

ORAL PRESENTATIONS

TUESDAY, JUNE 3, 2008

Sharing a hospital room: is exposure to hospital roommates a risk factor for nosocomial infection?

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Background/Objectives: Numerous patient- and hospital-level characteristics have been established as risk factors for nosocomial infection, however very few studies have examined the role of hospital roommates in transmission of infection. The objective of this study was to determine the association between exposure to roommates during a hospital stay and risk of nosocomial infection.

Methods: A retrospective cohort design was used to examine the association between number of hospital roommates and occurrence of three selected nosocomial infections (methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *Enterococcus* (VRE), and *Clostridium difficile* (*C. difficile*)) in patients admitted to tertiary level teaching hospital from 2001 to 2005. Exposures were characterized as daily number of roommates each patient was exposed to and number of unique hospital roommate exposures. Additional variables previously established to be associated with nosocomial infection were measured as potential covariates. Cox proportional hazards models were used to estimate the risk of infection associated with roommate exposure.

Results: Daily roommate exposures were found to be significantly associated with MRSA infection or colonization (HR=1.06, 95% CI: 1.02, 1.09) in multivariate analyses. No significant associations were found for total number of unique roommate exposures per day for MRSA, or for either roommate exposure variable and VRE or *C. difficile*.

Conclusions: The results of this study add to the growing body of research attempting to explain the transmission of nosocomial infections, as well their prevention and control. The significant association found between daily roommate exposures and MRSA demonstrates that limiting patients' contacts with each other may contribute to infection control in this facility.

Management of an outbreak of methicillin sensitive *Staphylococcus aureus* (MSSA) in a neonatal intensive care unit (NICU): space and design do matter

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Background: Our facility is the designated tertiary care perinatal center for Eastern and South Eastern Ontario, Western Quebec and Baffin Island, with a combined level 2 and level 3 NICU. We investigated and managed an MSSA outbreak in the NICU between Oct 2007 and Feb 2008.

Methods: Cases were defined as neonates infected or colonized with *Staphylococcus aureus* (SA) since October 1, 2007. Prevalence screens of asymptomatic neonates were performed on 7 occasions between December 20th and February 19th. NICU staff were screened for nasal SA carriage. Pulsed field gel electrophoresis (PFGE) analysis was performed on all SA isolates. Hand hygiene education was provided to the staff. Environmental cleaning and respiratory therapy protocols were reviewed to identify potential breaches in infection control. Space allocation within the NICU was assessed and compared to current design guidelines.

Results: A total of 26 infants were positive for SA (11 infected, 15 colonized) during the study period. 45/127(35%) of the staff were positive for SA. PFGE analysis identified 2 outbreak strains, which accounted for 82% of the infant isolates and 34% of the HCW isolates. Multiple control measures were put in place including cohorting of positive infants, educating staff about hand hygiene, providing decolonization therapy for colonized staff and enhancing environmental cleaning. The unit was closed to new admissions for a 2-week period. The median occupancy rate during the outbreak was 23 (range 15 - 30). The NICU has 26 designated spaces divided in 3 main rooms, providing an average of 89 square feet (range 75-118) per designated space. However, the number of infants in rooms A and B exceeded the number of designated spaces 19% and 44% of the time. On reopening the unit, admissions were limited to the number of designated spaces. There have been no further infections identified since January 25th 2008.

Conclusion: The unit's design and high occupancy level were barriers to optimal cohorting of infants and contributed to overcrowding, which facilitated transmission. A minimum of 120 square feet should be provided for each infant to meet current guidelines and the number of admissions should be limited to the number of designated bed spaces.

Infection Prevention and Control Impact on Emergency Department Design: Planning for the Unknown

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Background:

In 1976, the Sunnybrook Health Sciences Centre Emergency Department (ED) was built for a capacity of 20,000 visits per year. In 2007, the unit had over 41,000 visits and is recognized as a regional trauma centre. In 2003, the Health Services Restructuring Commission initiated an expansion project to increase capacity and restructure the department from 18,000 to 35,000 square feet and increase stretcher capacity to 48 bays.

Project:

Illustrate the key design elements in the Emergency Department and Satellite Imaging Expansion Project that support infection prevention and control (IP&C).

Results:

The final drawings took into account the need for patient segregation, unique separation qualities in the heating, ventilation and air conditioning system set-up, effective support areas and materials/surfaces conducive to easy cleaning and disinfection. Four self sufficient pods were created, serving varying levels of patient care/acuity. Each pod will contain a nursing station, airborne infection isolation room, patient rooms/bays, and support areas. Each pod will have its own air handling unit, with 100% outdoor exhaust to allow for pod isolation. There are 4 airborne infection isolation rooms; while another 18 rooms were retrofitted to provide negative airflow if required. The department has 17 hands-free, foot operated hand wash sinks, with adjacent water resistant wall covering. Clever use of space minimizes clutter and allows crash carts and stretchers to be stored out of traffic pathways.

Lessons Learned:

The involvement of IP&C from the beginning of the process enhanced the final designs by:

- ❖ Applying the region's changing epidemiology into the decision making process
- ❖ Ensuring that key IP&C design related standards were applied related to spacing, transmission of organisms, and workflow paths
- ❖ Redesigning the department within the confines of an existing footprint
- ❖ Utilizing strategies to mitigate risk to patients and staff despite project limitations

*Chosen as one of the best abstract submissions

THE EFFECT OF INADEQUATE FACILITIES ON METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS (MRSA) AND VANCOMYCIN-RESISTANT ENTEROCOCCUS (VRE) RATES IN VASCULAR SURGERY PATIENTS

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Background/Objectives: Few studies quantify the nosocomial infection risk with inadequate facilities. In Jan01, vascular surgery was amalgamated onto a multi-bed unit with shared toilets. The objective of this study was to evaluate the effect of inadequate facilities on nosocomial MRSA and VRE rates.

Methods: We prospectively evaluated nosocomial MRSA and VRE rates in vascular surgery compared to other TOH patients. During Period 1 (Jan01-Oct03) the vascular surgery unit had only 2 private rooms with a dedicated toilet. The remaining 27 patients shared 7 toilets, for a patient:toilet ratio (PTR) of 4:1. In Period 2 (Nov03-Jun04) patients were split between two units with beds blocked to achieve a PTR of 2:1. In Period 3 (Jul04-Jan06) patients were reconsolidated onto a single unit with a PTR of 4:1. In Period 4 (Feb06-Sep06), patients moved to a renovated unit with a PTR of 2:1.

Results: The nosocomial MRSA risk was significantly higher for vascular compared to other TOH patients during periods when the PTR was 4:1 (157.7 vs 31.9 per 100,000 pt-days; RR=4.9; 95%CI=3.8-6.4) but not when the PTR was 2:1 (81.4 vs 49.6 per 100,000 pt-days; RR=1.6; 95%CI=0.9-3.1). Similarly, nosocomial VRE risk was significantly higher for vascular compared to other TOH patients during periods when the PTR was 4:1 (42.6 vs 6.2 per 100,000 pt-days; RR=6.9; 95%CI=4.1-11.5), but not when the PTR was 2:1 (0 vs 7 per 100,000 pt-days; RR=0). There were no differences in patient population, patient days, staff and physicians, procedures performed or severity of illness.

Conclusions: Improving the PTR ratio had a significant impact on nosocomial MRSA and VRE. These data suggest that hospitals should strive to maintain a maximum PTR of 2:1.

VASCULAR SURGERY AND SSI - WHAT DO WE KNOW? WHAT ARE THE RISK FACTORS?

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Background/Objectives: In Canada, Surgical Site Infection (SSI) rates for vascular surgery patients are not readily available but in the US, SSI rates range from 4.3 – 10.3 SSIs per 100 vascular surgeries performed. Protocols for the administration of prophylactic antibiotics and hair removal have been widely published, but less is known about temperature and glycemic control and other risk factors in vascular surgery patients. The objectives of this study were: 1) to determine if hyperglycemia, hypothermia and other factors increase risk for SSI in vascular surgery patients, and 2) to describe the assessment and management strategies for hyperglycemia, hypothermia and other risk factors in these patients.

Methods: A random sample of 116 was drawn from all vascular surgery patients who underwent Class I (clean) vascular surgeries of interest (bypass and AAA repair) during 2005. Their paper and electronic charts were retrospectively reviewed, including post discharge records from outpatient clinics or ER, and microbiology results. Standard CDC definitions of SSI were used.

Results: The SSI rate was 17.2 per 100 vascular surgeries performed. Giving antibiotics late was significantly associated with SSI: late vs. within 30 minutes of incision ($p = 0.0089$) or late vs. within 60 minutes of incision ($p = 0.0113$). Because of the small sample size, there were few statistically significant results but many clinically important findings were found. Compared to patients with no SSI, those with SSI were more likely to be hypothermic on arrival to the postoperative unit from the PARR, smoke more cigarettes, have an emergency procedure, or have an elevated glucose level (> 11.1 mmol/L) or HbA1c. Few patients had their temperature assessed in the OR, had HbA1c or ferritin levels assessed, had hyperglycemic episodes effectively managed, or were prescribed iron supplements if anemic.

Conclusion: We need to improve glucose and temperature control in vascular surgery patients and give antibiotics in a timely manner. As well, we need to do more research with a larger sample size.

DOES HIGH HUMIDITY IN THE OPERATING ROOM (OR) IMPACT SURGICAL SITE INFECTION (SSI) RATES?

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ISSUE: There are few data on the risk of infections associated with high OR humidity. The American Institute of Architects (AIA) requires a relative humidity of 30-60% for ORs. Meeting these levels may be a challenge in hospitals with aging HVAC systems, increasing numbers of OR personnel and longer procedures. The University of Ottawa Heart Institute experienced unusually high humidity levels between June 11-17, 2005, coinciding with extreme external temperature and humidity. OR personnel reported damp OR records, moist sterile supplies and instruments, condensation on the OR walls and uncomfortable working conditions. **PROJECT:** Patients who underwent cardiac surgery during the high humidity period were flagged in the existing SSI database to allow for prospective monitoring and comparison with baseline SSI rates. All sterile supplies and equipment packaged in porous material were discarded or reprocessed prior to use. Reprocessed sterile items were bagged in plastic to prevent moisture from penetrating the packaging. Continuous temperature and humidity monitoring was installed the ORs and Sterile Supply Department; readings were recorded in a logbook. Nonurgent procedures were cancelled; patient disclosure for all other procedures was required when humidity readings were above AIA guidelines. **RESULTS:** During this week, humidity levels were consistently >60%, and often up to 85%. The SSI rate for procedures during this week was 10.7% (3/28 procedures). There were no fungal SSIs. This SSI rate was slightly higher than the remaining weeks in the first quarter of 2005 (5.6%), the first quarter for 2004 (3.3%), and the first quarter for 2006 (7.9%). However, these differences were not statistically significant. All procedures were deemed urgent; none were cancelled. No patient refused to undergo surgery upon disclosure. The humid weather and inability to alter the fresh air supply rate appeared to be cause of the increased humidity despite the HVAC system running at full capacity. **LESSONS LEARNED:** We documented a non-significant increase in SSIs during a period of consistently high OR humidity. These data are helpful to quantify patient risk in high humidity situations. ORs should maintain a log of temperature and humidity readings in order to correlate SSI rates with OR conditions. Additional studies in larger populations would be helpful to validate these findings.

Lights, Camera, Action: Being an Infection Control Paparazzo (ICP)

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Issue: Providing education to staff in a meaningful way is challenging. Infection Control Practitioners (ICPs) must find new methods to present old information. In a facility with over 5600 staff members, the hospital infection control team began using audio/visual technology to bring infection control (IC) information to frontline staff.

Project: The ICPs “star” in short, sometimes humorous, videos fashioned after commercials or music videos. The videos contain important infection control messaging from hand hygiene to equipment cleaning. The frontline staff is also asked to participate, as contestants, in games such as “Infection Control Jeopardy”, “Infection Control Clue” and Personal Protective Equipment Olympics”. The games consist of infection control facts that staff must answer questions about or demonstrate to win a prize. These activities are videotaped or photographed and are posted on the hospital IC website.

Results: Staff have given positive feedback about the videos and games. The audio/visual aides have increased interest in the IC website. The videos have sparked conversations about infection control issues.

Lessons Learned:

There were many benefits to providing IC information to frontline staff in a refreshing and innovative manner. Staff were entertained, while learning basic infection control principles. The videos and photographs increased the visibility of the ICPs. There was an increase in the awareness of IC issues. It is important for ICPs to use creative ideas to provide information in a manner that is engaging for staff. Using a multimedia approach is a creative and effective method to bring IC information to staff.

***Chosen as one of the six best abstract submissions**

A SUCCESS STORY: PERSONAL PROTECTIVE EQUIPMENT (PPE) TRAINING

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ISSUE: The 2003 Severe Acute Respiratory Syndrome (SARS) outbreak in Ontario highlighted the need for increased infection control training for healthcare workers (HCWs).

PROJECT: A training program was developed on the proper use of PPE based on Knowles' principles of adult learning. This one-hour program was advertised as mandatory attendance for all HCWs. To increase learner's readiness, a relief budget was made available and sessions took place away from clinical work areas. The key motivation message was: "use PPE correctly for your safety". Although the target audience was regulated HCWs, the degree of difficulty was low to accommodate all hospital staff. Strategies to improve retention were: explanation of PPE sequence, demonstration of donning and doffing PPE, followed by a video taped in a clinical setting. Participants performed a return demonstration. Individual feedback and positive reinforcement were given. Written educational material was provided to reinforce educational objectives. The evaluation component consisted of two-parts: (1) HCWs were observed for their demonstration of competency to measure immediate retention, and (2) HCWs' knowledge and needs were considered based on their feedback of the program.

RESULTS: 83% (1264/1516) of the attendees were regulated healthcare workers (RNs or allied health). The remainder were support staff (e.g. housekeepers, ward clerks). 718 return demonstrations were evaluated; 80% were performed correctly. Gown removal was the most common incorrectly performed step (47%), followed by incorrect sequence of PPE removal (20%) or a missed hand hygiene step (20%). From the feedback survey, 99% reported the program to be helpful to their practice; 89% found the return demonstration to be useful. The format, content and strategies were well received including the safety message, which was relevant to HCWs.

LESSON LEARNED: The success of this education program was confirmed by the high rate of HCWs who demonstrated immediate retention and competence. The majority of the target population found the program to be helpful to their practice. Future work is needed to measure long-term retention of the information as well as its applicability to alternate targets such as Medical Staff.

DO YOU KNOW WHAT'S ON YOUR HANDS AND PAGERS? OR HOW TO SENSITIZE HEALTHCARE WORKERS TO THE IMPORTANCE OF HAND HYGIENE

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Issue: Recently, transmission of multi-resistant organisms (MRO) was observed in our Neonatal Intensive Care Unit (NICU). To sensitize healthcare workers (HCW), a Hand Hygiene Awareness (HHA) Week was rapidly set in place by the nursing personnel on the unit, preceded by a visual demonstration by the Infection Control Service of bacterial flora found on hands and pagers prior to hand washing. The project was undertaken to illustrate cross-contamination between patients via personnel, as well as the importance of hand washing.

Project: During an 8-hour period, all personnel entering the NICU was requested to inoculate a blood agar plate with their fingertips, prior to hand washing. The highly touched surface of pagers was applied with a light pressure on blood agar plates for 5 seconds. Data on employment status (nurse, respiratory therapist [RT], technologist, resident, or staff) and departments were recorded. Each employee was given an identification number that was used for results reporting. Organisms were identified, using usual algorithm and resistance screening for MRSA, VRE and ESBL were done when appropriate. The available results were presented during the HHA Week in the NICU, along with a questionnaire pertaining to hand hygiene, and demonstration of proper hand washing technique. Results and weaknesses were discussed with the participants.

Results: In total, 48 HCW participated in the experiment (18 nurses, 9 staffs, 4 residents, 3 RTs, 4 technologists, and 9 others); all had a culture of their fingertips taken and 20 of their pagers. No MRO was recovered. The majority of fingertips culture (94%) and pagers (85%) revealed normal skin flora, 3 HCW had no bacteria on their fingertips but admitted washing their hands compulsively. Interestingly, 2 of 3 RTs had abundant respiratory flora on their hands and pagers, including filamentous fungus. *S.aureus* (not MRSA) was recovered on the hands of 6 HCW and *Enterococcus* (not VRE) was found on the hands of 4 HCW.

Lessons learned: HCW were very receptive to these results. The predominant respiratory flora on RTs' hands illustrated well the cross-contamination that can occur between patients via hands or contaminated equipments. No MRO were identified and normal skin flora predominated.

The Content of Pandemic Influenza Plans in Ontario Acute Care Hospitals

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Introduction: The purpose of this study was to examine the content of pandemic plans in acute care hospitals in Ontario to determine the information needed to be conveyed to help hospitals prepare for future influenza pandemics.

Methods: A survey was sent in early 2007 to all acute hospitals in Ontario. The survey was completed by the person most responsible for the hospital's pandemic influenza plan.

Results: The response rate was 77%, 97 of 126 acute care hospitals participated. Three quarters (75%, 73 of 97) hospitals had pandemic influenza plans. The most frequently consulted documents were the Ontario Health Plan for Pandemic Influenza (99%) and the Canadian Pandemic Influenza Plan (89%). Two-thirds of hospitals (65%) based their plans on the Incident Management System model. The key human resource components of which services to suspend (90%) and continue (85%) were addressed by most plans, however, few addressed staffing of alternative sites (36%) and roles for family members (36%). Surge capacity related to beds (97%) and on-site supplies (87%) were addressed by most hospitals, while fewer addressed morgue (74%) and parking (26%) capacity. Over 90% of plans identified critical supplies such as N95 respirators, masks, gloves, gowns, and eye protection, while fewer identified diagnostic supplies (63%) and cots (32%). Half of plans (53%) included a priority list for receiving antivirals and 42% a priority list for pandemic influenza vaccinations. The clinical care section of plans addressed the screening of new patients and visitors for febrile respiratory illness 100% of the time and triage procedures 90% while criteria for ventilator use was addressed by only a quarter of plans. Two-thirds (66%) of plans outlined a security strategy and half (51%) a within hospital patient transportation strategy. Challenges of smaller and rural hospitals (56%) and human resources (54%) were most often identified by respondents as priorities for pandemic preparedness learning.

Conclusions: The vast majority of pandemic influenza plans had shortfalls in many key areas. A web-based educational initiative, the "Being Prepared is Being Protected Pandemic Learning Portal Project", is currently being developed by the authors to address these important areas and will assist hospitals to plan effectively for future pandemics.

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EASING THE PAIN OF OUTBREAKS IN LONG TERM CARE: ELEMENTS OF A SUCCESSFUL OUTBREAK PREVENTION AND CONTROL TEAM

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Issue: The occurrence of outbreaks in a Long Term Care (LTC) facility is always a cause for concern.

Project: A multidisciplinary team was formed and terms of reference developed. Key issues identified included: outbreak prevention, empowerment of staff to assess and act promptly and efficiently to prevent transmission and the means by which decisions were made and executed in a timely, effective manner. Education and promotion programs were developed and delivered to residents, families, volunteers and staff. The team met as soon as evidence of an outbreak occurred and regularly throughout the outbreak. Members were responsible to report back to their respective groups. To further enhance communication within the facility, an electronic template was designed which outlines outbreak status, restrictions and expected actions of staff. To address the needs of residents, families and volunteers, an Outbreak Telephone Line was established which is updated after each meeting.

Results: The Outbreak group is an example of various disciplines coming together as a cohesive, productive team. Staff members now recognize and report potential cases of illness immediately to Infection Control. Staff members have reported a greater sense of comfort that has resulted from receiving clear, concise direction from the group. Residents and family members have reported satisfaction with improved communication

Lessons Learned: Early detection and action combined with effective communication are key to managing outbreaks successfully.

Infection Prevention & Control Participates in an Accreditation Pilot

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Issue: The Canadian Council on Health Services Accreditation (CCHSA) developed a new format for hospital accreditation. Infection Prevention and Control (IP&C) at St. Joseph's Healthcare chose to participate in an accreditation pilot project. This presented an opportunity for a program self assessment prior to accreditation in May 2008.

Project: An on-line survey, pertaining to Infection Control, was distributed to ninety-nine front line staff. IP&C submitted selected infection rate data along with supporting documentation for six new Required Organizational Practices. The final stage of the pilot was an on-site visit by the CCHSA surveyors who met with IP&C. Surveyors also assessed front-line staff Infection Control knowledge.

Results: The CCHSA reviewed the on-line survey results. Feedback indicated questions on the survey were ambiguous and lacked clarity, causing Infection Control to receive red flags, indicating unmet criteria related to standards. An action plan was developed to address the red flags. Conversely, the on-site visit report concluded that Infection Control had met all the standard criteria, and had no red flags.

Lessons Learned: We provided the CCHSA with feedback on the questionnaire format indicating that the front line staff found some questions difficult to interpret. The ambiguous nature of the questions was reflected in the number of red flags received. The on-site visit was a positive experience and IP&C gained valuable advice from the surveyors. Involving frontline staff in the process allows surveyors to better assess the quality of care provided. The accreditation pilot strengthened communication throughout the organization and built on St. Joseph's commitment to quality improvement.