidrug resistant gram-negative and gram-positive organisms but there is a high burden of multidrug resistant tuberculosis, malaria and increasing resistance in the Human Immunodeficiency Virus. The spread of antibiotic resistant organisms in Africa is compounded by problems of mass poverty, rapid urbanization, weak infrastructure and health care systems as well as the easy availability of antibiotics. However there is an absence of data on the actual burden of antibiotic resistant organisms on the continent. In 2011, the World Health Organization produced a 6 point policy package for the containment of antibiotic resistance which include:

- surveillance of antimicrobial resistance and use;
- rational antimicrobial use and regulation;
- antimicrobial use in animal husbandry;
- infection prevention and control;
- fostering innovations and
- political commitment.

Implementing sustainable antibiotic stewardship programs will require political commitment at both national and organizational levels, investment in data collection strategies as well as strengthening of human and infrastructural capacity.

Infection prevention and control training in low to middle income countries - examples from Africa

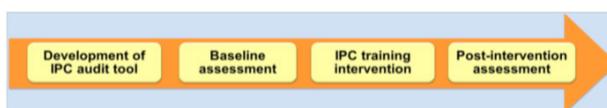
O51

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Infection prevention and control (IPC) training is the cornerstone of sound IPC policies and practices. Education and training, like all aspects of healthcare, is important to ensure good IPC practice. The socio economic conditions in various countries, especially low to middle income (LMI) countries have a major impact on the understanding and delivery of IPC towards safe healthcare practice. In many countries, IPC systems may be in place but are not adequately acknowledged and thus delivery suffers. There is confusion amongst healthcare workers (HCW) since the teaching is based on concepts which are alien to them and their implementation is not possible either due to the lack of financial or staffing resources.

Contextually appropriate IPC training programmes have been developed at the Unit for Infection Prevention and Control (UIPC), Stellenbosch University. The programmes take into account prevailing local conditions while embracing the principles but not necessarily the practice of IPC of the countries from which many IPC policies have been copied.



A baseline assessment of the general infrastructure of the healthcare facilities, knowledge of the HCWs, IPC provisions available, the application of these provisions to clinical practice and patient experience of IPC delivery. The deficiencies noted in the baseline assessment are emphasised in a 5-day tailor-made *Introduction to IPC for Healthcare workers* course. The trained HCWs are expected to implement what they have learnt and a subsequent post training evaluation documents the improvement in practice and any existing areas requiring attention. Trainers are selected from those that have completed the introductory course and they are taught how to teach adults. In Africa the spoken word and drama (participatory) are customarily methods for training - more so than the written word (self teaching). At the end of this 5- day *Train-the-Trainer in IPC course*, the participants must train at least five students each. The latter will be examined by the UIPC evaluators and if 50% of IPC information has been transferred to them, the trainers will receive a certificate of competence as an IPC trainer. This method has shown an improvement in knowledge of 25% or more and has greatly improved the application of IPC within LMI countries. The UIPC offers further articulated short courses (6 months) for IPC practitioners and a Postgraduate Diploma in IPC (part-time over 2 years) and a research-based Masters in IPC.

O52 CHICA Workshop: Outbreak management

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Carol Goldman and Jim Gauthier will discuss outbreaks and the steps needed to limit transmission, and bring an outbreak to a quick end. Participants will discuss questions posed as they work through the outbreak steps, with Carol and Jim's personal experience with unusual outbreaks being the focus.

Teaching laboratory of prevention and control of healthcare-related infections. A multidisciplinary experience

O53

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Introduction/aims:

To obtain success in prevention and control of healthcare-related infections (HRI) is necessary appropriate knowledge by the healthcare team, training of human resources and support of health managers. We describe the creation and development of the Teaching Laboratory in Prevention and Control of Healthcare-Related Infections (TLPC-HRI), in a public federal University of Rio de Janeiro State, Brazil.

Interventions:

We related experience of the development process and following of actions of the TLPC-HRI.

Results:

The TLPC-HRI was created in September 2011, with aim to perform effective actions for prevention of HRI on all levels of healthcare, providing knowledge, training human resources of different areas and create research tools to resolve problems related to this matter considering specificity of professionals. The laboratory is formally linked to a public University as an extension program, at a total cost of \$4500.00. Training of human resources was based in practical lessons and offered to students and healthcare of all levels of assistance and staff of the institution. Practices were performed utilizing anatomic simulators to improve participation and motivation. The contents of the course covered actions of prevention of infection also in hospital as in others healthcare scenarios such as outpatient clinics, rehabilitation hospitals, doctor's offices and pre-hospital care. The course was evaluated through a pre and post test that was applied in all people and measures acquisition of competences related to prevention of healthcare related infections. We trained initially 20 students and staff of a basic health unit (UBS) of Niterói City, Rio de Janeiro. The course promoted a better occupation of physical space of the unit according infection control rules, adequate

store of vaccines and a correct garbage packaging. The laboratory actions were supported by the direction of university hospital, hospital infection control committee and coordination of training of students and staffs in basic unit health.

Conclusions:

The creation of the TLPC-HRI is a low-cost initiative that can be reproduced in many parts of the world and involves healthcare professionals of different areas of assistance and in different phases of graduation. Use of anatomic simulators was an important tool of motivation between healthcare works. Success of program depends also of involving of administrative and direction of institutions.

O54 Impact of repeated multimodal supervision programs on the central line associated blood stream infections rates in a tertiary care hospital in India

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Introduction:

Central-line associated blood-stream infections (CLABSI) are associated with significant morbidity, mortality and costs. Multimodal supervision programs are effective in bringing down the rates of CLABSI, but repeated efforts are required to sustain this in view of the high attrition rates, fixed mindsets and short-memory spans of healthcare workers. Hence this study was carried out to see the impact of two multimodal supervision programs on the rates of CLABSI.

Interventions:

The study was conducted in a 300 bedded tertiary care private hospital for a 3 years period (Jan 2009-Dec 2011) in 3 phases. In Phase 1 (Jan 2009-Jun 2009), CLABSI cases were tracked/month(CDC-NNIS and NHSN) and the non-optimal patient care practices were detected by root-cause analysis. Based on this, the first intervention program was introduced in July 2009 which included the bundle components for the prevention of CLABSI with a special emphasis on hand-hygiene and introduction of needleless connectors. The CLABSI rates were analyzed in the Phase 2 (Jul 2009-Jun 2010)

at the end of which, a second intervention program was introduced in June 2010. This included corrective actions taken for deficiencies detected, reiteration of bundle components, avoiding unnecessary vascular access (scrub-the-hub campaign), formation of an active, dedicated and trained central-line team and trolley, regular training and auditing and above all involvement of senior doctors and management. Phase 3 (Jul 2010-Dec 2011) included the analysis of the CLABSI rates in pre-and post-intervention phases during the three year period.

Results:

The CLABSI rates varied between 0-9.6 infections/1000 catheter days in 36 months period, the mean being 3.14. Before the first supervision program, the mean CLABSI rate for Phase 1 (first 6 months) was 5.18 and Phase 2 was 4.39 (15.3% decrease, $p>0.05$). Phase 3 showed a significant decrease (54.9%) in mean CLABSI rates-1.98 ($p<0.05$). In Phase 3 21.9% and 82.5% increase was observed in hand hygiene and daily review of line necessity respectively as compared to Phase 2. Overall 61.8% decrease ($R^2=0.13$) was seen in CLABSI rates between the start and end of study period.

Conclusions:

Repeated multimodal supervision programs followed by post-program analysis & feedback effectively reduces CLABSI rates. Formation of dedicated central-line teams and involvement of senior management and doctors acted as boosters leading to significant drop in CLABSI rates.

Effect of long-term disinfection on common clinical contact surfaces

O55

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Objective:

This study's aim was to measure the effect long-term disinfection had on common clinical environmental surfaces.

Methods:

Groups of ten specimens (10 cm squares) were made of pebbled vinyl, brushed aluminum, Formica, stainless steel and Plexiglas. Wipes were Birex (dual phenolic) and deionized water (same wipe fabric and liquid amounts). Used was a wipe-discard-wipe method with two towelettes per two, three or five soiled specimens. Each specimen received 1920 disinfections (an estimated year's exposure). After 100 disinfections, 0.1 mL of defibrinated sheep blood went onto the center 5 cm² of each specimen, followed by an hour of drying, disinfection and then testing. PBS-moistened swabs sampled half the center area and went into 2.0 mL of PBS and vortexed. Then, a Hemastix dipstick test determined the amount of blood present. A 3M ATP swab then sampled the remaining area.

Results:

T-tests compared starting scores with intermediate and those after 1920 cleanings. In most cases, disinfectant specimens produced scores similar to those of water ($p > 0.05$). In some cases, disinfectant specimens had less residual blood and ATP than water cleaned specimens ($p < 0.01$).

Conclusions:

Disinfectant wipes produced similar or in some cases, slightly better cleaning than water wipes, suggesting surface changes was due more to wiping action than to the presence of a chemical.

The study was supported in part by Biotrol, Earth City, MO, USA.

O56 Antimicrobial copper prevents horizontal gene transfer of ESBL antibiotic resistance between pathogens on dry touch surfaces

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Horizontal gene transfer (HGT) is largely responsible for increasing incidence of antibiotic-resistant infections worldwide. Whilst studies have focussed on HGT *in vivo*, this work investigates whether the ability of pathogens to persist in the environment, particularly

on touch surfaces, may also play an important role. *Escherichia coli*, virulent clone ST131, and *Klebsiella pneumoniae* encoding extended-spectrum β -lactamase (ESBL) *bla*_{CTX-M-15} and metallo- β -lactamase *bla*_{NDM-1}, respectively, exhibited prolonged survival on stainless steel with approximately 10^4 viable cells remaining from an inoculum of 10^7 cfu per cm² after one month at 21°C. HGT of *bla* to an antibiotic-sensitive but azide-resistant recipient *E. coli* occurred on stainless steel dry touch surfaces and in suspension, but not on dry copper. Conjugation frequency was approximately 10-50 times greater, occurred immediately and resulting transconjugants were more stable with ESBL *E. coli* as donor cell compared to *K. pneumoniae* but *bla*_{NDM-1} transfer increased with time. Transconjugants also exhibited the same resistance profile as donor suggesting multiple gene transfer. Rapid death, inhibition of respiration and destruction of genomic and plasmid DNA of both pathogens occurred on copper alloys accompanied by a reduction in *bla* copy number. Naked *E. coli* DNA degraded on copper at 21°C and 37°C but slowly at 4°C suggesting a direct role for the metal. Persistence of viable pathogenic bacteria on touch surfaces may not only increase risk of infection transmission but also contribute to spread of antibiotic resistance by HGT. The use of copper alloys as antimicrobial touch surfaces may help reduce infection and HGT.

O57 Antimicrobial copper implementation in intensive care unit in Greece: social, medical and financial benefits

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Aim:

The aim of the following prospective, pilot research is to assess the medical-economic impacts in an ICU functioning, before and after antimicrobial copper (Cu+) application.

Method:

Medical and financial impacts of an ICU-General type, with 6 beds were evaluated during December 2010-March 2011, and December 2011-March 2012. We defined the term "ICU bed" and we took into account the DRG of Greek NHS.

Parameters, such as patients' conditions severity APACHE II (Acute Physiology and Chronic Health Evaluation), and SAPS II (Simplified Acute Physiology Score), previous measurements in relation to infections and microbial flora in the ICU surfaces and the reduction of microbial flora in ICU surfaces after the application of antimicrobial copper (Cu⁺), were taken into account. The copper alloy was Cu 63% - Zn 37% (Lead Free) and the objects - surfaces placed were certified.

Results:

At the appointed ICU, there was more than 90% reduction of microbial flora on surfaces and objects with antimicrobial copper (Cu⁺). This decrease affected morbidity, hospitalization time of severity condition patients, and the total operating costs of the ICU, at a significant percentage. The correlations between APACHE II and morbidity (p=0,012) and between Probability of Death and morbidity (p=0,018), were statistically significant. In this report, the hospitalization cost in relation to the pharmaceutical and technical support is analyzed and presented.

Conclusion:

In this pilot study the antimicrobial copper (Cu⁺) implementation positive effects (medical and financial), at an ICU-general type is demonstrated. Under the present economic crisis, the survey results are of particular importance and value.

Earthquake devastation and Infection Prevention management

O58

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The Canterbury Health District Board (CDHB) utilized previous healthcare planning in its response to a series of devastating earthquakes that extensively damaged the infrastructure and healthcare system of Christchurch, New Zealand. Lessons learnt from the September 2010 earthquake contributed to a strong health response when a more devastating earthquake hit five months later. The February 2011 earthquake extensively damaged the infrastructure of the city of Christchurch. This significantly disrupted healthcare provision and put the health of the population at risk. Relocation of acute tertiary inpatients to other hospitals was required as well as evacuation of residents from severely damaged long term care facilities. Welfare centres were set up for displaced Christchurch citizens and tourists. No running water or power and over a 100 kilometres of broken sewage pipes created issues both within the hospitals as well as in the community. Infection Prevention and Control issues facing Christchurch during this time and solutions utilized will be outlined. Key strategies of previous healthcare planning used as part of the framework for disaster management will also be discussed.

Using registry data to determine the spread pattern of MRSA in Norway

O59

Arnold Jensen

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The lecture will be based on a MPH-thesis, where the aim is to give a detailed epidemiological overview of MRSA in Norway 2008-2010, by identifying outbreaks, clusters and "single cases".

O60 Surgical site infections and operating room design and construction

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Surgical site infections (SSI) delay recovery, increase length of stay and are associated with increased morbidity and mortality, so prevention or reduction of SSI is an essential part of patient care. Sources of SSI could be endogenous or exogenous with many risk factors related to breaking the microorganisms chain between patient and health care worker by preventive measure could help a lot in reducing SSI. One of the important measures of prevention is operation room design.

A model for operating room ward design would be as follows:

1. Isolation of operating rooms with well divided transfer area.
2. Installations for ventilation and air conditioning to try to achieve the clean room in which the concentration of airborne particles is controlled.
3. Creation of positive and negative pressure.

Control of environmental quality is a prerequisite for operating room activities including assessment of equipments, ventilation and circulation of working staff.

O61 Ventilation and airborne infection

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The main source of airborne bacteria in a ventilated operating room is the skin of the persons present in the room. The bacteria belong to the normal aerobic and anaerobic skin flora and pose a risk of infection mainly in infection prone implant operations. Dispersers of *S.aureus* constitute a risk of airborne infection in all types of operations. The patient's skin might also be a source of infection through contact transfer of bacteria to the wound during surgical manipulation.

The relative importance of the airborne and contact route of transmission is debated. It has been difficult to identify a safe level of air cleanliness for different kinds of operations. In a British prospective multicentre study comprising over 8000 hip and knee joint replacements a direct relation between number of airborne particles and infection rates was shown and ultra clean air (< 10 cfu/m³) is often recommended for these operations. Technically it is possible to get the air cleanliness you ask for but costs may be substantial. It is important to verify that you get what you purchase. A technical specification regarding prevention of airborne infection in the operating room was produced by the Swedish Standards Institute 2012. A summary of the key issues in the document will be presented.

O62 Operating suite design and logistics – clothing, supplies, cleaning

Ulrika Ransjö

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The design of an operating suite is aimed to ensure good use of the resources present, in order to reduce risks of infection. To achieve this, the flow of patients, personnel, goods and air into and out of the operating room must be considered.

Deep surgical site infections are mainly caused by micro-organisms present in the operating wound before closure. Infective agents may reach the wound through many routes. Airborne particles from the skin of persons present in the operating room may be reduced by ventilation, but also by special clothing worn by the doctors, nurses and auxiliary staff during the operation. Antimicrobial prophylaxis may reduce the risk of infection by 2/3, but only if the organisms are sensitive to the available drugs. The relative roles of ventilation, clothing and antimicrobial prophylaxis will be discussed, as well as available types of clothing. Contact contamination of the wound may occur from the patient's skin, from the skin of the surgical team, and from the instruments used. Skin disinfection of the surgical site, surgical hand disinfection and cleaning/disinfection/sterilization of the instruments used must be properly performed. Cleaning/disinfection of

equipment is also needed. Walls and floors are less important, and attempts to disinfect these are futile and sometimes dangerous.

O63 A conceptual model for development of infection preventionist competency including certification as the core

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The Infection Preventionist (IP) Competency Model developed by the Association for Professionals in Infection Control and Epidemiology (APIC) will be presented. The model illustrates a path for current and future practice in the United States along the infection preventionist's career span. The design of the model will be reviewed as well as the four competency domains and recommended areas for professional development. Leaders from APIC and the Certification Board in Infection Control (CBIC) will discuss how the competency model can support professional development from novice to expert practice and be applied in diverse settings. The importance of certification as the core competency is explained. Relevancy of the IP Competency Model across the career span, across practice settings and other countries will be discussed.

O64 Perspectives from limited resource countries

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Infection prevention and control (IPC) in developing countries is still in the developing phase. Missing of many chapters of the IPC program is representing a big challenge for the establishment of a competent

infection control system, especially at the national level.

In Chile, education and training of IPC nurses is one of the objectives of competency improvement of infection control.

In Egypt, in addition to training, standardization of surveillance according to specific surveillance definitions is now a target in order to get valid data about health-care associated infections. In reference to evidence-based data, improvement of measures of IPC could be achieved.

Norovirus-environmental prevention strategies

O65

Birgitta Lytsy

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Norovirus cause gastroenteritis outbreaks in the community and in health care settings all over the world each year. Outbreaks of norovirus occur typically during the winter season and the reason for that is yet unknown. Nosocomial outbreaks of norovirus has emerged as a serious threat to modern health care, consuming major resources and causing considerable suffering and prolonged hospital stays for infected patients. The virus is highly contagious and can spread rapidly within health care settings by direct and indirect contacts and by contaminated surfaces, water and foodstuff. Large numbers of viruses are shedded within each stool and exposure to small numbers of virus particles may be associated with high rates of infection. Key strategies to prevent the spread of norovirus within health care settings is prompt identification and contact isolation of cases and staff. Other prevention strategies include strict adherence to hand hygiene as well as correct handling of food. Sometimes closing a unit to new patient admissions is the only effective remedy to halt an outbreak. Norovirus is shedded in high numbers from infected patients and contaminate surfaces in the immediate vicinity. Environmental prevention strategies such as the impact of cleaning in stemming outbreaks is discussed. Which cleaning methods and means are effective to prevent

the spread of norovirus in hospital settings? Which level of ambition concerning frequency of cleaning is necessary? Which tensides and disinfectants are most effective?

O66 Hospital cleaning and *Clostridium difficile* infection – fluff or serious stuff

Torbjörn Norén

Örebro University Hospital, Sweden

Emerging evidence is focusing on the importance of cleaning hospital environment. Institutional outbreaks of CDI have become the most common cause of bacterial enteritis in North America and Europe. Now famed epidemics caused by the virulent B1/NAP1/027 strain have since 2002 changed the clinical picture into increased morbidity and mortality. These strains, among other multiresistant *C. difficile*, exhibit a high sporulation capacity resisting disinfection as well as cleaning. Accumulation of spores due to insufficient cleaning of fomites have facilitated transmission and increased risk of recurrence in modern healthcare. Commonly used ethanol hand rubs leave spores unaffected and transmittable. Costly health-care interventions have been instituted together with sodiumhypochlorite in order to control outbreak situations. However, no standard for testing of disinfection of environmental surfaces is currently available in Europe and cleaning routines thus vary a lot between countries. A resting spore resists not only ethanol but, most detergents used as well as radiation and boiling. Sporocidal efficacy in spore solutions is often tested using surrogate bacteria like *Bacillus subtilis* and both hydrogen peroxide and chlorine products are believed to damage the inner membrane to some extent but mechanisms in *C. difficile* is not fully understood. The most commonly used agent in Sweden of today is Virkon® and liberated chlorine compound in this product has been proven partly sporocidal. In outbreak situations mechanical cleaning followed by a hypochlorite solution has been used successfully. Every day cleaning of frequently touched surfaces in wards still relies on mechanical cleaning together with detergents and ethanol.

O67 Bedpans as potential vectors in the transmission of (gastrointestinal) pathogen micro-organisms

Gertie van Knippenberg-Gordebeke

KNIP KNowhow Infection Prevention, consultancy infection prevention, Venlo-Boekend, The Netherlands

Since the International Organization for Standardization (ISO) has published standard nr.15883 for Washer-disinfectors (WD), not much attention has been paid to part 3 that specifies requirements for WD for bedpans and urinebottles. A Dutch study (1990) showed that validation and maintenance of WD was not executed correctly, bedpans and urinebottles were not clean, and responsibilities were vague. In 2010, the study was repeated in Dutch and foreign hospitals.

Questions covered the methods of emptying and cleaning and disinfection, awareness of ISO-15883 and finally if bedpans or WD have played a role in HAIs:

- The response was 77 Dutch hospitals and 53 foreign hospitals.
- WD in place in Western Europe 97% and the rest of the world 64%.
- Macerators in place for 14%.
- Knowledge of ISO -15883 is in Western Europe 76% and in the rest of the world
- Validation and maintenance of WD is not a regular procedure.
- 4 (21%) reported WD and/or bedpans and urinebottles as source of HAIs (Norovirus, *Pseudomonas aeruginosa*, MRSA, *Clostridium difficile*, etc.). Nobody wanted to make these findings public.
- The majority of the responders never searched for this source.

There seems to be a risk for HAIs caused by negligent bedpan management. With the current increase of MDRO, bedpan management must be integrated into quality assurance and patient safety. Only validated and well maintained WD provide a safe product. Further research is needed into the risks for HAIs associated with negligent bedpan management.

O68 Prudent use of antibiotics in hospitals: a European perspective

Dominique L. Monnet

European Centre for Disease Prevention and Control (ECDC), Stockholm, Sweden

Various European Union (EU)-funded projects (ESAC, 2001-2011; ARPAC, 2002-2004; ABS International, 2003-2008), as well as national networks, have documented large variations in antibiotic use in patients in European hospitals. In 2011-2012, the European Centre for Disease Prevention and Control (ECDC) coordinated point prevalence surveys of healthcare-associated infections (HAI) and antimicrobial use in European acute care hospitals and 30 countries agreed to participate. Preliminary results (as of 5 June 2012) from 369 hospitals in 11 countries showed that 6.3% patients had an HAI and 35.4% had received at least one antimicrobial agent for treatment or prophylaxis of an infection.

In November 2001, EU Health Ministers adopted Council Recommendations on the prudent use of antimicrobial agents in human medicine (2002/77/EC). These have since been completed by Council Recommendations on patient safety, including the prevention and control of HAI (2009/C 151/01, June 2009) and several Council Conclusions (June 2008, December 2009 and June 2012). Implementation of the Council Recommendations in EU Member States is regularly evaluated by the European Commission. While several EU Member States are making progress towards prevention and control of antimicrobial resistance and HAI, prudent use of antibiotics in hospitals remains a challenge. Raising awareness about prudent use of antibiotics is a necessity for Europe. The European Antibiotic Awareness Day, a European health initiative coordinated by ECDC, is providing support to national campaigns to raise awareness about prudent use of antibiotics among the general public and health professionals in Europe. A specific toolkit for hospital prescribers is available at: <http://antibiotic.ecdc.europa.eu>.

Poster Presentations

P1 **Hand hygiene in nursing and medical students during training: a study on knowledge, practices and impact on bacterial contamination**

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Aim:

To collect information about knowledge, behavior and hand hygiene (HH) practices in Italian nursing and medical students combining data with hand bacterial contamination before and after a morning training.

Methods:

A questionnaire designed to investigate knowledge on HH and its practical realization was administered to a casual sample of 100 nursing and 100 medical students attending our University. Data collected were associated with hand contamination measured at the entrance and exit of the turn of training.

Results:

All nursing students performed HH during training and the frequency was significantly higher compared to medical students, 39% of which declared not to have done it. At the end of training, hand contamination were significantly reduced in both groups, but more pronounced in nursing students. Scores on the HH knowledge were significantly related to HH practices and self-reported HH compliance and were significantly higher for nursing students. Students were also asked to give their opinion on HH knowledge acquired during the course and a significant increase of adequacy as the medical students progressed through their course was found.

Discussion:

Since the first year of their course, nursing students receive adequate knowledge and consequently apply HH practices during training activities, data confirmed by total bacterial count. Medical students get HH knowledge later and less attention is devoted to these practices also in relation to the reduced occasions of patient contact during their training. This suggested us to anticipate the Hygiene and Public Health teaching before the start of the training activity.

An investigation of antibiotic susceptibility and inducible-beta lactamase (IBL) production of *Pseudomonas aeruginosa* strains

P2

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Introduction:

Pseudomonas aeruginosa (*P. aeruginosa*) is the most common Gram negative pathogen associated with nosocomial infections for instance pneumonia, ear and eye infections, meningitis, skin and soft tissue infections and bacteremia in immunocompromised hosts. *P. aeruginosa* possesses several virulence factors and exhibits intrinsic resistance to a variety of antimicrobials including beta-lactams.

Aim:

The aim of this study was to determine in vitro antibiotic susceptibility and inducible-beta lactamase (IBL) production of 57 *P. aeruginosa* strains which were isolated from external auditory canal.

Methods:

Antimicrobial susceptibility testing was performed by

Kirby Bauer disc diffusion method using imipenem, gentamicin, meropenem, piperacillin-tazobactam, colistin sulphate, amikacin, ciprofloxacin, aztreonam, cefotaxim, ceftriaxone, ceftazidime discs and interpreted as per the clinical and laboratory standards institute recommendations. IBL production of isolates were determined by disc induction test. imipenem discs were used as strong inducers; whereas aztreonam, cefotaxim, ceftriaxone, ceftazidime discs were weak inducers. In addition to antibiotic susceptibility and IBL activity, the metallo-beta lactamase (MBL) production of *P.aeruginosa* isolates were detected by using modified Hodge test.

Results:

The resistance rates of isolates were 91.2% for cefotaxim and ceftriaxone, 24.56% for aztreonam, 10.52% for ceftazidime, 1.75% for amikacin, ciprofloxacin and gentamicin. all isolates were susceptible to imipenem, meropenem, piperacillin-tazobactam and colistin sulphate. IBL activity was detected in 35 of 57 (61.4%) isolates and none of them had MBL production.

Conclusions:

Early detection of IBL and MBL producing isolates has great importance in the on-time control of nosocomial infections, also to know the rates of positive strains are helpful for using appropriate antimicrobials in treatment.

P3 User experience when using a water based hand sanitising mousse in place of alcohol rubs in a hospital setting

Ana Budimir

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Introduction:

Alcohol hand rubs (containing 60 - 70% ethanol / IPA) are not without their problems which can include;

- environmental (facility) damage,
- flammability,
- dryness (xerosis) / dermatitis,
- oxicity (ingestion can be fatal).

Alcohol free hand rubs offering equivalent antimicrobial performance (in terms of EN test standards) are now available which overcome many of the above drawbacks associated with alcohol rubs. World Health Organisation (WHO) guidelines on hand hygiene in healthcare state that ‘...pilot studies aiming to help select [hand hygiene] products at the local level should mainly concentrate on tolerance and user acceptability issues’.

Evaluation aim:

To determine ‘user acceptability’ of a water based hand sanitising mousse when used in a busy hospital microbiology laboratory setting.

Methodology:

A formal two week product evaluation was undertaken using a water based hand sanitising mousse in place of the normal alcohol hand rub.

User feedback was via structured questionnaires upon completion of the evaluation.

Results:

One hundred staff members completed questionnaires. Feedback was overwhelmingly positive in favour of the water based hand mousse (Table 1);

Table 1. Summary of user feedback;

	Water based	Alcohol	No view
Most effective product?	60	14	26
Kindest to your skin?	83	7	10
Which did you prefer?	71	15	14
Easiest to use?	77	7	16

Discussion / conclusion:

This evaluation demonstrates a clear preference for water based hand sanitation compared to alcohol hand rub. With WHO guidelines stating ‘tolerance’ and ‘user acceptability’ should play key roles in product selection the adoption of water based (alcohol free) hand rubs are worthy of serious consideration.

P4 **Impact of hand hygiene campaign on the rate of nosocomial bloodstream infections**

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Introduction:

Following the WHO initiative we conducted an intensive hand hygiene (HH) education in our intensive care unit (ICU). The aim of this study was to analyse the impact of HH campaign on the nosocomial bacteremia rate in our ICU.

Materials and methods:

The adult ICU of the University Hospital for Infectious Diseases has six ICU beds and 12 post-ICU beds. Education in small groups was conducted during September and October 2010 and again in September 2011 followed by compliance evaluation using observation form in November 2011. 77% of staff attended workshops. Episodes of nosocomial bacteraemia in ICU patients were analysed for the first trimesters of 2010, 2011 and 2012.

Results:

A total of 435 opportunities were recorded. HH compliance was high for both doctors (87%) and nurses (80%). The lowest compliance was for nurses for moment 1 (60%) and in 11 out of 19 missed opportunities gloves were worn. Number of episodes per 1000 bed days (BD) in the three periods were as follows: 11.9, 15.1 and 7.3. *Acinetobacter baumannii* was the most frequent causative agent with rates of 6.3, 4.1 and 2.0 per 1000 BD.

Conclusions:

Nosocomial bacteremia rate did not decrease after educational workshops alone but it decreased after educational workshops followed by observership program. Decrease in invasive *A. baumannii* rate was recorded after workshops alone and even further after combining workshops with open observership. The exact impact of HH campaign is difficult to assess as there are many other factors that influence the bacteremia rate in ICU.

The resistance of most frequent causative agents of the healthcare associated infections at the Clinical Center of Serbia in 2006-2011 year

P5

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Introduction:

In a few last years, there has been an increase of the number of resistant HCAI causative agents resulting in the prolonged stay, higher treatment expenses and mortality rate.

Material and methods:

Data on resistance of the causative agents isolated from the biological material during treatment and hospitalization of patients in CCS were obtained from prospective, active epidemiological surveillance and everyday collection of data on HCAI. Cultivation, isolation, identification and testing of sensitivity of causative agents to antimicrobial drugs were performed by standard microbiological methods.

Results:

According to data obtained from blood cultures in CCS in 2011, out of a total number of *Staphylococcus aureus* isolates, 84% were resistant to methicillin. High prevalence rate of MRSA was reported in 2007 year (91%). MRSA obtained from wound swab was lowest in 2009 year (69%) and increased to 84% in 2011. *Enterococcus* spp. is the third most frequent cause of HCAI, accounting 14% out of all HCAI causative agents. The analysis of data for the period 2006-2011 showed the trend of increase of prevalence of VRE. High prevalence rate of VRE (57%) from blood cultures was reported in 2011 year. VRE obtained from urin was lowest in 2007 (7%) and increased to 33% VRE in 2011 year.

In 2011, out of a total number of isolates, 26% of *Klebsiella* spp., 11% *Escherichia coli* and 21% of *Proteus* spp produced ESBLs. The occurrence of metallo- β lactamase (MBL)-producing enterobacterial

strains in 2010 was alerting. 44% of *Klebsiella* spp., 54% of *Escherichia coli* and 42% of *Proteus* spp. produced MBLs. In 2011 year, have been noticed an increase number of MBL *Klebsiella* spp.(61%), but percent of MBL *Escherichia coli* and MBL *Proteus* spp have been decreased (40% and 21%) versus the results in 2010 y. In 2011, 87% of *Acinetobacter* spp. and 47% of *Pseudomonas* spp. isolates were resistant to antimicrobial drugs from carbapenem group and that was the highest rate of CR *Acinetobacter* spp. and *Pseudomonas* spp. isolated during the period 2006-2011 year.

Conclusion:

Establishment of the resistance of most frequent causative is very important for defining the empiric therapy and also is the baseline for implementation of adequate infection control measures.

P6 The results of three different methods of HAI surveillance at the Clinical Center of Vojvodina, Novi Sad, Serbia

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Introduction:

Nosocomial infections have been recognised as one of the major public health problems in our Communicable Diseases Law since 1986. According to that, infection control committees have been obligatory constituted in many hospitals in our province providing infection control programs with different efficiency due to limited resources and absence of infection control personnel.

Material and methods:

The frequency of healthcare-associated infections (HAI) was estimated using the same CDC definitions and applying three different methods: active epidemiological surveillance - incidence study and prevalence study, providing by trained young

epidemiologists from CDC department of IPH and passive surveillance through review of administrative records of HAI from hospital departments.

Results:

In three month incidence study 1339 patients hospitalized at 7 surgical clinics were surveyed. The number of patients with an operation were 1061 (79.2%). The incidence rate of HAIs was 14,6% ranged 7.6 - 16.7% by different surgical departments. In point prevalence study 166 patients hospitalized at the same clinics were surveyed. The number of HAI diagnosed was 14, and prevalence rate of HAI was 8.4%. In three month period 57 administrative records of HAI were reported from surgical departments among 1359 patients admitted, performing incidence rate of 4.2%.

Conclusion:

The data on HAIs should be collected using incidence study as the most sensitive surveillance method. Hospitals should form the infection control team trained to collect data and promote preventive guidelines. In the case of limited resources, infection control programs should focus on specific subpopulation rather than apply less sensitive surveillance methods.

Why do you wash your hands? Does the solution to hand hygiene compliance lie in understanding different types of hand hygiene behaviour– inherent and elective?

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Hand hygiene has been empirically shown to prevent the cross-transmission of hospital acquired infections (HAI). Despite this evidence healthcare professional hand hygiene compliance rates are consistently found to be less than 100%, usually considerably so – around 40% is not an unusual finding in empirical studies.

Recent research suggests that hand hygiene is not a homogenous behaviour, but can be split into two dimensions, inherent and elective.

Following a systematic review of hand hygiene and technology, on-going empirical research at WMG/ University Hospitals Coventry and Warwickshire (UHCW) explores the importance of both human behaviour and domain knowledge when designing interventions to monitor or improve hand hygiene compliance.

Healthcare professionals from UHCW are explicitly involved in the research, investigating the current hand hygiene audit process to identify examples of inherent and elective hand hygiene. A retrospective analysis of past audit data is then being used to test the hypothesis that compliance rates will be higher for examples categorised as inherent.

The implications of this for the potential role of technology or human behaviour as an intervention strategy at each of the specific 5 moments is then to be discussed. Two key questions are posed - Can human behaviour ensure healthcare professionals automatically perform hand hygiene? Are healthcare professionals more likely to need technology to aid their compliance at elective points?

P8 **Outbreak of *Clostridium difficile*-associated diarrhea in the Clinical Center University of Sarajevo, Bosnia and Herzegovina**

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Objectives:

Clostridium difficile is the predominant cause of antibiotic-associated colitis and the leading cause of diarrhoea at hospitalised patients. The aim of this study was to examine the main risk factors for outbreak of *Clostridium difficile*-associated diarrhea in Clinical Center University of Sarajevo.

Methods:

Between November 2011 and May 2012, the increased number of patients with symptoms of severe diarrhea was observed in several clinics of the Clinical Center of the University of Sarajevo (KCUS). Stool samples analysis was done at the Institute for Clinical Microbiology at KCUS with EIA test Serazym® *C. difficile* Toxin A+B (Seramun).

Results:

In total, fifty inpatients were positive on toxin A+B of *C. difficile*. The prior antibiotic therapy was administered to all inpatients, involved mainly a broad-spectrum antibiotic and lasted from 2 to 42 days before the episode of diarrhea. In most of the inpatients, antibiotic therapy was administered as a part of pre-operative prophylaxis and the most of them were aged. On the basis of the number of diagnoses in given period and the fact that all the cases are spatially and temporally related, it is considered as outbreak of *C. difficile*-associated diarrhea.

Conclusion:

Antibiotic therapy and advanced age of patients were the main risk factors for this outbreak. To stop outbreak the following measures were taken: isolation of patients, more severe hygienic measures in accordance with the protocol prepared by the committee and team for hospital infections control, as well as restricted use of antibiotics.

Correlation between ventilator associated-pneumonia (VAP) and the number of days of mechanical ventilation

P9

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Aim:

To investigate the correlation between the occurrence of VAP and the number of days of mechanical ventilation.

Patients and methods:

This prospective research included a total of 270 patients hospitalized at the Intensive Care Unit of the Zadar General Hospital during a six month period (1st January 2011 – 30th June 2011), of whom 50 (18.52%) required mechanical ventilation. Patient data was collected and analyzed from medical records.

Results:

VAP developed in 7 (24%) out of 50 patients on mechanical ventilation. The average number of days on mechanical ventilation was 10.67 (SD±9.23), with the number of days ranging from 1-47. The average number of days of mechanical ventilation in patients who developed VAP was 20.28 (SD±13.72). In patients who did not develop VAP, the average number of days of mechanical ventilation was 9.20 (SD±7.41), ranging from 1-30 days. We confirmed a statistically significant positive correlation between the number of days on mechanical ventilation and the occurrence of VAP (0.856897). Out of 7 patients who developed VAP, in 2 (4%) VAP was classified as early, and in 5 (10%) as late-onset VAP. The rate of VAP per 1000 days of mechanical ventilation was 13, and the percentage of patients who developed VAP with regards to the number of patients who were on mechanical ventilation longer than 48 hours was 14%.

Conclusion:

Obtained statistically significant interconnection between the development of VAP and the number of days of mechanical ventilation shows that VAP occurs more frequently in patients who spend more days on mechanical ventilation.

P10 Factors influencing nurses' compliance with Standard Precautions to avoid exposure to pathogens: a qualitative study

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Introduction:

Nurses are often exposed to pathogens, many of which can cause serious or even lethal infections. Standard

Precautions, a set of guidelines issued by the Centres for Disease Control and Prevention, aim to protect health care professionals and patients from exposure to pathogens. Nevertheless, despite their simplicity and clarity, there is a marked reluctance among nurses to comply with them fully.

Aim:

To gain an in-depth knowledge of the factors that influence nurses' compliance with Standard Precautions in order to avoid exposure to pathogens.

Method:

Four focus groups were organised to elicit nurses' perception on the factors that influence their compliance with Standard Precautions. Thirty nurses were purposively recruited and participated in the discussions. Content analysis of the discussions' transcripts was performed, coding the emerged data into codes representing factors influencing compliance.

Results:

Following data analysis, many factors influencing nurses' compliance with Standard Precautions in order to avoid exposure to pathogens emerged. These factors can influence compliance either positively or negatively.

Conclusion:

Efforts to change current behaviour of inadequate compliance with Standard Precautions among nurses should be based on the knowledge of the factors that influence it. Such knowledge can facilitate in the implementation of preventive programs that may contribute in avoiding of occupational exposure to pathogens.

Stepped wedge trial to improve hand hygiene among health care workers (HCW) in 11 sites in Argentina

P11

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Objectives:

To improve HCW hand hygiene compliance (HHC) in intensive care units (ICU).

Methods:

A stepped wedge trial was conducted in 11 ICUs in Buenos Aires. The components of the intervention, based on a preliminary qualitative assessment, were designed by and delivered through infection control nurses who subsequently interacted with the HCW of ICUs in a blinded randomized sequence. Intervention was comprised of:

- a) leadership commitment (leader's letter and executives walk-rounds),
- b) surveillance of materials needed for hand hygiene,
- c) reminders,
- d) a story board per ICU,
- e) HHC results feedback.

The HHC assessment was done monthly by blinded direct from August 2011 to February 2012. Data collection was done using the WHO tool. Statistical analysis was conducted using descriptive analysis and using generalized mixed linear models to adjust for differences in timing and participant characteristics. The WHO and an independent local board evaluated ethical considerations.

Results:

The study enrolled 348 participants (comprised of 63.1% nurses, 29.6% physicians and 7.3% others HCW) during 7 months of observation in 11 sites. HHC in the control group was 66.2% (2562/3869) vs. 74.2% (3772/5086) in the intervention group. The model for analysis was adjusted for time and provider characteristics. Univariate analysis showed association between the intervention and HHC (OR 1.15; 95% CI 1.11- 1.19). The effect was still present after adjustment time and time plus providers characteristics, (OR 1.07; 95% CI 1.02-1.12).

Conclusion:

This study finds that a multimodal intervention to improve HHC is effective in ICUs with active infection control programs.

This study was funded and technically supported by the Small Grant Program for Patient Safety Research, Argentina.

Effectiveness of implementing a bundle for preventing ventilator-associated pneumonia (VAP) in an intensive care unit of adults (ICUA) of Argentina: 27 months of intervention

P12

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Introduction:

VAP is a severe complication in intensive care units. The implementation of a bundle has proven effective in preventing VAP.

Objective:

To assess the impact attributable to the implementation of a care bundle for the prevention of VAP.

Material and methods:

A quasi experimental study performed in the ICUA of a university, high complexity, acute general hospital. A multidisciplinary team (MT) was formed in order to agree the implementation of process controls. The Institute of Healthcare Improvement (IHI) proposed measures's were implemented with changes. This new strategy was launched on February 1st 2010. ICUA medical staff daily evaluates: 30-45° head bed, oral hygiene with chlorhexidine 2%, assessment of need of mechanical ventilator, peptic ulcer prophylaxis, deep venous thrombosis prophylaxis, cuff pressure of endotracheal tube. Infection Control Nurse takes weekly measurements of adherence to the measures implemented. Pre-Intervention period (A): November 2007-January 2010, post-Intervention period (B): February 2010-April 2012. We calculated the rate of VAP according to the methodology described by the National Healthcare Safety Network (NHSN). The Mann-Whitney Test was used to compare average rates of VAP.

Results:

The rate of VAP for periods A and B respectively was: 11.81 ‰ and 3.47 ‰ days risk factor, which implies a decrease of 70.7% ($p=0.0019$). The rate of adherence to the process control was 100%.

Conclusions:

The adherence achieved to the bundle implemented was excellent, and it was associated with a significant decrease of the VAP. The MT was the main core in the development, implementation and control of the new strategy.

P13 Prevalence and antimicrobial susceptibility of microorganisms isolated in the intensive internal care unit of Clinical Center University of Sarajevo)

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The aim of the work is to determine which are the most frequently isolated bacteria in patients who are treated in intensive internal care unit of Clinical Center University of Sarajevo, and then determine their resistance to antibiotics.

The material consists of samples data from a computer database ITILLA LAMIS in OJ Clinical Microbiology. The processed samples were received from intensive internal care unit in the laboratory of anaerobic infections where the wound swabs, bronchial aspirate, exudates, etc. are tested. For isolation, identification were used classical method and VITEK 2 (Biomérieux, France) automated system. Susceptibility testing is performed by disk diffusion method according to CLSI standards and VITEK 2 system.

82 samples from 34 patients were analyzed for the period May 2011- May 2012. Most frequently isolates were *E. faecalis* 35.2% (12/34), *A. baumannii* 26.4% (9/34), *P. mirabilis* 26.5% (9/34), *E. coli*, *S. aureus* 20.5% (7/34), MRSA 14.7% (6/34), *P. aeruginosa*

8.82% (3/34). Other bacteria (*K. pneumoniae*, *E. cloacae*, *S. marcescens*, *S. epidermidis*) were in small number of isolates. Anaerobic bacteria (*Bacteroides* spp., *Peptococcus* spp., *P. melaninogenica*) were isolated in 14.7%. *A. baumannii* was sensitive on colistin (100%), tobramycin (44.5%); *E. faecalis* on vancomycin (100%), ampicillin, amoxicillin (83.34%); MRSA on vancomycin, fusidic acid (100%), trimethoprim-sulfamethoxazole (80%). *S. aureus* was quite sensitive on the tested antibiotic except penicillin. *P. mirabilis*, *E. coli*, *P. aeruginosa* were all sensitive on carbapenems, third generation of cephalosporins and aminoglycosides. 60% of anaerobic bacteria were resistant on penicillin and all were sensitive on metronidazole.

The conclusion was that *A. baumannii* was the most resistant on the tested antibiotics, then MRSA, *E. faecalis*, while *S. aureus*, *P. mirabilis*, *P. aeruginosa* and *E. coli* showed quite sensitivity. Anaerobic bacteria showed resistance on penicillin.

Assessment of skin and ring contamination after hand rubbing with alcohol solution and introduction of specific gesture for ring

P14

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The hands are the main mode of micro-organisms transmission also in the communitary environment than in the hospital. Hand hygiene is considered the most effective measure of general precautions in preventing the cross contamination in the influenza or gastro enteric outbreak. All people and specially the females care the removal of jewellery, especially wedding ring appears problematic in this period. The aim of this study had to assess the contamination of hands and the ring after to introduce a special gesture of ring during alcohol based hand rub solution use (ABHRS).

Method:

A cohort study was realized with 32 students in first year of biology study. Each student must be caring during 4 hours tow ring in the 4 finger of major hand. At this end the first ring (control) was out and a swab was realised on the place of ring on the finger. After a hand rub with the specific gesture, the second ring was out too. The coefficient of reduction was calculated $\text{Log}(\text{number of ufc after ABHRS} / \text{number of ufc before ABHRS})$

Results:

The special gesture was realized by 78% of the student. For realise the abhrs each student consumed 4.06g of hydroalcoholic solution. This study has shown that the introduction of ring special gesture has reduced significatively the number of micro organisms on the skin with $-1.65 [-2.01 - -1.30]$ and for the ring the coefficient is $-1.5 [-1.47 - -1.25]$.

Conclusion:

The introduction a special gesture for the ring can reduce the hand and the ring contamination.

P15 Assessment by atp measurement of keyboard contamination

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The most common nosocomial pathogens may well survive or persist on surfaces for months and can thereby be a continuous source of transmission if no regular preventive surface disinfection is performed.

The introduction of bedside computers into the patient's room in the critical care environment, may play a role in the transmission of nosocomial pathogens. Undisputedly hands are the main source of pathogen transmission. Cross-transmission of microorganisms by the hands of care personnel from computer components at the patient's bedside, might introduce an additional risk for critically ill patients

considering the frequent contact of nursing and medical staff during patient care with these fomites.

Objective:

For monitoring carefully the instantaneous and environmental health hospital, the method of ATPmetry was used in this study and we examined the contamination rates in patient's room.

Method:

According a standardized protocol of swabbing with ATPmeter UNI-LITE NG®, 400 samplings were realized in the University Hospital of Nancy (France): 200 samplings on the keys of the keyboards and 200 samplings on the immediate environment of the keyboard.

Results – Conclusion:

We showed a significant rate of contamination on the keyboards of computer present within the hospitals of Nancy. Even if this rate varies between the services and the establishments of health, the keyboards remain a source of contamination. It would be thus interesting to undertake solutions in order to decrease this rate by the installation of procedure of cleaning or / and the presence of covers or washable flexible keyboards seem also interesting.

Assessment of ethanol exposure of patient hospitalized to alcohol-based hand-rub solutions using for hand disinfection
P16

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The aim of this study was to assess the ethanol exposure of patient hospitalized in alcohol-based hand sanitizer used by healthcare workers.

Methods:

During 6 days we made a simulation of hand rubbing activity by healthcare worker in the bedroom building in the medical school. Research consisted in

monitoring for a false patient in this bed and a dummy (healthcare worker) during 8 hours of a work day in order to measure their exposure to ethanol. Ethanol concentration in inhaled breath was measured using Gilian pump LFS-113 to collect ethanol vapours. Concentration of ethanol, were determined using gas chromatography with flame ionization.

Results:

The health professional is not more exposed (335.16 mg.m⁻³ sd 140) that the patient (331.0 mg.m⁻³, sd 211.7) p value = 0.94. In contrast, ethanol concentrations in air are higher in the afternoon (375.29 mg.m⁻³, sd 156.89 for the health professional and 453.39 sd 245.17 mg.m⁻³ for the patient) than in the morning (295.03 mg.m⁻³, sd 122.90 for the health professional and 208.61 mg.m⁻³, sd 50.54 for the patient). These differences were statistically significant for patients with a difference of 244.7 mg.m⁻³ (p = 0.036) but not for health professionals with a difference of 80 mg.m⁻³ (p = 0.39). This result shows the ethanol vapors are dispersed across the room.

Conclusion:

This study shows that the ethanol vapours exposure from hand disinfection products among patient during their care activities was a reality but the level was under the value limited of exposure define by the authority.

the surface covered by the hydroalcoholic product. For each HWs, a measure of the systemic exposure was realised. At the beginning of the working day we realised blood samples, urinary samples and respiratory alcohol level measure before any hand rubbing. Once these samples realised, we give a hydroalcoholic gel bottle, previously weighed. At the end of the work sequence, the same samples and measures were done. The bottles were weighed again. Blood and urinary samples were analysed by gas chromatography allowing then to measure ethanol, acetaldehyde and acetate quantity.

Result:

The assessment of the hand rubbing quality was excellent in 78% of cases. The quantity of hydroalcoholic products consumed during the 4 hours of assessed working time was about 27.5g. Before the professional activity all measured parameters were zero except for one healthcare workers. 4 hours after working activity the mid alcohol level is none, except for one healthcare worker. 28 healthcare worker of 86 have alcohol presence in breathed out air. Values are very low for majority of them. For 6 of 28 have alcohol presence over 0.10. For this personal.

Conclusion:

The use of hydroalcoholic products can be done without any toxicological risk and particularly drunkenness risk.

P17 DEESSES, allowing assessment of professional exposure to ethanol-based hand rub solution

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The aim of this study is to assess the exposure to ethanol during the hand hygiene acts in real condition.

Material method:

In this assessment 86 healthcare workers were drawn lots. This hand rubbing was assessed by the investigator according to three criteria: rubbing time, respect of rubbing realization sequences and the percentage of

Point of use filtration efficiently protects against water bacteria)

P18

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Contamination of the water supply with potentially pathogenic microorganisms is very common. Common bacterial species include Legionella species, Pseudomonas aeruginosa and atypical mycobacteria. Cryptosporidium and some non-pathogenic protozoa capable of supporting growth of Legionella spp can be also found in water. Hospital water supplies are also

frequently contaminated with pathogens. For certain patient groups there is a higher risk of infection due to waterborne organisms. The risk is particularly relevant for immunocompromised patients such as transplant recipients, critically ill patients and neonates. Other potential route of waterborne infection is contamination of instruments and adjacent surfaces.

Normal methods of water treatment may not remove pathogens from water supply.

Some measures which are taken for reduction of possible Legionella infection (avoidance of showering, avoidance of drinking tap water) are time consuming and expensive. In case of epidemics there is also need for prompt measures.

Experience obtained in CHC Zagreb in one NICU and one surgical ICU by point-of-use water filters (Pall-Aquasafe, Pall Medical) showed reduction of waterborne bacteria in samples taken from patients and environment. In a 2-year period after introduction of point-of-use filters there were not detected infections caused by *Pseudomonas aeruginosa* or *Legionella* which can be attributed to tap water.

Point-of-use filtration are indicated to remove bacteria, protozoa, fungi, and particles from the water supply and provide protection to patients and vulnerable users by acting as a barrier to these common waterborne pathogens, and thus reducing the risk of water associated nosocomial infection and sanitary cost.

P19 **Effect of continuous education of employees on the quality of medical waste management system**

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Health Center Bijeljina, Bosnia and Herzegovina

Goals:

The aim of this study was to test the level of knowledge of workers in the management of medical waste for four years, and the impact of education on the quality of medical waste management system.

Materials and methods:

Management of medical waste is regulated with medical waste management rules. Health center Bijeljina has implemented the proper management of medical waste in 200 .Workers in this field is once a year in accordance with applicable regulations and certification standards for health.

The study was conducted interviewing workers (doctors, technicians and cleaners). From a total of 365 workers involved in the management of medical waste was tested 112 workers (30.7%).

The survey results were processed by computer and analyzed descriptively and statistically.

Results :

Surveyed 112 workers of which 30 (27%) doctors, 50 (45%) nurses / technicians of all profiles and 32 (28%) cleaners. Workers responded to the questions so as to chose the correct answers provided. Of the total number tested, only three workers (2.7%) correct answers to all questions.

Procedures by which the regulated medical waste management area in the facility correctly answered 7 (6%) 33 incorrect (29%), did not answer 13 (12%) and 33 incomplete (29%).

The question of what types of medical waste are generated at the facility is set to doctors and nurses / technicians. Out of 80 employees responded correctly 15 (19%) 21 incorrect (26%), partial 37 (46%) and did not answered 7 (9%).

Conclusions:

Based on these results we can conclude that respondents workers, both medical and non-medical do not have the expected level of knowledge, and training once a year is not enough.

It is necessary to introduce continuing education in infection control that will include the following areas: medical waste management, prevention of exposure to viruses that are transmitted through blood, a procedure in case of accidents, the sterilization process and control of sterilization, disinfection and decontamination procedures, etc.

P20 Infection control in health center (primary health care)

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Objectives:

The aim of this paper is to show the structure and type of standard procedures that are used for prevention and control of nosocomial infections in health center - the facility where the health center does not have hospitalized patients.

Material and methods:

The adopted procedures established in the field of infection control procedures and include the following instructions: sterilization and decontamination, sterilization process control and decontamination, infection control, hospital infection control, medical waste management, handling cases accident, maintaining hygiene. We used records of the Health Bijeljina, which applies to all services.

Results:

Health Bijeljina in 2009 introduced the standard ISO 9001: 2008 and adopted procedures for infection control that are used throughout the institution. Appointed by the Commission for the control of nosocomial infections, which oversees the transmission of the adopted procedures. Commission for the control of infection is the adopted curriculum, and also conducts training of workers in the field of infection control. In the current year shall be carried out analysis of the results and expectations, and audit procedures and guidelines which have been effective.

Conclusions:

The introduction the standard ISO 9001: 2008 has enabled better risk management and continuous availability of existing procedures to employed in electronic form. Continuous teamwork with the aim of constant supervision of staff, working environment, sterility instruments, the permanent control of implementation of all applicable procedures is crucial for reducing nosocomial infections.

In-vitro susceptibility of methicillin-resistant staphylococci isolated from clinical samples to newer antibiotics and vancomycin

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In last decades an increase was observed in the frequency of community and nosocomially acquired infections caused by methicillin-resistant staphylococci. The options for the treatment of methicillin-resistant *Staphylococcus aureus* (MRSA) infections are limited. In this study we aimed to investigate the susceptibility of vancomycin, tigecycline, quinupristin/dalfopristin and linezolid of 100 methicillin-resistant coagulase negative staphylococcus (MRCNS) isolated from clinical samples of patients at Ankara Dışkapı Yıldırım Beyazıt training hospital in January 2011-February 2012. Conventional bacteriological methods were used for identification. Sensitivity tests were performed according to the guidelines and criteria of CLSI using disk diffusion method. Inducible macrolide-lincosamide-streptogramin B (iMLS_B) resistance phenotypes were determined by the double disk method. 14 (14%) isolates had iMLS_B resistance. All MRCNS isolates in this study were found susceptible to vancomycin, tigecycline, quinupristin/dalfopristin and linezolid.

Hospital hygiene in rural western Africa - experiences and perspectives

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Walter Koller

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Trained and experienced in “western” hospital hygiene, I came to a rural hospital in Sierra Leone with the job to make an assessment of hospital hygiene.

Challenges were:

- Assess with open eyes and perceive what really is,
- Widen perspective (talk to colleagues and

understand the needs they perceived in their clinical work; view the hospital embedded in its vicinity),

- Accept the concurrence of modern facilities (buildings, photovoltaic, mobile phones, computers) with complete absence of basic hygiene provisions (water tap absent where it should be, abuse of toilets and bathrooms, ignorance of hand hygiene even in medical professionals, ignorance of infection hazards of pus, blood and medical sharps....),
- Accept the concurrence of warm-heartedness and willingness to fully cooperate and a remarkable absence of ability for stock keeping of even vital goods and of other managerial virtues,
- Put hands on when a feasible solution complies with your own abilities,
- Ask for and accept proposals from colleagues and from locals,
- Describe and recommend in writing,
- Be creative in “inventing” remedies constructed of locally available materials and which can be maintained by locals with local resources (“back to the roots of hygiene”),
- Don’t insist on a system which proved to work under middle European conditions,
- Focus on local training for locals and avoid anything that encourages trained locals to escape towards the metropole or to seek their fortune outside their country.

P23 Usage of luer split septum device in ICU

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We analysed advantages in using luer split septum device in two intensive care units.

Aim is to determinate utility of using the luer split septum device for the reduction of colonization and a possible source of severe sepsis in ICU patients.

In 2011 we had studied 76 patients in urological and 80 patients in surgical ICU’s. We followed up the length

of luer split septum device insertion (days), the toilet care, local complications, clinical signs of infections, microbiological examination (properly taken blood culture samples and CVC samples after removal).

Results of daily monitoring through detailed control nursing lists showed that luer split septum device is used for an average of 6 to 9 days. Sporadic signs of local skin irritation and some difficulties in rinsing each arm were described. Colonization of catheters was less than 1% patients. Two patients had severe sepsis with identically microbiological isolates in two or more different samples (not just in CVC and HK).

Luer split septum device significantly reduces possibility of colonization as well as a possible source of sepsis. Medical personnel also provide greater safety in handling and reducing possibility of the injection event.

Clostridium difficile eclosion: measures taken to tackle the problem

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Clostridium difficile is an anaerobic, Gram positive spore-forming bacteria, known to be responsible for hospital-acquired diarrhea since the 70s. However, the disease spectrum associated with this bacteria has worsened since the emergence of the B1/NAP-1 hypervirulent, fluoroquinolone resistant strain. Colitis associated with this bacteria can lead to toxic megacolon leading to lifesaving total colectomy.

Our hospital (a tertiary care teaching hospital) declared a *C. difficile* outbreak in February 2012. An incidence of 18.8 per 10000 patient-days and 23.1 per 10000 patient-days were noticed in February and March 2012, respectively.

Several measures were taken, targeting, different areas around patient care, such as: patient hygiene (making sure that they washed their hands before eating for example), staff hand cleaning reinforcement, prompt isolation of suspected cases (before obtaining the results of the *C. difficile* Ag and cytotoxin B), patient environment cleaning (increasing the toilet cleansing

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after each use instead of once a day), antimicrobial stewardship (to decrease as much as possible the use of antibiotics with a high *C. difficile* risk), prophylaxis (to decrease the length of prophylactic antimicrobials), etc.

Following the application of these measures, a clear decrease in the incidence of cases was noticed. Complete data will be presented.

With the advent of the highly virulent strain of *C. difficile*, the hospital hygiene, proper antimicrobial use and strict isolation precautions show all their critical meaning.

P25 Hospital acquired antimicrobial resistance genes identification with DNA microarray in the Western Romania

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Introduction:

The development of antimicrobial resistance (AMR) in bacteria is a major health concern and renders much hospital acquired (HA) infections untreatable.

Purpose:

This study, part of the PNCDII 42121/2008 national research project, proposed the investigation of AMR strains, isolated from adult (A) and paediatric (P) Timisoara University Hospitals, with the help of DNA microarrays.

Methods:

A selection of multidrug-resistant (MDR) HA strains have been sent for confirmation to the University

Microbiology laboratory, from the hospitals laboratories. Subsequently, at the level of the University Biochemistry laboratory, the molecular substrate for the MDR selected germs has been investigated with the help of microarray technique. Total bacterial DNA was extracted using High Pure PCR Template Preparation Kit. The oligonucleotides were manufactured and spotted in triplicate by ArrayIt Corporation (USA) in an 18 well subarray format. DNA was labeled with Alexa Fluor 3/5 by a randomly primed polymerization reaction and purified using BioPrime Total Genomic Labeling System (Invitrogen cat. no. 18097-011).

Results:

From 43 MDR-HA Enterobacteriaceae analysed strains, we detected 80.00% (from the HA-P strains), respectively 61.11% (from the A strains) presenting AmpC β -lactamases. CTX-M group β -lactamases have been found in 80.00% from the P strains, respectively in 50.00% from the A strains. We also identified TEM β -lactamases in 68.00% (P), respectively 38.38% (A), and blaOXY-K1 genes producers in 36.00% (P) and 11.11% (A).

Conclusions:

The microarray screening permitted simultaneous identification of many resistance genes, demonstrating the usefulness of the method in monitoring and control of antimicrobial resistance.

P26 Condom use and HIV transmission during foreplay with or without penetrative sex

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Aims and objectives:

Foreplay with or without penetrative sex has been documented to transmit Human Immunodeficiency Virus (H.I.V.). There is little information on condom use and H.I.V transmission following foreplay with or without penetrative sex, with 2.6 million people newly infected with H.I.V. in 2007 in the world. This study therefore assessed H.I.V. transmission risk following

foreplay with or without penetrative sex in a group of Nigerians in Benin City.

Patients and method:

Five hundred and sixty-two H.I.V. positive patients and five hundred and sixty-two H.I.V. negative patients were studied. They were assessed on their knowledge and practice of foreplay with or without penetrative sex and condom use.

Results:

Mean age for H.I.V. positive and negative patients were $19 \hat{\pm} 6.7$ years and $24 \hat{\pm} 8.4$ years respectively. 316 H.I.V. positive subjects compared with 48 H.I.V. negative subjects as control engaged in foreplay with or without penetrative sex ($P < 0.05$).

Conclusion:

H.I.V. transmission can occur during foreplay with or without penetrative sex as the condom is just only over the phallux and/or vagina.

December there was no data. In January rate was 8.6. In February we performed intensive education of staff with key recommendation on hand hygiene, use of maximal sterile barrier precautions, full body drape, use a disinfectant for skin preparation (polyhexanid instead 2% chlorhexidine), disinfection of catheter hubs, needleless connectors and injection ports with 70% isopropyl-alcohol, regularly flushing with sterile saline, removing of non-used catheters after 96 hours. After that the CR-BSI rate in February, March and April 2012 was 0 infections per 1000 catheter days. In May 2012 occurred one CR-BSI, the CR-BSI for this month was 11. In this period we stopped to use needleless-devices because of financial reasons. Our data showed that only use of needleless-split-septum-device did not decrease the incidence of CR-BSI, but we found a significantly decrease of CR-BSI rate after use of needleless-split-septum-device in addition to other preventive strategies ($p < 0.05$).

We can conclude that with strict adherence to current guidelines for prevention of CR-BSI the incidence of CR-BSI can be dramatically reduced.

P27 Reduction of the catheter related bloodstream infection after introduction of split septum needleless device in addition to other preventive strategies

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Central venous catheters are often used in clinical practice. The risk of CR-BSI depends on type of catheter used and the site of insertion. These infection increase cost and hospital stay. We did prospective analysis for CR-BSI in period May 2011-May 2012. In May 2011 CR-BSI rate was 6.1, in June, August and September there was no data. In July rate was 7.4. In September we implemented needleless-split-septum-access-system in our practice. After that, in October CR-BSI rate was 9.1, in November 7.6. In

Comparing two different peripheral intravenous catheters and replacement with clinical monitoring

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We observed in gerontology patients at our hospital, the need of change the cannula two or three times per day, sometime due to patient condition, it become in placement of a central venous catheter, this fact made us decided to evaluate another type of catheters.

Aim:

To evaluate two different peripheral intravenous catheters left in place for as long as they are clinically indicated.

Methods:

From September till 30th November 2011, all consecutive patients from oncohematology and

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gerontology with peripheral intravenous catheters that were expected to stay in place and receive intravenous treatment for at least 48 hours were included. We compared short catheter with FEP polymer and without wings versus catheter with wings and Vialon(TM) biomaterial. Catheter insertion and care were standardized. Only in cases of suspected or definite clinical complications the catheter was removed.

Results:

A total of 138 patients were enrolled in the study. Catheter without wings remained in site no more than 48 hours, catheter with wings left in place more than 96 hours, an average of 5 days, the longest IV dwell time was 9 days and 8 for two patients (removed at the end of therapy). No cause of bacteremia occurred.

Discussion:

Guidelines developed by CDC, recommend that intravenous catheters be changed every 96 hours, our study support the idea not to change them routinely.

Conclusions:

We demonstrated that the designed and materials of catheter with wings and Vialon(TM) perform better, also allowed us to avoid harm and discomfort to the patient and no additional cost.

P29 Outbreak of *Klebsiella pneumoniae* carbapenemase (KPC)-producing *K.pneumoniae* impact of a bundle of infection control interventions

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Objective:

To describe the effect of a bundle of infection control interventions implemented in an attempt to control an outbreak of KPC and to estimate the impact comparing the cases occurred during 2010 and 2011.

Retrospective observational study with pre- and post interventional phases. The intervention began in May11 The study facility is a 7-floor 326-bed with double occupancy rooms. Bundle: investigation of the initial isolation of KPC typing by molecular biology studies. Cohort of patients infected / colonized in an isolation area. Strict fulfillment of isolation precautions. Control of fulfillment of handwashing. Performing anal swabs to detect patients colonization. Rational use of antimicrobials, limiting the use of cephalosporins of 3rd and 4th generation and restriction of carbapenem. Enhanced environmental cleaning using quaternary ammonium compound as disinfectant. Education and training of personnel.

Results:

During 2010 there were 32 clinical cases,4 colonized cases, the first isolation was in March, 7 cases in April, 60% urine culture, only 4 cases in Intensive Unit. in 2011 there were 12 cases, only 1 in Intensive Unit, 1 colonized cases. The sensibility was similar to colistin, tigecycline and fosfomicin.

Conclusions:

A bundled intervention was successful in preventing horizontal spread of KPC and resulted in a sustainable and efficient measure to reduce the rate of appearance of Kpn-KPC. An isolated measure cannot be considered to be like effective, they will be successful when the strategies are used all together.

Attitudes, practice and occupational exposure to body fluids among health care workers

P30

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The health care workers (HCWs) are at risk of infections with bloodborne pathogens during the occupational exposure to blood and body fluids.

Aim:

To assess the attitudes and practice of HCWs.

Methods:

Cross-sectional study was carried out among health workers of the Institute of Cardiovascular Diseases of Vojvodina, Serbia. Data were collected using an anonymous, self-administered questionnaire containing 38 questions related to demographic characteristics, knowledge and attitude towards blood-borne diseases, experience with injuries, and HBV vaccination status.

Results:

The questionnaire was filled-in and returned by 389 out of 419 potential participants, for a 93% rate of participation. Their mean age was 39.0 (SD 10.6) with mean total work experience of 16.3 years (SD 10.2). They included 15% physicians, 60% nurses, 4% laboratory technicians, 15% health assistants and 6% of other workers. There was a high prevalence of life time (38.1%; 95% CI = 33.2% to 42.8%) and one year (12.6%; 95% CI = 9.3% to 15.9%) needlestick injury and exposures to blood and body fluids. The reported risks of receiving at least one needle stick injury did not differ among different groups of HCWs ($p > 0.05$). In contrast, a significantly higher proportion of other HCWs than doctors and nurses reported at least one needle stick injury ($p = 0.024$). Among factors contributing to the occurrence of needlestick injuries, recapping needles ($p = 0.003$) and decontamination/cleaning instruments after surgery ($p = 0.001$) were most frequent among nurses. About 40% of HCWs were not vaccinated against hepatitis B.

Conclusion:

HCWs should be made aware of hazards and preventive measures.

**Surgical site infection after cardiac surgery:
correlation between operative risk level and hospital
length of stay**

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Purpose:

Many authors found the EuroSCORE (European System for Cardiac Operative Risk Evaluation) model to be useful not only in postoperative mortality prediction, but also in intensive care unit length of stay, intubation time, and overall treatment expenses. The aim of the study: to assess the correlation between the EuroSCORE and length of stay due to surgical site infection (SSI) after cardiac surgery.

Methods:

This study included 88 consecutive patients with SSI (75 sternal, 10 vein harvest site and 3 deep) who underwent cardiac surgery from January 2008 to December 2011 (1.8% of all operated patients) at our clinic. For operative risk evaluation, the additive EuroSCORE model was used. For statistical analyses the Mann-Whitney and Spearman test were used. Results are shown as median (25-th percentile -75-th percentile).

Results:

The mean value of the EuroSCORE was not statistically significant between patients with SSI (group I) and without SSI (group II) ($p = 0,249$). The mean length of stay was 9.00 (8.00 - 14.00) vs. 35.00 (24.25 - 56.75) in group II and I respectively ($p < 0.0005$). There was no correlation between the EuroSCORE and hospital length of stay regarding both groups ($r = 0.089$; $p = 0.226$) but there was a correlation between the EuroSCORE and hospital length of stay in patients with SSI ($r = 0.292$; $p = 0.006$).

Conclusions:

There is a positive correlation between operative risk level and hospital length of stay after cardiac surgery in patients with surgical site infection.

P32 **Prevalence of hospital-acquired infections in East Herzegovina**

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The aim of this study is to assess the magnitude of the problem of HAI in hospitals of East Herzegovina in Republika Srpska. At the time of conducting this study (August 2011) there were 483 patients hospitalized, of which 234 were involved in this study. Involved were all the patients who spent at least 72 hours in hospital upon their admission. According to Center for Disease Control and Prevention methodology (CDC), all patients with manifesting infections were registered and the prevalence of patients with HAI of 4.2% evaluated. The greatest prevalence was registered at department of neurology (15.7%), followed by surgical intensive care department (12.5%) and gynecology (12.5%), the least prevalence being found at department of surgery (6.2%). The greatest prevalence was registered at the age of 40 to 59 years. The causing agent was isolated in 40% of HAI cases. By anatomic localization, the most common were infections of the surgical site (40%) and of digestive system (40%), followed by urinary tract infections (10%) and skin and soft tissue infections (10%). During this study, 42.7% out of total number of patients have been taking at least one antibiotic. In prophylaxis, antibiotics were taken by 31 (13.2%) patient and in therapy one medication was taken by 68 (29.1%), two medications by 15 (6.4%) and three medications by 2 patients (0.8%). The following risk factors were analyzed by multivariate regression analysis: surgical intervention (OR=4.6; CI=1.27-16.64), urinary catheter (OR=4.6; CI=1.27-16.64) and duration of stay in intensive care unit (OR=1.23; CI=1.03-1.47).

P33 **Risk factors of VRE colonization in patients hospitalized at the Clinic of Hematology, Clinical Center of Serbia**

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Background/Aim:

Vancomycin-resistant *Enterococcus* spp. (VRE) is one of the most significant hospital pathogens at the ICUs. The objective of our study was to evaluate the VRE colonization in patients hospitalized at the Hematology Intensive Care Unit and associated risk factors.

Methods:

Prospective cohort study involved 70 patients hospitalized at the Intensive Care Unit, Clinic for Hematology, in the period from 01.10 to 31.12.2010. Feces or rectal swab was collected for culture from patients on admission and at discharge in case when VRE was not isolated on admission.

Results:

The analysis of results showed that VRE was colonized in 27 (41.53%) patients at discharge. Univariate analysis demonstrated statistical significance in the incidence of diagnosis, length of present stay, use of aminoglycosides and pip/tazobactam in present hospitalization, duration of use of carbapenem and pip/tazobactam in present hospitalization between the VRE-colonized and non-colonized patients. Diagnosis of disease (AML), use of carbapenem in previous hospitalization and duration of use of piperacillin/tazobactam in present hospitalization are independent risk factors of VRE-colonized patients.

Conclusion:

Diagnosis (AML), the use of carbapenem and piperacillin/tazobactam in present hospitalization as well as the length of aminoglycoside and piperacillin/tazobactam use in present hospitalization are the risk factors of VRE colonization. Diagnosis (AML), the use of carbapenem in earlier hospitalization and length of

piperacillin/tazobactam use in present hospitalization are the independent risk factors of colonization of patients with VRE. Rational use of antibiotics is the most important preventive measure for development of bacterial resistance to antimicrobial agents.

P34 Situational analysis of healthcare-associated tuberculosis in seven facilities in Senegal: findings and the way forward

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Ministry of Health, Dakar, Senegal

A national plan to prevent healthcare-associated tuberculosis is currently being developed in Senegal and is planned to support seven pilot sites with training, infrastructure, technical devices and personal protective equipment.

A quick assessment grid was used for a situational analysis. The grid consisted of performance criteria based on organizational and technical measures. The grid was filled by the Hygiene Committee Coordinator in each facility and then validated by the National Program Coordinator.

The average performance rate was 0,57% based on a 10-point scale, with none of the other seven facilities exceeding the rate of 1/10.

The assessment showed:

- the imperious necessity to implement the preventive component within the national program to fight tuberculosis, especially in the current framework of multi-resistant strains, which are increasingly emerging;
- the huge gap to be filled on the steps to prevent healthcare-associated tuberculosis in Senegalese facilities;
- some components of guidance in the activities to implement the national action plan;
- some components of guidance for the next assessments of the plan.

The establishment of an one-stop information platform - Hong Kong Training Portal on Infection Control and Infectious Disease (ICID portal)

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Introduction:

In Hong Kong, Hospital Authority (HA) and Center for Health Protection (CHP) are using their own websites to disseminate the infectious diseases (ID) and infection control (IC) related information. However, lacking single access point would hinder the information retrieval by end-users. In view of the need of having a centralized and integrated hub for ID/IC information that tailored for the local community, Infectious Disease Control Training Centre (IDCTC) of HA has launched the ICID portal (<http://icidportal.ha.org.hk>) since 2010.

Missions:

1. To keep track on the updated information on ID/IC for training and development,
2. To announce round-the-clock and just-in-time ID/IC training by an e-learning management system,
3. To provide a common platform for knowledge sharing.

Key features:

1. D/IC Resources e-cabinet:
 - Local ID updates by linking up the Communicable Diseases Watch & Letters to Doctors/ Institutions that published by CHP,
 - IC guidelines developed by CHP,
 - Video clips on various IC topics and techniques,
 - A succinct list of internet resources for various ID.
2. Banner for ad-hoc/ topical issues:
 - One-click access to the respective information.
3. Training calendar:
 - Show the schedule of local ID/IC training activities and links to course materials.
4. New/ Revised ID/IC guidelines:
 - Alert healthcare workers (HCWs) on the updated

ID/IC management guidelines.

The way forward:

Two enhancements would be launched in the intranet version of the portal:

1. E-forum,
 - Allow HCWs to share experiences on ID/IC issues.
2. WIKI
 - Collaborate expertise and users in updating the ID/IC knowledge base in an open online platform.

P36 Antibiotic resistance among organisms causing bacteraemia: a one year study of inpatient data from King's College Hospital

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Sepsis syndrome related to bacteraemia is a common cause of morbidity and mortality in community and hospital patients. Current King's College Hospital NHS Trust guidelines are to treat sepsis of unknown origin with IV Co-amoxiclav and Gentamicin. There has been an increased rate of drug resistant strains of bacteria in recent years. Data from 511 adult and 55 paediatric cases of gram-negative bacteraemia admitted to KCH over one year were analysed for resistance patterns to antimicrobials. The most common organisms cultured were *E. coli* (43%), *Klebsiella* spp. (15%) and *Pseudomonas* spp. (10%). 7.8% of adult gram-negative bacteraemia cases were resistant to both co-amoxiclav and gentamicin.

P37 One world, one health, one medicine in control of zoonotic diseases

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"One Health" concept is very old because of various ways in which plants, water and animals interact to

influence human health and the manner in which different disciplines can contribute to an understanding of these interactions and to the design of effective interventions.

The most important factors for emerging of infectious diseases are: microbial adaptation, global travel and transportation, host susceptibility, climate change, economic development and land use, human demographic and behaviour, poverty, social inequality and a breakdown of public and animal health infrastructure. Majority of emerging diseases are transmissible from animals to humans.

Aim:

In our work we will present the current situation and trends of zoonotic diseases in Federation of Bosnia and Herzegovina.

Material and methods:

We will use weekly reports of zoonotic diseases as a part of notifiable diseases. Our study will be retrospective for the last five years (2007-2011).

Results:

In Federation of Bosnia and Hergezovina 84 diseases are notifiable. As a part of this list are some zoonotic diseases such as: brucellosis, salmonellosis, Q fever, echinococcosis, trichinellosis, leishmaniasis, leptospirosis which were registered with more or less cases in the considered period. We will analyse their appearance by years, months and cantons, and we will analyse the characteristics of patients.

Conclusion:

Zoonoses are becoming a more important problem in the whole world and also in Federation of BiH. The work on their prevention goes beyond human medicine and has to include other sectors: veterinarian medicine, trade, industry etc.

P38 **Costs of surgical site infection after primary hip replacement orthopaedic surgery**

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Background:

Surgical site infection (SSI) is one of the most common nosocomial infections and it is a complication of orthopaedic implant surgery. Data of ECDC for cumulative incidence of SSI was 1.2%. Hungarian incidence of SSI was 1.5 % [CI: 0.9-2.5].

Design:

Prospective pair wise-matched (1:1) case-control study within a cohort.

Setting:

University of Debrecen, Medical and Health Science Centre Department of Orthopaedics. This is a tertiary-care university medical centre.

Methods:

We analyzed all in-patients, who underwent orthopaedic surgery in this university medical care centre between October 01, 2009 and May 31, 2012. We reviewed the documentation of patients who had primary hip replacement, and we were following the microbiological results in every month.

Results:

A total of 934 procedures were performed and 22 SSI's were identified. The SSI's rate was 2.35%. We revised it with several factors (age, gender, underlying disease, type of endo-prosthesis, ASA score). 19 cases were successfully matched with a control. The average length of stay was 34.8 in the case group, by contrast, 8.58 days of the control group. Cost of antibiotics was more than 350% in the case group, and 3 extra surgical procedures were necessary for them.

Discussion:

It was revealed in the study of Withehouse J.d et al. from 2002 that infection after hip replacement increased the cost of hospitalization by more than 300 percent. According to the results of our surveillance, we spend

1.5 more on surgical site infection considering all the costs (days of hospitalization, costs of antibiotic, microbiological samples).

Reduction of *Pseudomonas aeruginosa* infections on a neonatal intensive care unit by point-of-use filtration

P39

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Pseudomonas aeruginosa is one of the most frequently isolated gram-negative pathogens causing nosocomial infections. It is well known that tap water outlets are often colonised with *P. aeruginosa* and may represent a source of endemic infections on NICU.

In NICU CHC Zagreb routine sampling for diagnostic and surveillance microbiological cultures was performed weekly from 2006 till 2008. Surveillance microbiological cultures included tracheal aspirate, stool, urine and gastric juice. Environmental samples included surfaces of sinks and other surfaces in areas adjacent to patients. It has been detected increase in total number of *Pseudomonas* spp. isolates.

In 2006: 117 patient isolates; 4 from blood. In 2007: 197 isolates; 1 from blood. In 2008: 364 isolates; 5 from blood.

In 2006. there were 7 environmental isolates, in 2007, 8 isolates and in 2008, 6 isolates of *Pseudomonas* spp. grown from the hospital environment.

At the end of 2008, point of use water filters (Pall-Aquasafe, Pall Medical) were installed. NICU nurses and cleaning personnel were instructed not to touch or clean the filters, although the filters were changed weekly by designated NICU personnel.

In 2009 there were 160 *Pseudomonas* spp. isolates, without isolates from environment; in 2010 there were 135 isolates; with 2 environmental; and in 2011. there were 10 isolates. From 2009 there were no isolates from blood.

Point-of-use filtration was associated with a reduction of chronically endemic *Pseudomonas aeruginosa* infection/colonisation on a NICU.

P40 **What's possible: The users' perspective on the validation of healthcare associated infection (HAI) and antimicrobial use (AMU) data?**

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The validity of approaches to HAI surveillance is usually assessed statistically. However, good science alone is insufficient to ensure robust data. The methodology has to be acceptable to data collectors and to ensure appropriate implementation it must be feasible.

Aim:

To explore the views of data collectors on the feasibility of approaches used in a pilot validation study of a point prevalence survey of HAI and AMU.

Method:

40 data collectors from 10 European countries completed an online survey. The questionnaire followed a debriefing structure using a mixture of forced and free text responses to identify what had gone well and what could be improved on. Data were analysed using descriptive statistics and content analysis.

Findings:

AMU data were thought to be the easiest to collect. 64% of participants considered AMU data easy to collect compared to 50% for denominator and 13% for HAI data. 83% thought there were no incentives for reporting HAI and 82% that engagement of staff was high. Concerns were raised about the risk of underreporting of HAI and suggestions for improvements included comments on training of data collectors, essential variables for inclusion and clarification of case definitions.

Conclusion:

Lessons learnt for future validation studies are: to take account of underreporting sensitivity as well as specificity should be assessed and; to maximise efficiency the number of variable collected, case definition used and training given should all be optimised.

Hands Up! Improving hand hygiene compliance as a key patient safety and quality initiative

P41

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Issue:

Rouge Valley Health System's (RVHS) hand hygiene compliance rates were below the provincial average in 2008/09 (55% and 80% for the first and fourth moments respectively). RVHS responded by making hand hygiene compliance a corporate priority, with the goal of attaining sustained hospital compliance rates of >90% for the first and fourth moments.

Project:

To achieve this, RVHS put into action its Hands Up strategy, aimed at fostering change throughout the hospital. The strategy has a three-pronged focus on:

- 1) strengthening education;
- 2) establishing accountability;
- 3) creating a cultural shift.

Highlights of Rouge Valley's hand hygiene education program include staff education at orientation sessions and road shows led by members of the senior management team.

Putting education into action requires staff accountability. This has been fostered through an ongoing audit program supported by:

- Unit-based Hand Hygiene Champions,
- Universal hand hygiene daily audits applying lean methodology,
- Monthly and ongoing feedback through data transparency,
- Recognition of top-performing units.

Education and accountability were reinforced by cultivating a culture that values proper hand hygiene. This was achieved through a widespread "Hands Up" communications campaign, which included a series of posters, screen savers, hospital video and bookmarks. A hand hygiene film festival (HUFF) was also launched summer 2011.

Results:

Hand hygiene rates now soar above the provincial average at 90% (first moment) and 94% (fourth moment).

Lessons Learned:

- A multi-faceted approach is fundamental,
- Establish Hand Hygiene as a corporate priority,
- Ongoing and timely feedback on performance,
- Engage all staff.

P42 Tackling VRE in a community hospital with teamwork and tenacity: lessons learned

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Issue:

A VRE outbreak was declared November 2010 at Rouge Valley Health System impacting two acute care and two complex continuing care units. A number of infection control measures were immediately put into action with an ongoing focus on environmental

controls, adherence to hand hygiene and isolation protocols. Despite concerted efforts to resolve the VRE outbreak in a timely fashion, ongoing transmission of VRE continued with three distinct peaks identified throughout the one year period. A total of 110 patients became colonized with VRE.

Project:

An outbreak management team was established. Control measures focused on: hand hygiene, contact precautions, personal protective equipment, dedicated equipment, active surveillance, patient, staff and visitor control measures, assessment of furniture and equipment, education, audits, enhanced laboratory testing, cleaning and disinfection etc.

Results:

A cause and effect review was conducted within the first two months of the outbreak which identified potential infection control breaches and opportunities to strengthen and/or reinforce infection control practices. Among the infection control measures implemented, the removal of furniture and equipment with hard to clean surfaces proved instrumental in halting further VRE transmissions.

Lessons Learned:

- A multi-faceted approach to outbreak management is fundamental, engaging key stakeholders and departments including senior management support,
- Ongoing communication and daily/weekly briefings,
- Maintaining staff morale and team cohesiveness throughout the outbreak,
- Implementing rapid testing by PCR for VRE,
- Replacement of furniture and equipment with hard to clean surfaces,
- Baseline swabs for all patients admitted to the affected units,
- Application of lean principles to outbreak management.

Evaluation of a two-step *Clostridium difficile* diagnostic algorithm of glutamate dehydrogenase and toxin A/B enzyme immunoassay compared to toxigenic culture; with retrospective clinical analysis

P43

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Background:

Recent updated *Clostridium difficile* guidance from the Department of Health, UK has recommended a 2-step glutamate dehydrogenase enzyme immunoassay (GDH EIA) /a molecular method and a sensitive toxin EIA/cytotoxin assay to identify patients with CDI and a third optional (more sensitive) test to detect excretors.

Methods:

The present study was aimed to evaluate the utility of the recommended 2-step algorithm (C.DIFF CHECK – 60 EIA for GDH and Techlab Toxin A/B EIA) against toxigenic culture (TC) in the diagnosis of CDI at Royal Berkshire NHS Foundation Trust, Reading, UK, between February 2011 and January 2012.

Results:

Of the total 9749 samples from 6811 patients tested, 177 (1.8%) from 150 patients (2.2%) were tested positive by the 2-step algorithm (2-SA). TC identified a further 243 (2.5%) specimens from 189 (2.8%) patients. Compared with TC, sensitivity, specificity, PPV and NPV of 2-SA were 38.3%, 99.6%, 99.4% and 46.2%. Of the 32 patients (2-SA positive) analysed, 30 (93.7%) patients were true CDI cases and 2 excretors. Of the 59 patients (TC positive) analysed, 35 (59.3%) patients were true CDI cases and 24 excretors. Although, severity of infection was more common among patients positive by 2-SA, there were no difference in recurrence and CDI related death rates between two groups.

Conclusions:

Findings of this study demonstrate that not only excretors, but a significant proportion (~60% in this study) of true CDI cases will be missed by the 2-SA. Further studies are required to measure cost-effectiveness of 3-step algorithm with a third molecular test.

Comparison of four phenotypic tests for culture-based screening of Methicillin-Resistant *Staphylococcus aureus*

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Aim:

Different phenotypic tests were evaluated for ability to identify Methicillin-Resistant *Staphylococcus aureus* (MRSA). This study used a variety of diverse samples, including different selective agars as well.

Material and methods:

A cross-sectional study included 175 MRSA isolates was performed at the Institute of Public Health of Sarajevo Canton, during a period of last trimester of 2012. The bacterial strains were identified by conventional method according to CLSI standards. The following tests were applied: oxacillin disc diffusion (DD) test, cefoxitin DD tests, E test MIC and Chrom ID MRSA, respectively.

Results:

All 175 tested MRSA isolates showed oxacillin resistance. According to age distribution, the greatest number of MRSA strains was present in 4-10 age group (46/175), while the lowest in 20-30 age group (3/175), respectively. Additionally, out of 175 isolates, 82 were isolate from skin and soft tissue samples. All preformed tests showed sensitivity of 100%, while specificity of oxacillin DD test and cefoxitin DD was 88.89%, respectively. Chrom ID and E test showed 94.4% specificity.

Conclusion:

Chrom ID and E test showed substantially better performance than other media. Both tests are highly effective media for the detection of MRSA and have an excellent sensitivity and specificity as well.

Key words: MRSA, phenotypic tests, specificity.

P45 **Hand hygiene knowledge among health care workers in eleven intensive care units in Argentina**

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Objectives:

To assess the level of knowledge on HH practices among healthcare workers (HCW) in intensive care units (ICU) in Argentina.

Methods:

This is a prevalence study part of larger investigation on HH funded by WHO. A validated WHO survey instrument was utilized to measure knowledge on HH. This survey was administered to 383 HCW. Outcomes were assessed with inquiry about appropriate HH practice: effective time for alcohol hand rub, the five moments for HH, elements to avoid according to standard definitions, and risk for microorganism transmission to patients and to personnel. The instrument had 8 sections: general source of transmission; microorganism reservoirs; transmission to patients; transmission to personnel; knowledge about hand rub; time for hand rub effectiveness, knowledge about hand rub and hand washing moments; elements to avoid for HH. Adequate knowledge was defined as more than 70 points. Two experts validated the results. Protocol had local IRB approval.

Results:

There were 383 survey respondents (97% response rate). Sixty eight percent of participants were nurses, 22% were physicians and 10% were other HCW. Seventy seven percent of participants received training about HH in the last three years and 98% utilize alcohol hand rub for HH. Adequate knowledge of appropriate HH practice was seen in 28.3%. (Median: 64 points; SD: 9.7). No difference was found between physicians and nurses (p: 0.49).

Conclusion:

These findings suggest poor level of HH knowledge among HCW besides the training received. Adequate knowledge was not associated to health care profession.

Microbiological diagnostics and subsequent antibiotics usage in nectrotizic enterocolitis treatment in selected Polish neonatal units

P46

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The aim of this study was examination and analysis of the influence of microbiological diagnostics on antibiotic usage in the treatment of necrotic enterocolitis (NEC) in selected Polish neonatal units.

Material and methods:

The data were gathered in the year 2009 in 6 neonatal units taking part in the Polish Neonatology Network. The study covered population of the very-low birth weight infants. Microbiology diagnostics and antibiotic usage were assessed in 59 NEC cases. Two kinds of indicators were used for expressing of the antibiotic usage – duration of treatment in days and defined daily dose (DDD), according to ATC/DDD system of WHO. Both measures in reference of one case of infection.

Results:

Beta-lactams, aminoglycozydes, glicopeptydes and metronidazol were mainly used in therapy antimicrobials, and the treatment duration for those

individual groups was 529; 75; 211 and 185 days respectively. The only antimycotic drug used in the treatment was fluconazol – 286 days of treatment. According to both indicators, that is duration of treatment and DDDs, antibiotic usage was greater in the group of infants in which microbiological tests were not performed. In this group the average duration of antibiotic treatment were 28.0 days or 577,1 DDDs per one case. Antibiotic consumption in the group of infants with infections confirmed by microbiological tests were 30% lower and amounted 18,6 days of treatment or 374,2 DDDs per one case of infection.

Conclusions:

The results confirm necessity and usefulness of microbiological diagnostics which helps to decrease antibiotic usage and to improve the results of the therapy.

P47 Nosocomial infections and the safety of hospitalization according to patients opinion

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Introduction:

Nosocomial infections (NIs) surveillance in Poland is regulated by the law for over ten years. Awareness of the NIs among medical staff is continuously increasing. But completely unknown is the patients' awareness about the impact of NIs on the safety of hospitalization.

Material and method:

This paper presents the results of the questionnaire conducted among patients regarding the factors affecting the safety of hospitalization. The population of 491 adults were interviewed, using a 10-minute telephone interview (CATI). The study was a part of educational program "Stop Hospital Acquired Infections. Program of the Hospital Hygiene Promotion" organized and run by the board of experts in infection control in Poland.

Results:

According to patients' opinion the crucial factor of

the safety of hospitalization is professional staff - 68% answers and only 7% of respondents appreciate the importance of proper hygiene and sanitary conditions in this area. Majority of the respondents (67%) were aware of the problem of NIs (heard about it before hospitalization), but only 22% of them declared that they were informed about the risk of NIs during their stay in the hospital. According to 45% of the respondents hospital staff washed or disinfected their hands before examination of every single patient, but 37% of the respondents did not pay any attention to that. According to 25% of the respondents staff wore gloves on the ward all the time. The results confirm the need for continuing education in the field of infection control, among medical staff and patients.

Recommendations for applying the WHO '5 Moments' for hand hygiene in overcrowded resource-limited settings

P48

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Hand hygiene (HH) is a core activity of patient safety for the prevention of healthcare-associated infections. To help standardize HH practices to increase adherence globally, the World Health Organization (WHO) developed the concept of 'My 5 Moments for Hand Hygiene', which defines the five moments when there is the greatest risk of transmission of microorganisms by healthcare workers' hands. The '5 Moments' is a key component of the WHO HH improvement strategy developed to assist countries with the application of the WHO Guidelines on HH in Health Care in a wide range of patient care activities

and healthcare settings. Central to the ‘5 Moments’ is the division of the healthcare environment into two virtual geographical areas: the patient zone and the healthcare area. Overcrowded hospital conditions with limited resources create major challenges in the realistic application of this concept. Fusion of the two areas is common with multiple patients per bed and inadequate or no spatial separation between beds, thus creating sub-optimal working conditions. These conditions pose difficulties for healthcare workers to correctly comply with the ‘5 Moments’, including the performance of compliance audits to document observations according to the WHO audit tool. Modifications to the ‘5 Moments’ adapted to resource-limited conditions were needed to train healthcare workers and audit realistic HH compliance. We have documented the challenges to apply the ‘5 Moments’ in a low resource setting and have developed HH indications tailored to the situation and context.

P49 **Impact of reducing the intrinsic bacterial burden on touch surfaces: enhancing patient safety through copper surfaces**

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Hospital acquired infections (HAI) continue to be one of the most common and significant complications associated with hospitalization across the globe. Microbes have an intrinsic ability to survive and ultimately colonize common touch surfaces where acquisition and transport from surfaces to humans is common. Healthcare workers (HCWs) have the potential to transfer microbiological contaminants not only from patient to patient but amongst themselves and back to surfaces, adding to the complexity of the microbial reservoir involved in transmission.

For millennia humans have indirectly appreciated the antimicrobial activity of copper. The inherent antimicrobial action of copper surfaces offers an advantage as its action is continuous rather than episodic. Significant interest in learning how to manage and provide best-practice applications for infection control for hospitals has been generated with recent publications demonstrating the antimicrobial activity of copper. In this study we describe how a limited application US- EPA-approved antimicrobial copper surfaces resulted in an average 83% reduction to the bacterial burden resulting in a significant, double digit decrease to the incidence of HAI/or colonization by MRSA and VRE in the intensive care units at three US hospitals. Given that the average HAI is conservatively estimated to result in an additional 19 days of hospitalization and \$43,000 in costs in the United States the use of antimicrobial copper surfaces warrant further study and optimization in order to fully realize the true benefit of the risk mitigation that antimicrobial copper surfaces offer in enhancing quality of health care delivery and improving patient outcomes.

Serratia marcescens (ESBL) nosocomial infection: epidemic investigation by phenotypic typing methods

P50

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Serratia marcescens is well established as a nosocomial pathogen, resulting in considerable morbidity and mortality in immunocompromised patients. It is associated with a range of infections, such as pneumonia, urinary tract infections, wound infections and bacteraemia.

Objectives:

The aim of this study was to investigate an outbreak of *Serratia marcescens* in Orthopaedic Clinic at Clinical Center University of Sarajevo.

Methods:

A total of 96 strains from 79 patients were isolated.

The isolates were identified by conventional methods. Susceptibility testing was performed by disc-diffusion method following NCCLS/CLSI guidelines. Results were confirmed by VITEC-2 system.

Results:

From January to December 2010, 96 strains from 79 patients were isolated in Orthopaedic Clinic at Clinical Center University of Sarajevo. The strains were isolated from wound swabs (78), blood cultures (17) and cerebrospinal fluid (1). The strains were identified with current phenotypic methods as *Serratia marcescens* with identical biochemical characteristics and antibiotic susceptibility patterns. All strains were susceptible to imipenem, meropenem, amikacin, ciprofloxacin, levofloxacin and piperacillin/tazobactam. Infection control team was appointed and after investigation discovered the same phenotype *Serratia marcescens* in anaesthetic vials used in procedures. This outbreak was extremely difficult to terminate, even with cohorting of patients, sterilisation of equipment, reinforcement of handwashing and deep-cleaning of facilities. The implementation of new control measures terminated the outbreak in February 2011.

Conclusion:

Continuous monitoring of nosocomial infections is indispensable. Phenotypic characterization of the isolates is useful for studying the relatedness of microbial pathogens. It is important in determining the reservoir of infection and transmission routes.

P51 Microbiological colonization of mechanically ventilated patients in the coronary care unit

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Introduction:

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 using tracheal aspirates were taken the first 24h of intubation and before extubation, in a total of 39 CCU patients (mean age 68.7±11.9yrs, 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 <0.001). Rates of positive cultures for potential pathogens correlated with the APACHE II score (p=0,047). Colonization with a potential pathogen was associated with placement of a nasogastric catheter (p=0,048), central vein catheter (p=0,004), the duration of MV (p=0,010) and placement of an Intra-Aortic Balloon Pump for a prolonged period (p=0,009).

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.

Potential pathogens microorganism in coronary care unit patients

P52

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Background:

Nosocomial infections in patients admitted to coronary intensive care unit (CCU) are frequently caused by potentially pathogen microorganism (PPM). The aim of the present study was

- 1) to determine the incidence of PPM of patients who were admitted in our CCU,
- 2) to identify the risk factors for colonization with PPM.

Methods:

We studied electronic medical records of all patients who were hospitalized from January 1, 2010, through December 31, 2010, in our institution and without previous infection. Specimens for culture were taken from the nasopharynx, blood, urine and, if applicable, from the central or peripherals catheter.

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 *S. epidermidis* (36.7%), *Klebsiella pneumoniae* (32.6%), *Pseudomonas aeruginosa* (10.2%), *Candida albicans* (8.2%) and MRSA (4.1%). Risk factor for colonization with PPM was found the duration of stay in CCU (ANOVA test, F= 5.008, p=0.004) and increase value of urea and creatine (ANOVA test, F= 4.502, p=0.039).

Conclusion:

The rates of PPM were significant high and particular attention will be given in the risk factors with which it found to be correlated.

P53 **Nasal carriage of Methicillin-resistant *Staphylococcus aureus* (MRSA) in patients on admission to a medical surgical ICU at the university hospital, Skopje**

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MRSA nasal carriers on admission to ICU have an increased risk for acquiring MRSA infections and high potential of spreading the infection. The aim of this study was to evaluate the nasal carriage of MRSA as measure for control and prevention of its spreading among patients in surgical ICU at the university hospital, Skopje. We studied the prevalence of the nasal carriage of methicillin-sensitive *Staphylococcus aureus* (MSSA) and methicillin-resistant *Staphylococcus aureus* (MRSA) in nasal swabs taken from 218 patients in the first 24 hours on admission in surgical ICU during one year period. Standard microbiological procedures (catalase, DNase, 5% sheep blood agar, chromID MRSA, oxacillin disc on salt agar and cefoxitin disc according to disc diffusion method), as well as automated VITEK technique were done in aim to confirm and distinct MRSA from MSSA. All MRSA were tested for mupirocin susceptibility. *S. aureus* nasal carriage was detected in 23 (10.6%) of the patients. MSSA was isolated from 17 (7.8%) patients, and MRSA was isolated in 6 (2.8%) patients. None of the isolate was resistant to mupirocin. In some of the patients 29 (13.3%) was detected nasal carriage of Gram-negative bacteria such as *Acinetobacter* spp., *Klebsiella* spp., *E. coli*, *Pseudomonas aeruginosa*, and 161 (74%) patients had no nasal carriage identified. The 2.8% prevalence of MRSA in our admissions shows that we have low prevalence according to published literature data (3%-12%).

The HALT-project in Hungary: lessons learned and moving forward

P54

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Background:

Many studies indicate that healthcare-associated infections and antibiotic use are common among residents in long-term care facilities (LTCF). For these reasons the European Centre for Disease Prevention and Control (ECDC) funded the HALT-project (Healthcare-associated Infections and Antibiotic Use in European Long-term Care Facilities) in order to establish baseline rates and identify priorities for improvement.

Methods:

All EU member states were invited to participate in this point prevalence survey (PPS) in 2010. Per LTCF, two questionnaires had to be filled in: an institutional questionnaire collecting data on e.g. infection control practices (ICP) and a resident questionnaire for each resident with infection and/or using antimicrobial. Infections were confirmed according to McGeer criterias.

Results:

Our results were not representative. Only 5% of LTCFs participated in the PPS. Prevalence of infections was 1.9%. The mean prevalence of antimicrobial use reached 1.8%. After PPS, we faced with the most important problems: lack of appropriate ICPs, specific guidelines and national surveillance of infections and antibiotic use.

Conclusions:

The HALT-project turned our attention to infections and antibiotic use in elderly in LTCFs. This survey raised awareness for the safety of residents and we obtained a global image of LTCFs about ICPs. Therefore we developed a voluntary online surveillance system of infections and antibiotic use for LTCFs and it will be implemented from September 2012. In addition, national guidelines on infection control and hand hygiene in LTCFs will also be developed and we will participate in HALT-2 next year with a representative number of LTCFs.

as a result of compromised host immune response, virulence of the pathogen and the antibiotic resistance.

Aim:

The aim of this study is to show the antibiotic resistance of outpatient and hospital strains of *Pseudomonas aeruginosa*.

Materials and methods:

A total number of 75 strains of *Pseudomonas aeruginosa* were examined: 11 from outpatient samples (swabs from skin changes due to ischemia) and 64 from hospital samples (22 from surgical wounds, 29 from respiratory secretion, and 13 from other samples – blood, urine, central venous catheter).

Samples were cultivated on standard media. Identification was made with disk diffusion method using disk kanamycin (always resistant) and disk carbencillin (always susceptible) and confirmation with automated method Vitek 2 Compact (BioMerieux). Antimicrobial susceptibility was tested on: piperacillin-tazobactam, cefepime, ceftazidime, imipenem, meropenem, ciprofloxacin and gentamicin according to EUCAST (The European Committee on Antimicrobial Susceptibility Testing).

Results and discussion:

In general, the highest resistance was determined to gentamicin. In surgical wounds, the highest resistance of *P. aeruginosa* was to imipenem, gentamicin (54.54%) and ciprofloxacin (50.00%), unlike outpatient wounds where resistance to imipenem / meropenem and ciprofloxacin was low (27.27%). In outpatient wounds the highest resistance was found to piperacillin-tazobactam (54.54%).

Conclusion:

Pseudomonas aeruginosa isolated from hospital samples show high resistance to more antibiotics which are part of the standard antimicrobial test. The development of resistance is directly associated with intra-hospital use of antibiotics. High resistance to piperacillin-tazobactam in outpatient wounds, most probably, is due to overuse of amoxicillin-clavulanate in general population.

P55

***Pseudomonas aeruginosa* resistance according to EUCAST standards during year 2011/2012 in patients of Special Hospital for Surgical Diseases Filip Vtori, Skopje – Republic of Macedonia**

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Special Hospital for Surgical Diseases - Filip Vtori, Skopje, Republic of Macedonia

Background:

Pseudomonas aeruginosa is a Gram-negative opportunistic bacterium which can cause infections to almost all tissues. It is a common cause for infection

P56 **The dynamics of multiply resistant bacteria at the University Hospital Merkur**

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The incidence of infections caused by multidrug resistant (MDR) bacteria is increasing worldwide. We conducted the 5-year surveillance study to analyze the trends of multidrug resistant bacteria in our hospital. From 2006 to 2010 the number of multidrug resistant gram-negatives increased significantly, especially carbapenem resistant *Acinetobacter baumannii* (11 patients in 2006 compared to 93 patients in 2010) and extended spectrum beta-lactamase (ESBL) producing *Klebsiella pneumoniae* (15 patients in 2006 compared to 97 patients in 2010). Since 2008 a significant decrease was seen in number of MRSA patients (from 129 in 2008 to 63 in 2010). The same was observed for carbapenem resistant *Pseudomonas aeruginosa* (from 47 patients in 2007 to 19 patients in 2010). Vancomycin resistant enterococci are still sporadic and only three isolates were noted, one in 2006, one in 2008 and one in 2009. No carbapenem resistant enterobacteriaceae were isolated until the end of 2010. The rise of multidrug resistant gram-negative bacteria requires the stricter adherence to existing infection control measures in order to limit their further spreading.

P57 **Evaluation of the knowledge of the personnel included in control of the intrahospital infections as an indicator for training and education**

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Objective:

The aim of the paper is making an evaluation of the knowledge of the personnel included in controlling the air and inanimate nature in the hospitals in Republic of Macedonia.

Materials and methods:

In the paper are analyzed data obtained by testing 38 doctors (microbiologists, epidemiologists and clinical doctors) and 46 nurses included in control teams for intrahospital infections from different cities in the country. The questions in the test were about methods of the microbiologic screening on the hygienic safety of the air and the disinfection and hygiene of hands.

Results:

On each question individually, the right answers were between 92% and 100% for the doctors and between 78% and 90% for the nurses.

Taking in consideration all of the questions there is no significant difference between the results of the doctors and the nurses ($p > 0,05$).

Conclusion:

Doctors and nurses included in control teams for intrahospital infections in the hospitals in Republic of Macedonia are well educated for the control of the air and the inanimate nature.