SHEA Abstracts

The July through December issues of Infection *Control and Hospital Epidemiology* will include reprints of the poster and presentation abstracts from the 1992 SHEA Annual Scientific Meeting, April 12-14, 1992, held in Baltimore, Maryland.

ABSTRACT #6

Outbreak of Vesicular Lesions in a Neonatal Intensive Care Unit

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In September 1991, a a-day-old boy was noted to have vesicular lesions on his wrist and palm. Over the next 12 days, an additional 10 infants developed vesicular lesions on their extremities, most at the wrists and ankles. No child had an enanthem. All children had underlying problems requiring neonatal intensive care. There was no acute change in condition of any affected child. Tzanck smears were done on 4 lesions: no abnormalities were identified. Viral cultures (skin, respiratory, stool, or urine) were obtained from all affected infants (1 to 7 per child); cytomegalovirus was recovered from respiratory tract of 2 children. Bacterial cultures were obtained from 4 lesions; *Staphylococcus aureus* was recovered from 1. There had been no recent change in tape, soap, or other supplies. No topical agent was in use. Three days prior to the outbreak, the fiberoptic cable of the transilluminator, a high intensity light source used to identify vessels during placement of vascular catheters was replaced. A metallic ring not present on the original cable, which came into direct contact with the skin, concentrated ultraviolet energy in the form of heat. The temperature of this ring exceeded 50°C; thus the vesicles resulted from thermal injury. The transilluminator was removed from use and no additional lesions were noted.

ABSTRACT #7

Validation of Surgical Wound Classification in the Operating Room

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Surgical procedures are classified by operating room (OR) personnel for risk of contamination as clean, clean-contaminated, contaminated or dirty/infected, but the accuracy of classification by OR personnel has never been determined. One hundred operations were observed by a hospital epidemiologist (HE) from start to finish (gold standard) and classified simultaneously with OR circulating nurses (CN) without their knowledge. Previously defined major breaks in technique were also simultaneously recorded by the HE and OR CN. The accuracy of classification by OR CN was 88% (95% confidence interval [CI_{95}] of 81.6%-94.4%). The classifications by the OR CN and HE showed excellent agreement by the Kappa statistic (.829). Accuracy for general surgery procedures was 94% (83.0%-98.0%). Classification in trauma surgery was more difficult with accuracy of 52.9% (27.5%-81.0%). After additional education, accuracy increased to 90.9% (76.0%-98.0%). Accuracy was higher for all groups when only two classifications were needed (i.e., for the NNIS risk index) (clean and clean-contaminated versus contaminated and dirty/infected). Overall accuracy was 93% (88%-98%), general surgery 98% (89.0%-99.9%), and trauma surgery 88% (79%-97%). The most common breaks in techniques were foreign bodies falling into the surgical wound and contamination of sterile gloves on unsterile surfaces. With prior education, CN in the OR can classify surgical procedures accurately. Classification of procedures in trauma is more difficult and may require additional education.

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ABSTRACT #8

Validation of a Surgical Wound Infection Surveillance System

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Regular feedback of surgical wound infection (SWI) rates to surgeons has been proposed as a strategy for decreasing SWI rates. There are no published data on the validation of SWI surveillance systems, In this study, 3 nurse epidemiologists (NE) performed SWI surveillance on patients on general surgery and trauma surgery services for 10 months using standard surveillance procedures which included review of patients' charts and microbiology and lab reports. If the diagnosis of SWI was questionable, the patient's case was discussed with surgical staff nurses, interns, or residents. If such discussion did not rule in or out an SWI, the NE examined the patient. All patients were simultaneously examined daily by a hospital epidemiologist (HE) as a validation gold standard. Centers for Disease Control definitions were used for SWI. Nine hundred twenty-five patients were seen simultaneously by the NE and HE. The NE identified 67 SWI and the HE identified 80 SWI (sensitivity [SS] 83.8%, 95% confidence interval [CI_{95}] 75.7%-91.8%, specificity [SP] 99.8%, CI,, 98%-100%). Results also were analyzed by incisional and deep SWI and by general and trauma surgery. Incisional SS was 78.6% (66.2% 91.0%) and SP 99.9% (99%-100%). Deep SS was 89.5% (76%-97%) and SP 99.9% (99%-100%). General surgery was 84% (64%96%) and SP 99.7% (98%-100%), and trauma surgery SS was 83.6% (73.9%-93.4%) and SP 99.8% (98%-100%). Three incisional SWI were missed by a NE in trauma surgery because of system error (patients discharged between visits to the nursing unit for surveillance). If the patients were excluded, overall SS was 87% (79.5%-94.5%), incisional SWI SS was 84.6% (73.3%-95.9%), and trauma SS was 88.5% (79.8%-97.2%). After a learning curve of eight months, NE achieved 100% SS.

TABLE

OPERATING TIME ALONE: A VALID BASIS FOR WOUND INFECTION MONITORING?

RI	cases	WI	Cases	(OT>2)	W I	(OT>2)
0	908	5	0		0	
1	1587	21	474	(30%)	15	(71%)
2	1205	49	1150	(95%)	43	(88%)
3	427	17	427	(100%)	12	(71%)
	4127	92	2051	(50%)	70	(76%)

ABSTRACT #9

Operating The Alone: A Valid Basis for Wound Infection (WI) Monitoring?

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Focused monitoring (FM) discovers a majority of WI in a minority of patients. We validated NNIS-based risk index (RI) in 1990 using 3 variables (ASA, operation time [OT], and wound contamination), then asked: how effective is OT>2 hours (the most effective parameter in the RI) as a solo FM criterion? RI-stratified WI data from global 30-day surveillance of 4127 cases are listed in the Table.

OT-based FM would have missed 22 WI (mean case = 74 minutes), 16 of which (73%) followed orthopedic cases. Comparing patients examined per WI tallied, OT-based FM out-performed global surveillance ($p = .006$). OT>2 hours as solo criterion is high-risk biased but supports 76% effective FM with 50% less effort than global schemes. Each WI found by FM can be analyzed rigorously by RI standards before feedback to surgeons.

ABSTRACT #10

Surgeon-Specific Thresholds, A Factor in Decreasing Infection Rates?

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Several studies, including the Study of the Efficacy of Nosocomial Infection Control (SENIC) conducted by the Centers for Disease Control have suggested that feedback of surgical wound infection (SWI) data to individual surgeons will reduce infection rates.

Surveillance of postoperative orthopedic infections was begun in 1988 using definitions agreed upon by the surgeons. SWI rates were stratified for procedure type, and the total joint implants were further stratified according to a primary versus revision procedure. In 1989, quarterly reporting of surgeon-specific rates was initiated. At the end of 1990, individual surgeon thresholds were established by calculating one standard deviation from the mean of the previous eight quarters of data.

Prior to establishing the individual thresholds, SWI rates remained relatively constant. In 1989, the overall incidence rate in all clean cases was 1.1% and in total joint procedures 2.3%. These rates were 1.2% and 2.2%, respectively, in 1990.

In the first three quarters of 1991, a dramatic decrease in infection rates was noted when compared with the previous two years. The overall 1991 incidence rate was 0.66% (chi square = 3.76), and the rate in total joint procedures was 0.59% (chi square = 5.02).

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We are unable to identify any other factor that may account for the decrease. We conclude that the reporting of surgeon-specific SWI rates with thresholds established from the individual surgeons experience does reduce infection rates.

ABSTRACT #11

Surveillance for Infection Following Caesarean Section: Comparison of Antibiotic Exposure and Coded Discharge

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We assessed the postoperative exposure to antibiotics and assignment of a coded discharge diagnosis of infection as markers of infection and of potentially inappropriate antibiotic use after Caesarean section. Review of a weighted sample of 457 records among 2,197 deliveries indicated that the overall infection rate was 9%. Eight percent of the cohort had a coded diagnosis for infection, and 16% received some parenteral antibiotics after the first postoperative day. Exposure to at least 2 days of parenteral antibiotics after the first postoperative day provided the best discrimination between infected and uninfected patients. This marker had a sensitivity of 81%, a specificity of 95%, and a positive predictive value of 61% for detecting infection. Coded diagnosis for infection had rates of 66%, 97%, and 66%, respectively. Few (0.7%) patients received at least 2 days of postoperative parenteral antibiotics for which no explanation was apparent. Parenteral antibiotic exposure correlated strongly with more labor-intensive methods for identification of postoperative infection. Such exposure may therefore be readily standardized, easily obtained, and an inexpensive measure of infectious complications and/or inappropriate prescribing. The combination of antibiotic exposure information with coded discharge diagnoses also provided a rapid screen for errors in discharge coding, unexplained antibiotic use, and infectious and noninfectious morbidity.

ABSTRACT #12

Comparative Study of *Cefazolin*, Cefamandofe, and Vancomycin for *Prophylaxis* in Cardiovascular Surgery

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We report a prospective double-blind trial of cefazolin, cefamandole, and vancomycin for prophylaxis of surgical infection in 321 patients undergoing cardiac or major vascular operations. All 3 regimens provided therapeutic blood levels throughout the operation. The incidence of surgical infection was lowest with vancomycin (4 infections [3.7%] versus 14 [12.3%], and 13 [11.5%] in the cefazolin and cefamandole groups, p = .05). There were no thoracic wound infections in cardiac operations with the vancomycin group ($p = .04$). Five of the surgical infections in the cefazolin group were caused by coagulase-negative staphylococci or enterococci resistant to cefazolin ($p<.05$). The mean duration of postoperative hospitalization was lowest in the vancomycin group (10.1 days, $p<.01$) and highest in the cefazolin group (12.9 days). Eight patients given vancomycin became hypotensive during administration of a dose, despite infusion over 1 hour. However, after pretreatment with diphenhydramine, vancomycin was resumed, and the course completed uneventfully in 5 of the patients. There were no identified infections, nor did we identify postoperative cutaneous colonization with vancomycin-resistant organisms. We conclude that administration of vancomycin, approximately 15 mg/kg preoperatively, provides therapeutic levels for surgical prophylaxis throughout most cardiac and vascular operations, resulting in protection against postoperative infection superior to that obtained with cefazolin or cefamandole. Vancomycin deserves consideration for routine use prophylactically in prosthetic valve replacement and prosthetic vascular graft implantation to reduce the risk of implant infection by methicillin-resistant coagulase-negative staphylococci, and for all cardiovascular operations with a high incidence of surgical infection with methicillin-resistant staphylococci.

ABSTRACT #13

The *Epidemiology* of Nosocomial Pneumonia in Medical Intensive Care Unit *(MICU)* Patients: A Prospective Study Based on Protected Bronchoscopic Sampling

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Our understanding of the epidemiology of nosocomial pneumonia (NP) is limited by the reliance of most published studies on clinical and radiographic diagnostic criteria that are nonspecific. In the present study, this difficulty was addressed by performing bronchoscopy with protected specimen brush (PSB) and protected broncho-alveolar lavage (PBAL) sampling for new or worsening radiographic infiltrates in association with fever, leuckocytosis, or leukopenia during an ll-month period in MICU patients. The diagnosis of NP required at least 1 of the following: growth of a pathogen $\geq 10^3$ CFU/brush or 10^4 CFU/ml of PBAL sample, or histopathologic consolidation. Of 500 patients whose MICU stay was ≥48 hours, 29 (5.8%, CI,, = 4.0%-8.3%) developed NE Eleven percent

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(7.615.9) of patients receiving mechanical ventilation (MV) developed NP, compared with 0.4% (0.1-2.3) of patients not receiving MV. NP occurred at a rate of 20.6 cases per 1,000 patient-ventilator-days (14.3-29.8) in patients receiving MV, but only 0.9 cases per 1,000 patient-days (0.2-5.4) in the patients not receiving MV. Univariate analysis found NP to be significantly ($p<.05$) associated with the presence and duration of mechanical ventilation, APACHE II score, TISS score, low body mass index, and duration of ICU stay. The risk of NP in MICU patients is concentrated in those receiving MV; epidemiologic studies based on specific diagnostic criteria may provide a basis for renewed efforts at prevention.

ABSTRACT #14

Nosocomial Sinusitis in Medical Intensive Care Unit (MICU) Patients: A Prospective Epidemiological Study

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During an ll-month period, patients admitted to the MICU were followed prospectively for the development of nosocomial sinusitis (NS). Sinus imaging was performed whenever fever ≥38.3°C persisted for 3 days with no apparent source, followed by maxillary sinus aspiration when imaging identified fluid. Diagnosis of NS required culture of a pathogen and/or a gram stain showing microorganisms and ≥25 WBC/LPF from sinus aspirate. Of 507 patients whose MICU stay was ≥48 hours, 28 (5.5%, CI_{95} = 3.8%-8.0%) developed NS, including 9.3% (6.413.5) of those with nasoenteric (NE) and 0.5% (0.1-2.6) of those who did not have NE tubes. NS occurred at a rate of 18.6 cases per 1,000 patient-days (12.827.1) in NE intubated patients, compared with only 1.0 case per 1,000 patient days (0.2-5.8) in patients without NE tubes. Most cases of NS were polymicrobial including *P aeruginosa* (7), S *aureus* (6), viridians streptococci (6), *Enterobacter* species (6), *Klebsiella* species (6), *E coli* (5), and *P mirabilis* (5). Univariate analysis found NS to be significantly ($p<.05$) associated with the following variables: presence and duration of NE intubation, APACHE II score, TISS score, social status index, and duration of ICU stay. A possible association with nosocomial pneumonia (NP) is suggested by the occurrence of NP in 10 of 28 patients with NS, with the same pathogen(s) isolated from both sites in 6 patients. We conclude that NS occurs frequently in MICU patients with NE intubation, and that the diagnosis of NS should be considered when fever occurs in this setting.

ABSTRACT #15

Risk Factors for Vascular Catheter-Related Septic Thrombosis of the Great Central Veins Caused by Candida

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We previously have reported the features of central venous catheter (CVC)-related septic thrombosis of the great central veins caused by *Candida* (*Ann Surg.* 1985;202:653): microbiologic evidence of CVC-related infection and high-grade candidemia persisting after removal of the catheter. We now report analysis of 22 cases of clear-cut CVC-related *Candida* bloodstream infection, 5 with transient candidemia and 17 with septic thrombosis (candidemia persisting for more than two days after removal of the CVC [mean = 11 days]). Patients with septic thrombosis were considerably older on average (37 versus 21 years) and were more likely to have had recent surgery (55% versus 20%); they were not however more likely to be immunocompromised. Most notably, the most important risk factor associated with septic thrombosis and persistent high-grade candidemia, as contrasted with transient candidemia after the catheter was removed, was the length of time the CVC was left in place after the onset of sepsis (median, = 6 days versus <1 day, $p<.008$). This analysis suggests that failure to remove a CVC in patients developing catheter-related candidemia greatly increases the risk of septic thrombosis and candidemia that persists long after the catheter is removed. It argues strongly for having a low threshold to remove CVCs in patients suspected to have CVC-related bloodstream infection or patients who develop primary candidemia that could conceivably originate from a CVC.

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