15-24 Outbreaks and Clusters

101 An Outbreak of Bloodstream Infection (BSI) Caused by Extended-Spectrum β-Lactamase (ESBL) Producing *Klebsiella pneumoniae (Kp)* in a Neonatal Intensive Care Unit (NICU)

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Background: Outbreaks of infection due to ESBL *Kp* in NICUs are associated with a reservoir of ESBL *Kp* in the neonatal gastrointestinal tract, and hand transmission by ward staff. The NICU at Gregorio Marañon University Hospital is a 16-bed referral centre and, until recently, ESBL *Kp* were uncommon with only 6 babies colonised/infected and no BSIs from January to August 2006. However, on 17 September, one neonate developed BSI with ESBL *Kp,* sensitive to amikacin, imipenem, meropenem, ciprofloxacin and co-trimoxazole. There followed a brisk outbreak of ESBL *Kp*, with 6 more BSIs in the week from 26 October, and 2 later in November.

Objective: To control the outbreak by identifying any common source of infection, breaches in aseptic practice, and the risk factors (RFs) for ESBL *Kp* acquisition in this unit.

Methods: The investigation was initiated after the second BSI, when rectal swabs were taken from all babies admitted to the unit and then weekly. Cohort isolation of cases was established, hand hygiene reinforced, and the type of IV line used was changed. 88 environmental samples included maternal and formula milk (23), parenteral feeds (13), in-use heparin vials (8), other in-use IV drugs (10), suction pump valves (6), and incubators (2). 80 hand samples were taken from staff. Standard microbiological methods for *Kp* were used. A cohort study investigated RFs for acquisition of ESBL *Kp,* including birth weight, gestational age, presence of IV devices, parenteral nutrition, multiple IV fluids, and previous antibiotics. Ward procedures were scrutinised by the infection control team, with particular attention to IV devices and hand washing.

Results: From 26 October to 28 November, of 62 admissions, 8 developed ESBL *Kp* BSI (4 of whom died), and 1 became colonized (attack rate of 14.5%). Within 6 days of the initiation of the investigation of this outbreak, there was a rapid decline in new cases, with only 3 in November. Of the 8 neonates with BSI, 4 were initially identified as colonized, in 2 the infection was preceded by rectal colonization with ESBL *Kp,* and in 2 the colonization status was unknown. Very low birth weight was the only statistically significant RF in both univariate and multivariate analyses. No major errors in ward procedures were detected. All 80 hand samples were negative and of the 88 environmental samples, only one, from a suction pump valve, yielded ESBL *Kp.*

Conclusions: Even when ESBL *Kp* are not established in NICUs, sudden outbreaks of sepsis can occur with a high mortality. Recognition that the second case heralded a serious outbreak led to prompt investigation, reinforcement of control procedures and control of the outbreak in a few days. The immediate cause of these outbreaks is often not established.

102 Outbreak of *Pseudomonas aeruginosa* Infections in Postoperative Cardiovascular Surgery Patients, 2006

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Background: Gram-negative bacteria, including *Pseudomonas aeruginosa*, account for 35-50% of healthcare-associated infections in cardiac surgery patients; these infections can triple the risk of patient death at a substantial cost to hospitals. Over a 5-month period, staff at a hospital performing a large volume of cardiothoracic surgeries (Hospital A) noted a cluster of *P. aeruginosa* infections in postoperative cardiovascular (CV) surgery patients.

Objective: To assess the scope and impact of the *P. aeruginosa* outbreak at Hospital A, identify risk factors for infection, and develop preventative recommendations.

Methods: To determine the extent of the outbreak, we reviewed infection control and laboratory records. We defined cases as CV surgery patients with a positive *P. aeruginosa* culture and fever (≥100.4°) or elevated white blood cell count (≥11,000 WBC/mm3) in Hospital A's post-surgical intensive care unit (PSICU), from May through September, 2006. To assess risk factors for infection, we randomly selected controls, frequency matched by surgery type, who underwent CV surgery during the same time period. Adjusting for study design, we used logistic regression analyses to estimate the magnitude and significance of risk factors for infection. Additionally, we collected environmental samples and observed surgical and postoperative procedures.

Results: Eight (7 cardiothoracic and 1 vascular) surgery patients met the case definition, resulting in a *P. aeruginosa* infection rate of 3.4% for major CV surgeries performed at Hospital A during the outbreak period. Four cases (50%) and one control (3%) died (p=.009); cases had longer median lengths of stay in the PSICU (15 vs. 6 days, p=.02). In case-control analyses adjusted for study design, risk factors for infection included Swan-Ganz vascular catheter-days (p=.01) and number of blood or blood product transfusions (p=.006). Cases also had higher odds of receiving a non-commercially prepared respiratory therapy medication than controls (aOR=7.2, 95% CI=1.2-43.4), which was mixed at patients' bedsides and administered through multiuse devices. We observed suboptimal cleaning of these devices and breaches in hand hygiene by PSICU staff. *P. aeruginosa* was recovered in low (Environmental Protection Agency-allowable) concentrations from PSICU tap water. No case isolates were available for typing, but antibiograms of case and water isolates were identical.

Conclusions: Infections likely resulted from extrinsic contamination of multiuse medical devices and insufficient hand hygiene in combination with low levels of *P. aeruginosa* in the PSICU water supply. We recommended proper disinfection and drying of multiuse respiratory therapy devices and hand hygiene vigilance when mixing medications or caring for patients with vascular lines. Since implementation of recommended procedures, Hospital A has detected no additional cases.

103 A Pseudo-Outbreak of *Mycobacterium abscessus* due to Laboratory Contamination

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Background: *Mycobacterium abscessus* is a rapidly growing acid-fast bacillus that is a rare cause of human infection. In August 2006, Centers for Disease Control and Prevention was notified that a hospital in Florida was experiencing an increased incidence of cultures growing *M. abscessus*.

Objective: To investigate the causes of this potential outbreak.

Methods: We reviewed the medical records of patients with a culture growing *M. abscessus* from January 1, 2005 through June 30, 2006 and observed procedures from which *M. abscessus* was frequently isolated. Environmental samples were collected. Isolates of *M. abscessus* from 12 randomly selected patients and the hospital environment were compared by pulsed-field gel electrophoresis (PFGE).

Results: Specimens from 143 patients grew *M. abscessus* from various anatomical sites including maxillary sinus (43%, 62/143), sputum (14%, 20/143), abscesses (14%, 20/143) and broncho-alveolar lavage (8%, 11/143). Few patients were perceived to have clinical infections. No procedure was significantly associated with recovery of *M. abscessus* and observations revealed no major breaches in infection control or in processing mycobacterial specimens in the laboratory. Isolates of *M. abscessus* grew only after prolonged incubation (mean 45 days; SD 15 days) in unsealed Middlebrook 7H10 or

Lowenstein-Jensen agar tubes. The incidence of fungal contamination of mycobacterial cultures was found to be high with 5.1%, and 5.2% being contaminated in 2005 and 2006, respectively. Isolates of *M. abscessus* from the 12 patients were genetically indistinguishable from one another by PFGE. Several environmental cultures processed at the hospital, including an uninoculated Middlebrook 7H10 agar prepared by the manufacturer, grew *M. abscessus* that matched the 12 patient isolates. Environmental cultures collected from the interior of the specimen incubator on different days grew strains of *M. abscessus* that were distinct from each other and from the patient strains. Cases decreased to baseline after the hospital followed recommendations to clean the incubator and seal culture tubes with shrink-seal.

Conclusions: Although the source was never confirmed, our investigation suggests that this was a pseudo-outbreak of *M. abscessus* due to contamination of mycobacterial cultures during incubation. Adherence to recommended disinfection and laboratory protocols may have prevented this pseudo-outbreak.

104 Outbreak of *Burkholderia cepacia* after Cardiovascular Surgery

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Background: *Burkholderia cepacia* (Bcep) is a primarily waterborne, often resistant, gram negative (GNR) bacteria, often associated with outbreaks in cystic fibrosis patients. Transmission of Bcep from contaminated equipment and medicines has been reported. Washington Hospital Center is a 900 bed hospital, performing over 1500 cardiovascular (CV) surgeries per year. From FY 2003 - 2006, 4 CV surgery patients had Bcep from clinical cultures (.5/1000). From July - October 2006, 4 CV patients were infected with Bcep (8/1000; p = .0000004 [one pneumonia and bacteremia, one pneumonia alone, one bacteremia alone, and one mediastinitis.]).

Objective: To investigate an outbreak of Bcep in CV surgery patients.

Methods: Case review was conducted. We obtained cultures from respiratory, transesophageal echocardiogram (TEE), Operating Room (OR), and intensive care unit (ICU) equipment. Personnel were interviewed to determine patient care processes.

Results: Review of the 4 cases revealed associations with deep hypothermia, large estimated blood loss, use of TEE, and prolonged surgery (table) . We obtained 135 cultures of equipment and medications used by ICU, OR, anesthesia, respiratory and TEE teams, with 2 (1.5%) cultures positive for GNRs (*Acinetobacter* and *E. coli*). Ten of 31(32%) cultures of ice and ice equipment were positive for the following GNRs: *Delftia acidovorans*, *Bordetella bronchiseptica*, *Pseudomonas fluorescens*, *Ralstonia picketii*, *Sphingomonas paucimobilis*, *Sphingobacterium thapophium*, *Wautersia pulua*, *Vibrio metshnikovii*. Personnel interview revealed that ice was used for the heart-lung machine and was applied directly to the patient's head using a plastic bag to achieve hypothermia. Inspection of the ice machine showed gross contamination.

Conclusions: Our findings of water-based bacteria, phylogenetically similar to Bcep in ice and ice equipment, and direct exposure to ice during surgery strongly suggested the source for Bcep. Improvement activities were focused on alternative methods to achieve deep hypothermia, and on providing a better ice source for OR usage. No new cases have been seen since the intervention.

Review of Cases

Patient	Surgery	Bcep Source	Deep hypothermia	Lowest Core Temp (C^o)	TEE	Est Blood Loss	OR time	Outcome
1	mitral valve replace; ventricular assist	Blood, sputum	No	32	Yes	1000	6:40	Expired

	device							
2	Aortic Aneurysm Repair	Sputum	Yes	16	Yes	800	7:20	Alive
3	Aortic Aneurysm Repair	Sternum	Yes	18	Yes	1000	4:43	Alive
4	Aortic valve replace; Aortic Aneurysm Repair	Blood	Yes	18	Yes	2000	7:33	Alive

105 *Enterobacter cloacae* outbreak in a neonatal ICU due to contaminated infant formula and breast milk preparation

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Objective: To determine the source of an *Enterobacter cloacae* outbreak in our NICU involving 10 patients from March 2006 to August 2006 (only 5 cases in the previous 7 months) and describe our interventions.

Methods: 42 surveillance cultures from multiple environmental sources and 36 rectal swab (RS) cultures from all infants in the NICU were obtained. Environmental sources included: ventilators, breast pumps, multi-dose vials, distilled water bottles, open oral syringes, laryngoscope handles, medication pumps, glucometers, formula room preparation tools, containers, prepared infant formula (IF), open IF at bedside, and a breast milk (BM) sample prepared with human milk fortifier (HMF). Strain typing by repetitive sequence-based PCR (rep-PCR) was performed on the clinical, RS, and environmental *E. cloacae* isolates.

Results: Four of 42 environmental cultures grew *E. cloacae*. These included a BM sample prepared with HMF, a prepared IF, a bedside open IF, and a basin used for sterilizing and rinsing containers that stored prepared IF/BM. Additionally, 8/36 RS cultures grew *E. cloacae*. Eight of 9 clinical isolates, 5 of 8 RS isolates and 1 of 4 environmental isolates (from BM with HMF) had identical rep-PCR patterns. Three other environmental isolates from the formula preparation room, one clinical and one RS isolate were shown to comprise a second clone with identical rep-PCR patterns but different from the first clone. Isolation of *E. cloacae* only from reconstituted IF, BM with HMF, containers in the formula preparation room, lack of isolation from any other environmental source, and genetic relatedness of these environmental isolates to clinical isolates were highly indicative of contamination of IF/BM preparation as the likely source of this *Enterobacter* outbreak. An action plan was initiated that included revised procedures for IF/BM preparation and terminal cleaning of the formula room. Procedural revisions included the removal of mixing bowls, blenders, and non-sterile washbasins from the formula room. These were replaced by sterile, disposable containers for use in the preparation of IF/BM. Pre-made IF was used whenever possible. Ongoing surveillance revealed no further cases over a 3 month period.

Conclusion: *E. cloacae* clinical infection and widespread colonization in the NICU was linked to contaminated IF/BM preparation. Changes in the IF/BM preparation appear to have stopped the outbreak.

106 Epidemiology of Acute Hepatitis B at a Public Healthcare System

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Background: Hepatitis B continues to be a public health threat in spite of availability of an effective vaccine. A key function of infection control programs is infectious disease public health reporting. A cluster of cases of acute hepatitis B at a public hospital in fall 2005 prompted this investigation.

Objective: To determine whether a community outbreak of hepatitis B was occurring in the city and to describe the outbreak by person, place, and time.

Methods: An outbreak investigation was performed at the request of San Antonio Metropolitan Health District. The setting was University Health System (UHS), which is the primary public health system for the indigent population in San Antonio, Texas, with a 450-bed tertiary hospital and several satellite clinics throughout the city. While this study is not population-based, trends within UHS closely reflect community patterns. All patients with serologic test results from Jan-04 to Oct-06 positive or borderline for hepatitis B core IgM (HBcIgM) were included. Medical records of the patients were reviewed to collect demographic and laboratory data, as well as potential modes of acquisition of hepatitis B. Cases with past medical history of hepatitis B were excluded. Definite acute hepatitis B was defined as positive HBcIgM in addition to positive Hepatitis B Surface Antigen and/ or elevated liver enzymes, AST and ALT. All others were considered to have probable acute hepatitis B. Data were analyzed using SPSS v14.0.

Results: One hundred and eleven cases were identified during Jan-04 to Oct-06, of whom 82 (74%) had definite and 29 (26%) had probable acute hepatitis B. The definite cases are described here. The demographic profile was 79% male, 21% female; 63% Hispanic, 27% Caucasian and 10% other. Median age was 38 years. Nearly half (40, 49%) cases occurred in two geographically clustered areas, 29 (35%) in 5 contiguous zip codes to the north/ west of downtown, and 11 (13%) in 2 contiguous zip codes to the south/ east. Annual incidence increased from 17 in 2004 to 35 in 2005 and 30 in 2006 (until October). An epidemic curve confirmed clustering of cases during Sep-Oct05 (15, 18%), Dec05-Jan06 (8, 10%) and Aug-Sep06 (14, 17%). Median AST and ALT levels were 822.5 and 1137 mg/dl. Co-infection with hepatitis C and HIV were present in 33 (40%) and 7 (8%). Stated sexual preference was 20 (24%) heterosexual, 7 (8%) homosexual, 1% bisexual and others unknown. Twenty-six (32%) admitted to injection drug use, 24% denied, and others unknown. Other risk factors were present in less than 10% cases. Hospitalization occurred in 28 (34%) patients. Cases from clustered areas were more likely to be Hispanic (30/40 vs. 22/42, $p<0.05$).

Conclusions: Temporal clustering of new infections of hepatitis B is concerning for ongoing transmission within possible injection drug using networks. Vaccination outreach and injection risk reduction efforts need to be intensified in specific areas of San Antonio, particularly in the Hispanic population.

107 Possible HIV Transmission Associated with a Transrectal Ultrasound (TRUS) Prostate Biopsy

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Background: The New York State Department of Health was notified of an acute case of HIV infection with no identified risk factors.

Objectives: To identify the source and mode of HIV transmission.

Methods: Case study, contact evaluation, and infection control assessment of recent healthcare interventions.

Results: The New York State Department of Health (NYSDOH) investigated a case of possible HIV transmission associated with a transrectal ultrasound (TRUS) prostate biopsy.
Incident HIV infection was detected during autologous cytapheresis donations for a surgical procedure. At the time of initial cytapheresis, the patient tested HIV negative by enzyme immunoassay (EIA), p24 antigen, and nucleic acid amplification testing (NAT). The p24 antigen was positive at the time of his second autologous donation one week later, and he later tested positive for HIV-1 antibody by EIA and

Western Blot tests. On repeated interviews, the patient denied all HIV risk factors.
The procedures at the blood center were reviewed and found to be in compliance with appropriate infection control guidelines, and all other donors within a 10 day period were HIV negative. The only recent medical or dental procedure was a TRUS prostate biopsy performed 63 days prior to the p24-positive donation. The prostate biopsy had been performed in a private urology practice setting.
A review of the prostate biopsy procedures revealed that “single use only” needle guides had been reused between patients. At the time, the needle guides were reprocessed by injecting (flushing) with gluteraldehyde and soaking in a basin of gluteraldehyde. There was no evidence that the device had been brushed, that the internal lumen of the needle guide had sufficient contact time with the disinfectant or that the concentration of the disinfectant was being monitored and maintained.
The NYSDOH attempted to identify a source patient with HIV and any additional suspected cases of HIV transmission by sending a letter of notification with recommendations for HIV testing to 40 patients who underwent prostate biopsies in the same setting in the same time period. Of the 32 individuals who underwent HIV testing or reported results, all reported HIV negative results.

Conclusion: No patient source of infection was identified although HIV test results were not reported for all patients preceding the incident HIV case. The investigation was ultimately inconclusive and transmission via the prostate biopsy procedure could not be confirmed.

108 *Norovirus* Outbreak In The Community

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Background: *Norovirus*, one of four genera of the virus family *Caliciviridae*, accounts for approximately 23 million cases/year of acute gastroenteritis in the United States and continues to be a huge burden when associated with outbreaks. Although a self-limiting illness, this virus is easily communicable through person-to-person contact, fecal-oral route, and contaminated environments since it requires minimal virions (10-100 particles) for infection to ensue. Its ease of infectivity makes this organism very difficult to control and eradicate during outbreaks. We present a recent outbreak of *norovirus* in a 137-bed rehabilitation facility.

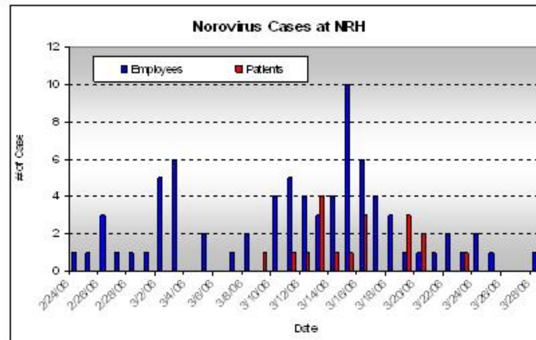
Objective: To identify the likely source of outbreak, contain and prevent worsening of the outbreak, and control the likely mode of transmission.

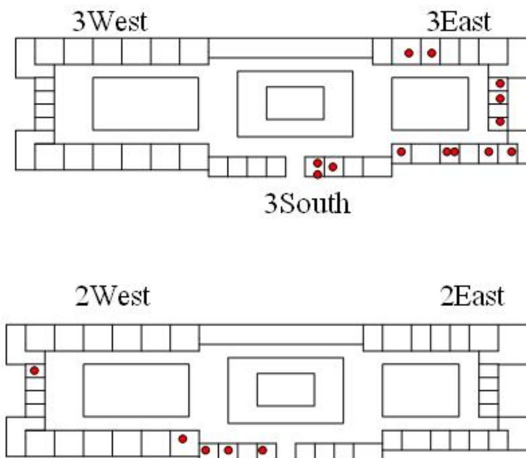
Methods: An outbreak investigation was conducted to identify patients and staff with symptoms consistent with *norovirus* infection. Symptomatic patients were cohorted and placed on contact precautions; symptomatic staff were sent home until 3 days after symptoms abated. Terminal cleaning was initiated immediately with chlorine bleach throughout the facility. Strict handwashing guidelines were emphasized, stool specimens were obtained, and sent to the local DC Health Department for analysis. The facility was temporarily closed to further admissions until the outbreak was controlled.

Results: Ninety-five individuals (79 staff members, 18 patients) were identified with symptoms consistent with *norovirus*. Thirteen of twenty-one stool specimens tested positive for *norovirus genogroup II*, by RT-PCR. Sixteen days after implementation of outbreak control measures, no new cases were reported. The index case appears to have occurred through a staff member, not a patient. Staff with O+ blood were at greater risk for symptomatic disease. Two other local hospitals experienced *norovirus* outbreaks during this same time period.

Conclusions: *Norovirus* outbreaks, although common in a closed-setting, may also be present drifting in the community. Careful standard precautions and strict handwashing help prevent disease but need

reinforcement. Chlorine bleach cleaning is effective against this virus. Individuals with blood type O+ are





at greater risk for symptomatic disease.

109 A *M. fortu*nate Discovery: An Outbreak of *Mycobacterium fortuitum* Respiratory Tract "Infections"--To Treat or Not to Treat?

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Background: *M. fortuitum* has been previously associated with nosocomial outbreaks and pseudo-outbreaks, many due to contaminated water sources. We noted an unusually high number of *M. fortuitum* sputum isolates from January to August of 2006, from patients on our respiratory isolation ward.

Objective: To identify the source of *M. fortuitum* and to assess the therapeutic management of affected patients.

Methods: The charts of patients with *M. fortuitum* sputum isolates were reviewed. Tap water samples were obtained from selected locations on the respiratory isolation ward for surveillance culture. All patient and water isolates were submitted for strain identification by restriction fragment length polymorphism analysis.

Results: 14 patients had at least one *M. fortuitum* sputum isolate. Of these, 8 had a single positive culture, 3 had 2 positive cultures, and 3 had 3 positive cultures. All patient isolates were identified as *M. fortuitum* complex, with identical antimicrobial susceptibility patterns. In each case, infectious diseases consultation provided advice on clinical management. 13 of the 14 patients had a clinical picture initially concerning for pulmonary *M. tuberculosis* (TB), but symptomatically improved prior to final culture results. Based on American Thoracic Society (ATS) guidelines for the diagnosis and treatment of nontuberculous mycobacteria, no patients were believed to have illness due to *M. fortuitum.* 3 patients received therapy for TB--one with active TB, who had both TB and *M. fortuitum* isolated from his sputum; one at an outside facility due to the initial positive culture, with cessation of therapy when *M. fortuitum* was identified; and 1 for clinical findings unrelated to the *M. fortuitum* isolated. No patients received targeted therapy for *M. fortuitum.* Of the surveillance cultures of tap water on the affected ward, 16 of 17 samples were positive for rapidly growing mycobacteria. Strain identification for all isolates is underway.

Conclusions: It appears that contaminated water was the source of this pseudo-outbreak. Strict compliance with ATS guidelines prevented unnecessary treatment of *M. fortuitum* in 14 patients with positive sputum isolates, all with a lack of clinical disease. Careful evaluation of the clinical context of *M. fortuitum* isolates is necessary during a potential outbreak. By correctly identifying patients witth colonization only, and not true disease, unnecessary toxicities from long-term therapy for *M. fortuitum* can be avoided.

110 A Program of Aggressive Infection Control Interventions Limits the Impact of Norovirus Outbreaks in Acute Care Facilities

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Background: Norovirus (Nv) is the most common cause of institutional outbreaks (o/b) of gastroenteritis (GE) with often frequent patient and staff illness, staff absenteeism and significant impact on operations and costs. Attack rates (AR) of up to 70% have been reported with o/b lasting as long as 32 days or more.

Objective: To limit the impact of Nv o/b by a program of intensive infection control (IC) interventions.

Methods:The program was begun in October, 2004 in Central Vancouver Island (CVI). Key components include: incident command structure to manage operations; improved coordination with Public Health authorities; widespread use of droplet barrier precautions for all exposed and ill patients throughout affected units; enhanced droplet barrier precautions for ill patients and those exposed in the same patient room; initial segregation and use of droplet barrier precautions for patients with GE in the ED; staff, patient and visitor restrictions; enhanced housekeeping with H_2O_2 (with follow-up disinfection with bleach on patient discharge); improved signage, and clear communication of recommended IC practices to staff and public. Evaluation after each o/b (including debriefing with the o/b management team and feedback from staff) was conducted to identify areas for improvement in the program. AR was defined as # of patients or staff developing GE / total # of patients admitted or staff (nursing and unit clerk) assigned to the affected unit.

Results:From November, 2004 - October, 2006, 8 o/b occurred in 3 acute care institutions in CVI. Nv infection was confirmed in all cases by RT-PCR. In most cases, only 1 unit in the institution was involved; in one case, 4/6 floors were involved simultaneously from multiple exposures over 4 days in the Emergency Department (ED) at the beginning of the o/b. Spread between units was prevented in all cases. Once an o/b was declared and precautions instituted, further patient and staff cases were limited. Where staff and/or patients developed GE after institution of precautions (indicating ongoing transmission), breaches of IC practices were identified and further spread limited with intensification of IC measures. The AR for patients was median 24% (13-88%). The AR for staff was median 26% (13-81%).

O/b lasted median 9 days (7-15 days). Normal outpatient and inpatient hospital operations were maintained with continued admissions through the ED and outpatient laboratory and radiology services in all cases, except for cancellation of some surgical procedures (range 2-9) in 2 outbreaks. In all cases, there was deliberate delay in transfer of patients from affected units, except for higher level care as dictated by medical conditions.

Conclusions:A program based on disaster management principles and involving aggressive IC interventions and restrictions can limit the impact of Nv o/b in acute care facilities.

111 A Hospital Outbreak of Norovirus and Development of "Upset Stomach Etiquette" ("USE")

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Background: Norovirus is a highly contagious cause of sporadic gastroenteritis in the community and of large outbreaks of gastroenteritis in institutions. Hospital outbreaks of norovirus are costly and disruptive. Dramatic infection control measures may be required, especially if an outbreak is widespread or prolonged.

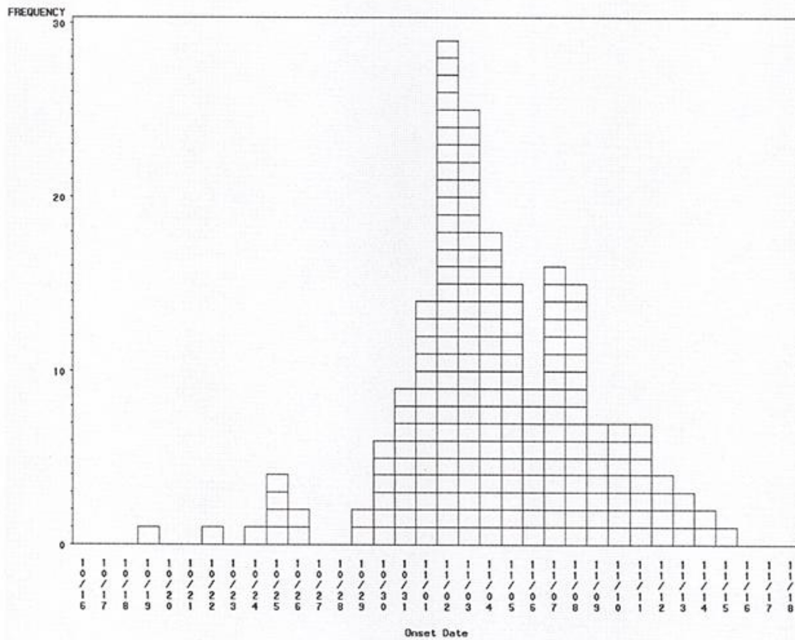
Objective: We describe an outbreak of norovirus in a hospital, which affected healthcare workers and patients. The development of “Upset Stomach Etiquette” (“USE”) for control is discussed.

Methods: An epidemiological investigation was initiated on November 2, 2006 because of an increase in healthcare worker absenteeism from acute gastroenteritis.
The working case definition was any person with an epidemiologic link to the facility with diarrhea and/or vomiting since October 16, 2006 and no other explanation for illness.
The local health department conducted initial interviews. Testing of stool or vomitus specimens by reverse transcriptase-polymerase chain reaction for norovirus RNA was performed by the state public health laboratory.
The health department posted an on-line confidential survey on the web for ill persons to complete. Housewide surveillance for illness was performed by infection control practitioners.

Results: Of 236 survey respondents, 199 (84%) met the case definition for norovirus illness. Cases included:
159 (80%) staff,
24 (12%) patients,
14 (7%) nursing students, and
2 (1%) visitors.
Specimens submitted were positive for norovirus genotype II RNA by RT-PCR. Staff absenteeism returned to usual levels by the weekend of November 11-12, 2006, and the survey was discontinued on November 17, 2006 (Figure 1). Actions taken for outbreak control included: education and communication; housewide surveillance for illness; and rapid implementation of control measures - patient case identification and isolation, frequent hand hygiene, thorough and prompt disinfection of the environment, staffing restrictions, safeguards with laundry, and changes in food service. Our experience with this explosive norovirus outbreak led to the development of “Upset Stomach Etiquette” centered around “USE” emesis bags, personal protective equipment, hand hygiene, and environmental disinfection.

Conclusions: Norovirus infections can significantly disrupt hospitals through their rapid spread to staff and patients, as well as the associated high attack rate. Early recognition of an outbreak and prompt implementation of infection control measures and staffing restrictions can limit spread of norovirus infection in a hospital. The development of an institutional “Upset Stomach Etiquette” (“USE”) may help control this healthcare problem.

FIG. 1: No. of Cases by Date of Onset of Symptoms



112 Legionnaires' Disease Outbreak in Patients Receiving Aquatic Therapy in a Healthcare Facility Swimming Pool

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Background: Outbreaks of Legionnaires' disease may occur due to contamination of healthcare facility water systems.

Objective: To describe an outbreak of Legionnaires' disease among outpatients receiving aquatic therapy at a healthcare facility swimming pool.

Methods: In August 2006, two cases of Legionnaires' disease were identified in outpatients receiving aquatic therapy at a healthcare facility-affiliated swimming pool. The diagnosis was confirmed based on chest radiography and positive *Legionella* urinary antigen. The hot water heating unit in the building malfunctioned two months prior to the outbreak, and had been replaced. The pool area was closed and active surveillance was initiated to identify any additional cases among patients using the swimming pool area, and water sources in the swimming pool area were cultured.

Results: Of 177 patients that had recently used the swimming pool, 6 were referred for testing due to pulmonary symptoms and 1 additional case of Legionnaires' disease was identified. *Legionella pneumophila* serogroup 1 was cultured from the multiple shower heads in the pool area and from the hot water heating unit for the pool building, but not from the swimming pool water or from water sources in other buildings in the facility. Superheat and flush and hyperchlorination resulted in negative cultures, but contamination recurred two weeks later. Additional measures for decontamination are being implemented.

Conclusions: The outbreak of Legionnaires' disease occurred due to contamination of the healthcare facility water system. Aerosols generated during showering may have facilitated transmission.

113 A Cluster of Unusual Surgical Site Infections among Patients with Procedures Involving Arthroscopy

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Background:Reported rates of postarthroscopy SSI are rare. An increase in surgical site infection (SSI) rates among patients who had procedures involving arthroscopes was noted in two surgery centers (A and B) at a Colorado hospital. During the first 9 1/2 months of 2006, nine patients with SSI were identified, 3 of whom had SSI due to *Enterobacter cloacae*.

Objective:To describe an outbreak of post-arthroscopy SSI and determine the source of the *E. cloacae* cluster.

Methods:The medical record of each patient with postarthroscopy SSI in 2006 was reviewed and classified by CDC guidelines. 3 controls of non-infected orthopedic arthroscopy cases from 2006 were randomly selected for each infected case. A total of 9 case and 27 control charts were reviewed for a comprehensive list of exposures as part of a case-control study. Statistical analysis was performed for Fisher's Exact tests with odds ratios and confidence intervals. Environmental samples for culture were obtained. Central sterile processing and OR staff and surgeons were interviewed to assess knowledge of decontamination, sterile processing, and infection control practices. The physical plant of both surgery centers was toured and an arthroscopy case was observed. Relevant written procedures and risk management reports were reviewed.

Results: Between 1/1- 9/21/06, 9/ 2292 (0.39%) patients who had arthroscopic procedures at surgery center A and B developed SSI, a 3 ½-fold increase over a baseline of 0.11%. Of the 9, 6 developed SSI after arthroscopy at surgery center A (0.71% of 842 arthroscopies) and 3 developed infection after arthroscopy at surgery center B (0.21% of 1450 arthroscopies). No individual provider was present in more than 3 cases. Case patients were older, more commonly male, more likely to have a prior medical or orthopedic surgery history, and more commonly had an ASA classification of III or higher. Case patients were more likely to receive intra-articular corticosteroid injection intraoperatively and were more likely to have been prepped with betadine than control patients. However, only older age was a statistically significant (p=0.01). All but one SSI was deep-incisional or joint space and microbiologically confirmed. 3 were due to *E. cloacae* after knee arthroscopy. The same center, room, surgeon, scrub nurse and camera were common to the 2nd and 3rd *E. cloacae* cases. *E cloacae* was not identified from any of the 63 samples from "clean" areas or equipment, but was identified in surgery center B aquaboxes. Several concerns around sterile processing were identified in risk management reports.

Conclusions: Overall rates may have been impacted by the higher than usual use of intra-articular steroid use in an older group of patients with higher rate of past medical and orthopedic problems. These risk factors, coupled with lapses in infection control and sterile processing, may be responsible for the propagation of *E. cloacae* during this outbreak.