SHEA Abstracts

The following are poster and presentation abstracts from the SHEA Annual Scientific Meeting held April 12-14, 1992, in Baltimore, Maryland.

ABSTRACT #S8

Comparison of Efficacy of Amuchina and Formalin in Disinfecting the Hemodialysis Machines

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Current use of formalin as a disinfectant of hemodialysis machines has raised concerns regarding the safety of the procedure. Therefore, research for an efficient and hazard-free replacement for formalin is essential. In this study, we compared the efficacy of a new chlorine-based compound (Amuchina) with formalin, the current agent in our institution. Baxter SPS-500 dialysis machines were seeded with an equal concentration of the 3 clinical isolates of each ***Staphylococcus epidermis,*** *Corynebacterium* ***jeikeium,*** and ***Pseudomonas aeruginosa.*** Bacterial suspensions (150 ml) containing 5×10^7 cfu/ml were introduced into the machines. The initial viable counts were then determined by collecting water samples from the machines 15 minutes post-inoculation and spread plating 0.1 ml of 1/100 and 1/000 dilutions onto blood agar plates (Remel). Plates were incubated at 35°C for 48 hours. The machines were subsequently disinfected by passing 150 ml of either Amuchina or formalin into the equipment. The exposure times for Amuchina or Formalin were 15 minutes and 4 hours, respectively. The viable counts were determined in water samples collected from the rinsed machines immediately, and 20 hours and 44 hours post-disinfection. The initial counts of Amuchina-treated machines dropped from 4.7×10^3 cfu/ml to undetectable levels in 0.1 ml (<10 cfu/ml) of specimens, but those in formalinized ones were decreased from 7.8 to 10^3 cfu/ml to 3.5×10^3 cfu/ml. The results also showed that formalin was more effective against ***P aeruginosa*** isolates than C ***jeikeium*** and S *epidermis,* while Amuchina was equally effective. In summary, Amuchina's better performance, lower cost, and safer application make it an attractive replacement for formalin.

ABSTRACT #S9

Effect of National Regulated Medical Waste Policies on Disposal Costs at a University-Affiliated Hospital

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In Rhode Island, public concern over beach wash-ups of medical waste in 1988 resulted in changes of local policies regarding disposal of regulated medical waste and support for the national EPA Regulated Medical Waste Tracking Act (RMWTA) of 1989. Policy changes had dramatic effects on the amount of hospital waste treated as regulated medical waste and on waste disposal costs at a university-affiliated hospital. The amount of regulated medical waste increased 3-fold as a result of the RMWTA. Even though contract negotiations lowered the price/LB paid for regulated medical waste disposal, costs nearly doubled to $175,352/year during the two-year implementation of the RMWTA. Despite the increased costs and problems associated with complying with the RMWTA, the number of syringes found on Rhode Island beaches increased during 1990 when the RMWTA was in effect. We conclude that the amount of regulated medical waste and the costs of its disposal increased substantially under the RMWTA, without any apparent health or environmental benefits.

ABSTRACT #S10

Epidemiology of Clostridium difiicile *at a Tertiary Care Hospital: Diversity of Types by Restriction Endonuclease Analysis (REA)*

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Clostridium dificile diarrhea is a major nosocomial infection that remains difficult to control. The mechanisms of acquisition and transmission of C *difficile* among hospitalized patients are not clearly established. A prospective study of C ***dificile*** colonization and diarrhea was conducted at NEDH from January to May 1991, because of a sustained increase in incidence of ***C*** *difficile* diarrhea. Weekly rectal swab cultures for C *difficile* were obtained from patients on 1 medical, 1 surgical, and 3 intensive care unit wards (2 surgical, 1 medical). All clinical stool specimens with + C dificile cytotoxin were cultured for C ***dificile. C dificile*** strains were typed by REA, using Hind111 digestion of extracted DNA. Of 106 patients

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with one or more positive swab or stool cultures, 39 (37%) had C *difficile* diarrhea (36/39 with toxigenic strains) and 67 (63%) had C ***dificile*** colonization (3/67 with toxigenic strains). C *difficile* was community-acquired in 20 patients (19%), nosocomial outside hospital-acquired in 14 patients (13%), and nosocomial NEDH-acquired in 67 patients (64%). REA typing revealed 53 distinct C *difficile* types (32/53 toxigenic) among the 106 patients. Of 53 C ***dificile*** types, 32 (60%) were isolated from a single patient; 14/32 (44%) of these patients had community- or outside hospital-acquired C ***dificile.*** Seven types (G1, G5, T7, Wt, Y1, Y6, and Y16) were isolated from >5 patients each and were associated with NEDH-acquired ***C*** *difficile* (odds ratio [OR] = 4.5, $p<.01$). These 7 types also were associated with increased risk of ***C dificile*** diarrhea (OR = 3.9, $p<.01$). There were small, temporally linked clusters of identical C ***dificile*** types on study wards, but roommate transmission was infrequently detected (4 presumed instances). In conclusion, C ***dificile*** types by REA at NEDH were highly diverse, with many community- and outside hospital-acquired ***C*** *difficile* contributing to the diversity of types. C *difficile* types associated with nosocomial C ***dificile*** diarrhea showed increased clustering, suggesting that virulence and transmissibility may be correlated.

ABSTRACT #S11

Postoperative Complications of Propofol: Evidence in Support of Direct Drug Effects and Against Infection

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The widespread use of the anesthetic propofol has resulted in many reports of adverse reactions, some being infections attributed to extrinsic contamination. The Centers for Disease Control (CDC) reported that propofol supports rapid microbial growth at 30°C and endotoxin production after 24 hours ***(Infect Control Hosp Epidemiol.*** 1991;12:535-539). Our purpose is to present evidence which disputes the infection theory and supports direct side effects of the drug. At 22°C (normal operating room temperature) bacterial growth in propofol was insignificant over 24 hours, indicating that endotoxin production is unlikely. At 12 hours (typical operating room day) insignificant growth occurred at 22°C and 30°C. In adverse reactions (hypotension and fever) at our hospital, all propofol involved was opened and used within 5 hours, with no evidence of infection in vials or patients. However, implicated propofol exhibited aggregation of liposomes and electron microscopic evidence of instability. When propofol was mixed with serum, it aggregated or "creamed," which is characteristic of liposome emulsions. We found that with increased incubation time (14 days) or temperature (37°C), propofol creamed to greater extents and with less serum, some samples creamed without serum. We also have found significant coalescence (combining of droplets into larger ones) of propofol after only 5 days at 28°C. The significance of these 2 phenomena is not known, although changes in particle size may alter their distribution and elimination. We hypothesize that these changes, caused by time and/or temperature, alter the pharmacodynamics of propofol, producing effects in the postoperative period, consistent with the third elimination phase of the drug. Also, enhanced removal of larger particles by reticuloendothelial cells may allow vulnerability to infection. Further studies are needed to evaluate these effects.

ABSTRACT #S12

Epidemiologic Typing of Methicillin-Resistant Staphylococcus aureus by DNA Restriction Fragment Length Polymorphisms of rRNA Genes (Ribotyping)

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An outbreak of methicillin-resistant ***Staphylococcus areus*** (MRSA) infection occurred in a neonatal intensive care unit that had previously been free of this organism. Over a 2.5 month period, 18 neonates developed invasive disease and/or were colonized with MRSA; 1 infant died. The outbreak subsided after infection control measures (including cohorting of infants and staff and strict enforcement of barrier precautions) were instituted. Initial isolates recovered from the outbreak were bacteriophage nontypeable. All isolates had identical antibiograms. Isolates from 11 of 18 patients were available for further study. Because recent work has shown that there is a diversity of hybridization banding patterns (ribotypes) among S **aureus** isolates, ribotyping was performed on all study isolates following digestion of chromosomal DNA with *Eco*RI. All 11 patient isolates recovered from the intensive care unit had an identical ribotype suggesting the clonal nature of this group of nosocomial MRSA isolates. Ribotyping differentiated this clone from control S ***aureus*** (MRSA and methicillin-sensitive S ***aureus),*** including other nontypeable MRSA isolates, some of which had similar antibiograms. In summary, ribotyping proved to be a useful molecular epidemiologic technique for typing epidemic MRSA isolates recovered from a well-defined outbreak and was superior to phage typing. Ribotyping demonstrated the clonal nature of a group of bacteriophage nontypeable MRSA isolates and supported clinical epidemiologic data on transmission of MRSA in this intensive care unit setting.

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ABSTRACT #S13

Common Source Outbreak of Methicillin-Resistant Staphylococcus aureus Associated with Respiratory Therapy and Nursing Personnel

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During a three-year period, there was a significant increase in the incidence of community-acquired methicillin-resistant ***Staphylococcus aureus*** (MRSA) ($p<.001$) and nosocomially-acquired MRSA ($p<.001$) at a university-affiliated hospital. Of 55 nosocomially-acquired cases, 28 yielded isolates with the same antibiogram. Plasmid analysis was performed on 17 of the 28 isolates, and all had identical restriction endonuclease digest patterns. Twenty-one cases with the epidemic antibiogram were compared with 12 control patients with other strains of MRSA. Cases had been in the intensive care unit significantly more often than controls (p = .02). Twenty of twenty-one cases and 9/12 controls received preceding respiratory therapy ($p>.05$). Prior to acquiring MRSA, cases were exposed to 292 nurses, 232 physicians, and 47 respiratory therapy personnel. Cases were exposed to respiratory therapist 17 ($p<.001$) and intensive care unit nurse 46 (p = .01) significantly more often than controls. Therapist 17, who had chronic sinusitis, therapist 13, who had a chronic dermatitis of her hands, and intensive care unit nurse 46 were intranasal carriers of MRSA with restriction patterns characteristic of the epidemic strain. The incidence of nosocomially-acquired MRSA decreased significantly after implementation of measures designed to reduce transmission of imported and epidemic strains (p = .02).

ABSTRACT #S14

A Staphylococcal Nursery Outbreak in Circumsized Males Possibly Related to Photography by Volunteers

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The endemic rate for staphylococcal infection in our newborn nursery has been <1%, (1-2/month) seen equally among males and females. In late 1990 we noted an increase in this rate without change in gender distribution and without obvious cause. In mid-December 1990, we instituted single hexachlorophene baths for all infants upon admission to the newborn nursery. Despite this change we continued to have an increased number of staphylococcal infection (on average ≥3/month), almost exclusively among circumcised males. Among 41 infants infected between December 1990 and November 1991, 34 (82.9%) were males, of whom 32 (94.1%) were circumcised. In contrast, approx. 3/4 of all males in the newborn nursery are circumcised. In a case-referent study of the first 24 cases through 7/91 (with 48 referents) there was a trend ($p<.10$ by chisquare) favoring being male (20/24 cases versus 29/48 referents) as a risk factor for staphylococcal infection. However, being a circumscised male (19/24 cases versus 19/48 referents) was highly associated ($p<.01$) with staphylococcal infection, as was circumscised ($p<.05$) in an analysis confined to males. Circumcision-related policy changes in May 1991 through June 1991 failed to alter the pattern of cases. Further observations of newborn nursery practice suggested that volunteers who served as photographers were potential sources of cross-transmission. In particular, 21/24 (87.5%) cases and 25/48 (52.1%) referents were photographed ($p<.01$). Inservice education in August and September 1991 did not decrease cases but recent ending of use of volunteers for photography may have led to a return to endemic levels. Our analysis will continue.

ABSTRACT #S 15

Prospective Epidemiologic Study of **Staphylococcus aureus** *Isolates in a Research Hospital*

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We evaluate the epidemiology of ***Staphylococcus aureus*** isolates in a research hospital in which S ***aureus*** is an important pathogen. Between August 1989 and November 1991, S aureus was implicated in 9% of infections in our hospital. During this period, we attempted to study all S ***aureus*** isolates prospectively, collecting antibiograms, phage types, clinical, and demographic data. Of 788 isolates from 472 patients, 728 (92%) were evaluable. S ***aureus*** was found in greatest frequency in wounds (127/728 [17%]), skin lesions (105/728 [14%]), and sputa (101/728 [14%]). Four hundred and two (55%) were classified as causing infection, 300 (41%) were colonizers, and 26 (4%) were contaminants. S ***aureus*** infections occurring with greatest frequency were skin/soft tissue (258, 64%), primary blood stream (43, 11%), and sinus or ear infections (30, 7%). Oxacillln resistance (5% overall) occurred in 41 isolates from 17 patients; hyperbetalactamase production (3% overall) occurred in 22 isolates from 19 patients. The most frequently occurring S ***aureus*** strains were lytic group II (173, 24%) and pure/predominantly group III admixed (145, 20%). All group II S aureus were oxacillin-sensitive, except for 2 hyperbetalactamse production. Oxacillin-resistant isolates had no predominant lytic group. One of nineteen (58%) of the hyperbetalactamase production isolates

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were lytic group V. Consistent with data from other U.S. hospitals, the most common *S aureus* isolates are lytic group II and pure/predominantly group III admixed with other groups. Our findings were unusual in that hyperbetalactamase production isolates were predominantly lytic group V, oxacillin-resistant and hyperbetalactamse production were uncommon, and clustering and/or nosocomial transmission was not detected.

ABSTRACT #S16

The Evolving Epidemiology of Methicillin-Resistant* Staphylococcus aureus *at a University Hospital

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Methicillin-resistant ***Staphylococcus aureus*** (MRSA) is recognized primarily as a hospital-acquired pathogen. Its role as a community-acquired pathogen is not widely known. To determine the epidemiology of MRSA at our 850-bed institution, we surveyed patients with MRSA isolates from January to December 1991. Data collected included nosocomial versus community-acquired (within 48 hours of admission), intravenous drug use, nursing home residence, recent antibiotics, and recent hospitalization (within 6 months). Thirty-nine of 75 isolates (52%) were nosocomial in origin; 36 (48%) were community-acquired. Significant risk factors for community-acquired included nursing home residence (16.7%), recent antibiotics (49.3%), and recent hospitalization (61.1%). A total of 39.9% of patients with community-acquired isolates had not been hospitalized within the past year. As compared with prior reports, intravenous drug use was not a significant risk factor. Pulsed field gel electrophoresis of whole cell DNA was used as a marker of strain identity. While there were 5 instances of cross-transmission of identical strains in the nosocomial group, only 6 dermatology patients had an identical strain among the community-acquired isolates. This suggests that MRSA is no longer an organism acquired solely in the hospital setting. It has increased in prevalence so that it may now be seen in the community setting as well.

ABSTRACT #S17

Association of* Staphylococcus aureus *Nasal Colonization and Intravenous Therapy-Related Phlebitis

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Intravenous therapy-associated phlebitis is common, but its causes are ill defined. Some cases may be related to colonization of the skin surrounding the intravenous catheter by ***Staphylococcus aureus. Thus,*** we prospectively examined the association of catheter-related phlebitis with nasal S ***aureus*** carriage, as well as with other potential risk factors. Selected demographic and clinical data and a nares culture were collected from patients at the time of their initial intravenous catheter placement. Patients were followed for signs and symptoms of phlebitis for the duration of the initial catheter's use, and for up to 2 additional intravenous placements. Potential risk factors were compared by Cox multivariate modeling between patients who developed phlebitis and those who did not. During 10 weeks 273 men with a total of 416 catheter placements were fully evaluable. Phlebitis occurred during 13.7% of the catheter placements. Nasal cultures yielded S ***aureus*** from 14.3% of the patients but none of the intravenous team nurses. Surprisingly, ***S aureus*** nasal colonization was related (at borderline significance) to a reduction in phlebitis risk. Location of the patient on a surgical ward, the presence of an infection at any site, and a larger gauge intravenous catheter were each significant independent risk factors for phlebitis. The highest risk of phlebitis appeared to have been within 12 to 24 hours of catheter placement. Thus, nasal colonization with S aureus did not increase the risk of developing intravenous catheter-associated phlebitis. Our rate of intravenous catheter-associated phlebitis was similar to that in other studies, but the factors predisposing to phlebitis differed somewhat from previous studies.

ABSTRACT #S18

Effect of Systemic Antimicrobial Prophylaxis in Cardiac and Vascular Surgery in Nosocomial Colonization by Methicillin-Resistant Coagulase-Negative Staphylococci

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Studies have shown that patients undergoing elective cardiac surgery show no detectable or only very low-level cutaneous colonization by methicillin-resistant coagulase negative staphylococci on admission to the hospital, but by the seventh postoperative day over 80% of operated patients, who usually receive a first-generation cephalosporin for surgical prophylaxis, show heavy colonization by resistant strains. It is unknown whether the use of drugs for prophylaxis that exhibit in vitro activity against methicillin-resistant coagulase negative staphylococci, such as cefamandole or vancomycin, might prevent or at least reduce postoperative colonization by methicillin-resistant coagulase negative staphylococci. In a prospective randomized trial of cefazolin, cefamandole, and vancomycin for perioperative antimicrobial prophylaxis in cardiac and vascular surgery, we monitored

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cutaneous colonization by methicillin-resistant coagulase negative staphylococci on admission and throughout the postoperative period. Few patients in the 3 groups were colonized by methicillin-resistant coagulase negative staphylococci at the time of hospital admission, but by the time of hospital discharge, more than three-fourths of the patients in each group showed heavy colonization by methicillin-resistant coagulase negative staphylococci. When cultured 6 weeks to 3 months later in the outpatient clinic, three-fourths of the patients in each group still showed colonization by methicillin-resistant coagulase negative staphylococci. We conclude that the use of drugs with activity against methicillin-resistant coagulase negative staphylococci for perioperative surgical prophylaxis does not have a material effect on preventing colonization by methicillin-resistant coagulase negative staphylococci postoperatively.

ABSTRACT #S19

Methicillin-Resistant* Staphylococcus aureus *Bacteremia in a Hemodialysis Unit: Importance of Standardizing the Process of Care

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An outbreak of methicillin-resistant ***Staphylococcus*** aureus (MRSA) bacteremia was identified in a hemodialysis unit. Eleven patients with bacteremia were noted during January through May 1991. Further investigation revealed an endemic problem with MRSA bacteremia during 1990 (1.21 episodes per 1,000 treatments). A case-control study and microbiological surveillance using field inversion gel electrophoresis were used to investigate the outbreak. Twenty-seven controls were randomly selected from uninfected patients undergoing dialysis during the same period. The most important risk factor for bacteremia was dialysis through a plastic cannula (Udall catheter) vis-a-vis fistula or shunt (odds ratio undetermined, 0 in one cell, $p = .004$). There was no significant association with other environmental or host factors. Analysis of 5 blood and 3 nasal swab isolates with molecular techniques failed to reveal a common strain of MRSA. Aseptic care of catheter exit sites was poorly standardized. Control of variation in the care of exit sites was important in controlling this epidemic.

ABSTRACT #S20

Secular Trends of Infections Due to Metbicillin-Resistant* Staphylococcus aureus *at the Atlanta VA Medical Center

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The prevalence of methicillin-resistant ***Staphylococcus aureus*** (MRSA) (as a proportion of all S ***aureus)*** has increased from 0% to 65% at the Atlanta VA Medical Center since 1979. In order to better define secular trends of MRSA at our facility, we reviewed our prospective surveillance from 1979 to 1990. A total of 1,016 patients (and 5 employees) have been infected or colonized; the frequency increased from 22 in 1979 to 192 in 1990. Compared to the trend early in the epidemic when all cases were nosocomial, in 1990, 38% of all new cases were community acquired, and 23% of community-acquired cases came from nursing homes. Nosocomial cases have increased dramatically since Universal Precautions/body substance isolation was introduced in December 1988. Compared with the epidemiology early in the outbreak, when only 1 or 2 strains were involved, recent analysis suggests that at least 11 different strains are now circulating at our facility. In summary, the Atlanta VA Medical Center has continued to experience serious problems with MRSA despite several attempted methods of control; the recent increasing problem after the institution of body substance isolation is disturbing. A large community reservoir, especially in nursing homes, is apparent. This latter fact, in addition to the dissemination into multiple strains, suggests that future control will be much more difficult.

ABSTRACT #S21

Methicillin-Resistant* Staphylococcus aureus *Adds to the Number of* S aureus *Nosocomial Infections

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Buffalo General Hospital is a 700-bed tertiary care teaching hospital where methicillin-resistant ***Staphylococcus aureus*** (MRSA) first was identified in November 1987. All patients harboring MRSA were placed in strict isolation. Surveillance of nosocomial infections in 1988 89 using Centers for Disease Control definitions distinguished nosocomial infections due to methicillin-susceptible ***S aureus*** (MSSA) from those due to MRSA MSSA caused 390 nosocomial infections in 338 patients: 21% bacteremia, 22% pneumonia, 31% wound infection, and 26% skin/other. Seventy percent of patients were surgical and 20% were in intensive care units. MRSA caused 110 nosocomial infections in 83 patients: 19% bacteremia, 31% pneumonia, 26% wound infection, and 24% skin/other. Fii-eight percent of patients were surgical and 27% were in intensive care units. There were no infection outbreaks. Comparing numbers of nosocomial infections per 1,000 admissions (excluding obstetrical, nursery, and long-term care patients) for the 8 months before September 1988 to the ensuing 16 months, nosocomial infections due to both MSSA (9.07 versus 11.57, $p = .051$) and MRSA (1.94 versus 3.59, $p = .094$) increased. MSSA bacteremias did not change

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(2.36 versus 2.12, $p = .668$) but MRSA bacteremias increased (0.17 versus 0.78, $p = .027$). In our hospital, MRSA added to the "burden" of nosocomial infections due to MSSA, rather than replaced MSSA. Documentation of the increased morbidity with introduction of MRSA justifies measures to control its spread.

ABSTRACT #S22

Methicillin-Resistant Staphylococcus aureus *in Nursing Home and Affiliated Hospital: A Four-Year Perspective*

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When methicillin-resistant ***Staphylococcus aureus*** (MRSA) appeared and spread through the nursing home care unit at the Vancouver Division of the VA Medical Center, concern arose about the potential impact of this outbreak on the acute care facility (hospital) located 10 miles away. Specifically, would the nursing home care unit outbreak increase the MRSA caseload at the hospital? lb examine this issue the surveillance records for the 2 facilities were reviewed for the period of 1987 to 1991. Review of nursing home care unit records indicated that MRSA first appeared in December 1987. By March 1989, when a prevalence survey was conducted, 34% of residents and 7% of staff were colonized. The number of MRSA infections in the nursing home care unit was 0 in 1987, 3 in 1988, 13 in 1989, 7 in 1990, and 5 in 1991. During this period, the number of MRSA-colonized or MRSA-infected nursing home care unit residents transferred to the hospital ranged between 0 and 8 per month (85 total). The MRSA outbreak in the nursing home care unit was associated with a modest increase in the MRSA caseload at the allied hospital.

ABSTRACT #S23

Retrospective Investigation of Methicillin-Resistant Staphylococcus aureus Outbreak and Failure Initial Control Measures

R. Webb, R. Nolan, E. Spruil, M. Norris, H. Turner; VAMC, Jackson, Mississippi.

In July 1990 the Jackson VAMC (450 acute care beds) noted a 4.5fold increase in methicillin-resistant ***Staphylococcus aureus*** (MRSA) isolates. Review of 36 MRSA isolates obtained from 21 patients from July through August revealed 3 patients with MRSA on admission (accounting for 11 of the 36 isolates). Of these 3 patients, 2 were interhospital transfer and 1 was a nursing home patient. Thirteen (including both interhospital transfer patients) of these 21 patients resided in the intensive care unit sometime during their stay. Gown, glove, and mask isolation was initiated on all nursing home and interhospital transfer patients admitted. Surveillance cultures were taken on nursing home and interhospital transfer patients and any patients admitted to the intensive care unit. In the following 6 months, 102 of 129 MRSA isolates recovered were from nursing home and interhospital transfer patients. Despite the control measures MRSA increased to 41% of S ***aureus*** isolates and 69% of nosocomial ***S aureus*** infections. Further review of the first 21 patients from July through August showed that 17 of these patients had hospital stays >15 days, and 13 had 1 to 4 ward transfers, including 11 patients with transfers to the intensive care unit. Nine of these 13 had MRSA documented at some site for >15 days. The MRSA outbreak was perpetuated due to MRSA patients having prolonged hospitalizations and multiple ward transfers. This negated measures to control the spread of MRSA in patients (nursing home and interhospital transfer) traditionally associated with the spread of MRSA.

ABSTRACT #S24

Analysis of Process and Results of Retrospective Notification of Recently Operated Patients of a Surgeon With Fulminant Hepatitis B

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A 65-year-old surgeon developed fulminant hepatitis B and recovered from coma 3 days following liver transplantation. Investigations initiated while he was in coma indicated that he was the primary surgeon in 30 exposure-prone procedures during the antecedent 3 months. The hospital at which these procedures were done consulted public health authorities, hematologists, public relations specialists, and legal counsel, as well as the hospital epidemiologist in developing a notification and a recall program for the patients at risk of exposure to hepatitis B. Counselling, base line liver function tests, and hepatitis B testing was offered to those interested. Seventy percent of those notified responded to the certified letter or followup phone call and requested appointments. All of these individuals were supportive and solicitous for the welfare of their physician; several had abnormal liver function tests, but none had developed hepatitis B markers. Followup studies are in progress. The nominal costs to the hospital for this recall effort included the initial costs for lab testing. The professional time of the hospital epidemiologist, his nurse epidemiologist, and office staff were absorbed by the hospital.

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