

THE SOCIETY FOR HOSPITAL EPIDEMIOLOGY OF AMERICA
ABSTRACTS OF THE THIRD ANNUAL MEETING
CHICAGO, ILLINOIS APRIL 18-20, 1993

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LATE-BREAKER PLATFORM PRESENTATIONS

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Late-Breaker Platform Presentations	Abstracts L1-L4
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<p>1 How Prepared are U.S. Hospitals to Control Nosocomial Transmission of Tuberculosis? J. RUDNICK, K. KROK, L. MANANGAN, S. BANERJEE, G. PUGLIESE, W. JARVIS. Centers for Disease Control (CDC), Atlanta, GA & American Hospital Association, Chicago, IL.</p> <p>To determine the extent of tuberculosis (TB), infection control programs we surveyed all U.S. municipal, veterans administration, and university hospitals (Sample 1, N = 6321 and a 20% random sample of all private hospitals with > 100 beds (Sample 2, N = 444). We assessed tuberculin skin test (TST) screening for healthcare workers (HCWs), admission of patients with multidrug (isoniazid and rifampin-resistant TB (MDR-TB) and isolation practices. As of October 15, 1992, 758 (70%) completed surveys we., returned. All but 7 hospitals performed TSTs on HCWs at the time of hire; subsequent testing practices varied greatly. MDR-TE patients were admitted to 178 (25%) hospitals in 39 (78%) states, and Washington D.C., hospitals in Sample 1 were more likely to admit such patients, (Odds ratio = 2.8, 95%CI 1.8-4.2, p < 0.0001). Number of acid-fast bacilli (AFB) isolation rooms meeting CDC recommendations per hospital ranged from 0- > 60 (median = 6); 217 (27%) hospitals reported no rooms meeting CDC criteria for AFB isolation, i.e., negative air pressure, 6 air exchanges/hour and air directly vented to the outside. Fifteen (2%) hospitals reported nosocomial transmission of TB to patients and \$1 (13%) hospitals reported nosocomial TB transmission to HCWs. Additional hospitals reported HCWs with TST conversions but not active disease. Although hospitals in each Sample had a similar median number of AFB isolation rooms, hospitals in Sample 1 were more likely to report nosocomial TB transmission to patients (Odds ratio 10.1, 95%CI 1.4-210, p=0.01) or HCWs (Odds ratio 1.7, 95%CI 1.0-2.7, p=0.04). Theme data show that MDR-TB is widespread in the U.S. and many hospital TB infection control programs need to be enhanced to prevent TB transmission to patients and HCWs.</p>	<p>2 Nosocomial Transmission of Multidrug-Resistant <i>Mycobacterium tuberculosis</i> among Persons with Human Immunodeficiency Virus Infection, New York, CORONADO, VG*, BECK-SAGUE, CM HUTTON, MD, et. al., CDC, Atlanta, GA</p> <p>Transmission of multidrug-resistant <i>M. tuberculosis</i> (MDR-TB) to immunocompromised persons in health care settings has emerged as a life-threatening occurrence. From January 1989 through December 1991, MDR-TB caused by <i>M. tuberculosis</i> strains resistant to isoniazid, rifampin and streptomycin was diagnosed in 16 patients at Hospital F, New York City; 14 died within a median of 4 weeks of diagnosis. To identify risk factors for MDR-TB, we compared 1) MDR-TB patients to all other TB patients at the hospital and 2) HIV-infected (In) MDR-TB patients to all other HIV-In patients hospitalized on the same wards at the same time as infectious MDR-TB patients. Case-patient isolate were genotypically typed by restriction fragment length polymorphism (RFLP) analysis. Risk factors for MDR-TB were HIV-seropositivity (14/16 vs 21/1158, p < 0.0001) and prior admission to hospital F (10/16 vs 3/158, p < 0.0001). HIV-In MDR-TB patients were more likely than other HIV-In patients to be hospitalized closer to (median = 1 vs 2 rooms, p = 0.02) and for longer periods (median = 25 vs 2 days, p = 0.002) within 3 rooms of an MDR-TB patient before onset of MDR-TB. Eight MDR-TB isolates from case-patients had identical RFLP patterns. Lack of negative pressure in isolation rooms and ambulation on the wards of inadequately masked TB patients may have facilitated nosocomial transmission. These data provide evidence for nosocomial MDR-TB transmission and underscore the need for effective isolation practices and facilities in health-care institutions.</p>
<p>3 Interruption of Nosocomial Transmission of Multidrug-Resistant <i>Mycobacterium tuberculosis</i> (MDR-TB) Among AIDS Patients in a New York City Hospital. *L. STROUD, J. TOKARS, M. GRIECO, M. GILLIGAN, W. JARVIS, CDC, Atlanta, GA, St. Luke's-Roosevelt Hospital Center (SLRHC), New York, NY.</p> <p>Since 1989, CDC has documented nosocomial MDR-TB transmission at nine hospitals. In October 1992, we assessed the efficacy of introduced infection control measures at an outbreak hospital (SLRHC). All AIDS patients with TB resistant to isoniazid and streptomycin were identified during the epidemic (January 1989-April 1990), early postepidemic (May 1990-July 1991), and late postepidemic (August 1991-September 1992) periods. Nonenvironmental (e.g., staff education, prompt TB patient identification, isolation and treatment) and environmental (e.g., negative pressure rooms and ultraviolet lamps) control measures were reviewed. The proportion of TB patients with MDR-TB was similar during the epidemic and early postepidemic period (18/105 vs 19/113, p=0.95), but significantly decreased between tb. epidemic and late postepidemic period (18/105 vs 0/52, p < 0.01). The last MDR-TB patient ward exposure occurred in May 1991 before environmental (July 1991) but after nonenvironmental control measures (April 1990) were introduced. Our data show that patient-to-patient MDR-TB transmission was terminated by enforcement of readily implementable control measures months before more expensive and difficult to implement environmental changes could be made.</p>	<p>4 Efficacy of Control Measures in Preventing Nosocomial Transmission of Multidrug-Resistant <i>Mycobacterium tuberculosis</i> among Patients and Health Care Workers. P. WENGER, C. BECK-SAGUE, J. OTTEN, A. BREEDEN, D. ORFAS, W. JARVIS, COC, Atlanta, GA and Jackson Memorial Hospital, Miami, FL.</p> <p>From 1988 to 1990, an outbreak of multidrug-resistant tuberculosis (MDR-TB, i.e., isoniazid and rifampin resistant) occurred among HIV-infected patients and tuberculin skin test (TST) conversions occurred among healthcare workers (HCWs). Restriction fragment length polymorphism analysis of patient <i>M. tuberculosis</i> isolates revealed a common strain. CDC TB guidelines were initiated in March 1990. In September 1992 we evaluated the efficacy of these control measures. Post-epidemic period case-patients (patients who developed MDR-TE during June 1990-June 1992) were compared to MDR-TB patients from the epidemic period (January-May 1990) and HCW TST conversion rates on the HIV ward were compared before and after implementation of control measures. The proportion of TB patients with MDR-TB declined from the epidemic to the post-epidemic period (26/180 vs 28/1498, P < 0.001). No MDR-TB patients had prior exposure to smear-positive MDR-TB patients in the HIV ward after implementation of control measures while 10/126 epidemic case-patients had prior HIV ward exposure (P < 0.001). TST conversions among HCWs on the HIV ward declined from 12/28 (43%) during March 1 1988-March 1990 to 3/17 (18%) during June 1990-February 1991 to 0/23 during March 1991-July 1992 (P < 0.001). These data suggest that the CDC 1990 guidelines are effective in halting transmission of MDR-TB to HIV-infected patients and HCWs.</p>
<p>5 Tuberculosis (TB) Screening of Hospitalized Patients. VICTORIA J. FRASER*, CHARLES M. KILO, KRISTA JOHNSON, JONATHAN PRIMACK, GERALD MEDOFF, WC DUNAGAN, Washington University Medical Center and Barnes Hospital, St. Louis, MO. 63110</p> <p>To determine if TB screening of hospitalized patients should be reinstated, we provided free TB skin testing for patients admitted to Barnes hospital on 5 study days (excluding 23 hour, Obstetric and newborn patients). Demographic information (race, age, sex, underlying diseases, prior TB and PPD results) was obtained on all patients. PPD's (Aplisol, Parke-Davis 0.1cc intradermally) and controls (candida, and tetanus toxoid) were placed on the volar aspect of the forearm and read at 48-72 hours. 347 of 420 (83%) eligible patients were contacted. 20/347 (5.7%) had a history of TB or a +PPD and were not skin tested. 36/327 (11%) refused skin testing. 291 patients had skin tests placed, 249 (85.6%) PPDs were read in the hospital, 41/291 (14%) patients had left the hospital and skin tests were read by the patient through telephone contact. & 11/291 (3.7%) patients were lost to follow up. 46/280 (16.8%) evaluable patients were anergic. 19/234 (8.1%) non anergic patients were identified with a new +PPD. Of patients with a new +PPD, 3 had old granulomatous disease & 6 had previously unrecognized pulmonary infiltrates. As a result of these skin tests, 6 patients were placed in respiratory isolation and evaluated for TB. 1 patient was empirically treated for TB and 5 patients were given prophylactic INH therapy. Neither sex, age, underlying disease, nor service was predictive of anergy; however, +PPD's were significantly more common in noncaucasians and in those on the medical and neurology services (p < 0.0001). TB screening did facilitate identification and isolation of patients who required evaluation for TB. Further studies are necessary to assess the cost benefit of TB screening among different patient populations given the changing epidemiology of TB.</p>	<p>6 Efficacy of an Expanded Respiratory Isolation (RI) Policy in Limiting Nosocomial Exposure to Tuberculosis (TB). *HM BLUMBERG, JD BERSCHLING, J COOPER, C. PARRISH, P MOORE, JE MCGOWAN, JR., Emory University School of Medicine and Grady Memorial Hospital (GMH), Atlanta, Georgia.</p> <p>The resurgence of TB in the U.S. has been accompanied by increased nosocomial transmission of TB. Patient to healthcare worker (HCW) transmission has occurred in part due to failure to recognize and appropriately isolate patients with active pulmonary TB on admission. Delayed recognition and diagnosis of TB in HIV+ patients who may present with "atypical" chest radiographic findings has been emphasized. In an attempt to limit nosocomial exposure to TB at GMH, which currently cares for ~300 new TB patients annually, we instituted an expanded RI policy on 3/1/92. The new RI policy included admitting all HIV-infected patients with an abnormal CXR into a RI room until active TB (or lack of contagiousness) was ruled out by 3 negative AFB smears; in addition, all patients with active TB, TB in the differential diagnosis or AFB sputum cultures ordered were also admitted to RI as per the previous policy. The new RI policy was accompanied by increased educational efforts for all HCWs and by increased surveillance. Institution of the expanded RI policy resulted in a decrease in the number of TB exposure episodes from 4.1/mo under the old policy (7/91-2/92) to 0.9/mo (3/92-10/92) under the new policy [p < 0.0001] despite a 10% increase in TB cases in the second period. An exposure episode was defined as an admitted patient not being placed in RI, but subsequently diagnosed with smear positive pulmonary TB during that admission or within 2 weeks of discharge. The average number of days per month that patients with potentially contagious TB were not in isolation decreased from 34.6 to 3.8 [p < .02]. Under the old policy (but not the new), HIV+ TB patients accounted for twice as many exposure episodes than HIV- TB patients, although the overall percentage of TB patients at GMH who were HIV+ was 51% of those tested. In summary, an expanded RI policy accompanied by enhanced surveillance and education led to a marked decrease in the number and duration of TB exposures at this public hospital.</p>

7
An Epidemic of *Candida parapsilosis* Fungemia Linked to a Fluid-Compounding Machine for Total Parenteral Nutrition (TPN). MARK A. KEROACK, M.D. The Medical Center of Central Massachusetts, Worcester, MA.
 An epidemic of 10 bloodstream infections caused by *C. parapsilosis* (Cpar) was linked to a machine used for adding inorganic ions to TPN. over a 10 day period, 4 cases of Cpar were detected. There was no common health care provider or nursing unit, but all cases were receiving TPN. Although production of TPN was halted, an additional 6 cases occurred. The lag time bet... blood sampling and the detection of Cpar ranged from 8-10 days (avg. 7.2d). The 10 cases occurred among 44 recipients of TPN during a 20 day period. Four months prior to the epidemic, the preparation of TPN incorporated a new fluid-compounding machine for inorganic ion... The machine utilized a sterile, detachable transfer set which consisted of Lo solution delivery lines feeding into a common weighing chamber, which connected to the TPN mix via a single drain tub... The machine was driven by a vacuum pump equipped with a 0.22 micron filter. During th. compounding process, a solution was pumped into th. weighing chamber and ejected into th. TPN mixture. TPN was then aspirated briefly back through the drain tub. in order to rinse th. weighing chamber, allowing for its contamination with nutrient-rich solution. contrary to manufacturer's recommendations, the transfer set was allowed to remain in place for up to 4 days, after which it was replaced in its entirety. Cultures of th. TPN area, as well as th. apparatus, failed to yield the pathogen, but these were obtained 1 day after the installation of a new transfer set. The epidemic ceased after institution of a policy of changing the transfer set on a daily basis.

8
Prevalence and Risk Factors for Pharyngeal Colonization with *Candida* Species in HIV-Infected Outpatients. STEGER K*, FAGAN M, QUINN J, ROLITSKY C, CRAVEN DE. Boston City Hospital, Boston University School of Medicine, Boston, MA.
Objective: To measure the prevalence and risk factors for pharyngeal colonization with *Candida* spp. in clinic patients with advanced HIV disease.
Methods: We obtained NP swabs on all consenting eligible patients obtaining care in the municipal HIV clinic between 11/91 and 3/92. Swabs were streaked onto blood agar plates and cultured per routine bacteriologic methods. Medical data was obtained by chart review and patient interviews were done to collect information on relevant symptoms and substance abuse activity. Data was compiled on standard forms and analyzed using SPSS.
Results: Of the 204 study participants, 78% were male; 42% were white, 48% were minority; and 60% reported intravenous drug use, 33% had HIV symptoms or AIDS; 53% had CD4 lymphocyte counts <200/mm3. Yeast was identified in 28% of the patients; 62% of the isolates were identified as *C. albicans* and 18% were other species. Independent risk factors for yeast colonization after stepwise logistic regression were previous antibiotic use (p<.007), absence of an azole drug (p<0.01), and a history of asthma (p<0.05). There was a trend (p=0.1) toward association with female gender, history of staphylococcal infection and the presence of psoriasis.
Conclusions: Pharyngeal colonization with *Candida* spp. in HIV-infected patients is strongly associated with previous antibiotic use and only a trend was seen toward increased colonization in women. The lack of association between yeast colonization and CD4 counts of <200/mm3 probably reflects the protective effect of azole drugs. Azole drugs significantly decrease candida colonization and should be evaluated as prophylactic agents for patients with advanced HIV infection.

9
High Frequency of Yeast Carriage on Hands of Nurses. *L. STRAUSBAUGH, D. SEWELL, T. WARD, M. PFALLER, T. YOST AND R. TJOELKER, Portland VA Medical Center (PVAMC) and Oregon Health Sciences University, Portland, OR.
 During an investigation of funguria at the PVAMC's Nursing Home Care Unit (NHCU), 15 of 20 (75%) nurses (N) were found to harbor yeasts on their hands. To follow up on this unexpected observation the frequency of yeast carriage on the hands of N and non-nursing personnel (NNP) was examined in different areas of the PVAMC. Hand cultures for yeast and questionnaire data regarding handwashing, glove use and patient contact were obtained from N in geographically separate units of the PVAMC - NHCU, Outpatient Clinic (OPC) and two intensive care units (ICU's) at the main hospital and from three groups of NNP in the Fiscal (FIS), Supply (SUP) and Personnel (PER) Services. Cultures were obtained using hand washes in baggies with 20 ml BHI broth. BHI specimens were incubated at 30° for 6 days and subcultured to BCG and inhibitory mould agar on days one and six. Yeast isolates were identified with the Rapid Yeast ID Panel (MicroScan). Overall, 27 of 36 (75%) N versus 7 of 21 (33%) NNP had positive hand cultures for yeast (p<0.005); 9 of 12 N in OPC; 11 of 12 N in NHCU and 7 of 12 N in ICU's versus 4 of 7 NNP in SUP; 1 of 7 NNP in FIS and 2 of 7 NNP in PER. On the day of testing N reported more handwashing (92% vs 28%), glove use (50% vs 5%) and patient contact (78% vs 0%) than did NNP. *C. albicans* (n=8) *C. parapsilosis* (n=9) and other species of *Candida* (n=6) accounted for 72% of 32 yeast isolates from N whereas *C. albicans* (n=3) and *Rhodotorula* sp. (n=4) accounted for 78% of 9 isolates from NNP. **Conclusion:** Nurses frequently carry pathogenic yeasts on their hands; this may be due to handwashing practice, glove use, patient contact or same combination of these factors.

10
Fluconazole Resistant Yeasts in Patients Receiving Fluconazole Prophylaxis
 * P. CARLISLE, R. GULCAP, P.H. WIERNIK
 ALBERT EINSTEIN CANCER CENTER, BRONX, N.Y. 10467
 We surveyed all patients in our bone marrow transplant unit who were receiving fluconazole prophylaxis for the development of gastrointestinal colonization with fluconazole-resistant yeasts after one patient with an anal fissure developed *Candida krusei* fungemia and was found to have *C. krusei* in stool. Of 24 consecutive patients surveyed 15 grew *C. krusei* from stool cultures; 6 of these also grew *Torulopsis glabrata*. All of the remaining 9 patients grew *T. glabrata*. Fungal sensitivity tests performed at the standard reference laboratory confirmed that the *C. krusei* isolates were resistant (MICs >40mcg/ml) to fluconazole but susceptible to amphotericin B (MICs 0.5 mcg/ml). The prophylactic dose of fluconazole was reduced from 400 mg/day to 200 mg/day. Preliminary results on 5 patients surveyed demonstrated that no further *C. krusei* or *T. glabrata* colonization has occurred; however *C. albicans* has occasionally been recovered from mouth or stool cultures and one patient developed clinical thrush.

11
Prevention of Nosocomial *Aspergillus* Infection During Hospital Construction. *VIVIAN G. LOO, CELINE BERTRAND, BEVERLY DE SALIS, CATHERINE DIXON, HUGH G. ROBSON, Royal Victoria Hospital, McGill University, Montreal, Canada.
 From January 1989 to November 1991, 23 patients in a dedicated hematological unit of a 1960s vintage tertiary care teaching hospital developed aspergillosis. Previous studies—relying on an incidence definition based on either admissions or discharges—have correlated *Aspergillus* outbreaks with periods of intense hospital construction. This is the first report that confirms these previous findings using an alternate denominator in the definition of incidence: patient-neutropenic days. Thus, the incidence density was calculated as the number of patients infected with *Aspergillus*/total number of patient-neutropenic days. In 1988, 1989, 1990, and 1991 the incidence densities were 6.4, 4.2, 12.1 and 13.2/1000 respectively. When compared to the 1988 pre-construction baseline rate, the relative risks for acquiring *Aspergillus* infection during the two years of demolition and construction (mid-1989-1991) were 1.89, 95% CI (1.43, 2.64) and 2.06, 95% CI (1.56, 2.87). Construction associated environmental contamination was substantiated by both air sampling (3-18 CFU/m³ *Aspergillus* species) and swab cultures (*A. flavus*, *A. niger*, *A. species* and other fungi).
 The following environmental control program was implemented: application of copper-8-quinolinate (a fungus-inhibiting chemical) to surfaces such as walls and ceilings; installation of in-room portable high-efficiency particulate air (HEPA) filters; sealing the windows; and keeping doors shut. In the six months following the program's initiation, there has been only one patient with clinically suspicious aspergillosis. Environmental *Aspergillus* counts have been reduced to zero. Life-threatening aspergillosis can be prevented in high-risk immunocompromised patients through environmental manipulation.

12
Invasive Aspergillosis following Cardio-Thoracic Surgery.
 M BORDNER, ELIAS DUNRY, BRENT LASKER, ROBERT W. FINKER, OFELIA C. TALLAN, ARVIND A. PADHYE, PAMELA K. RICKERT, BRUCE S. JAMORY, University Hospital, Hershey, PA and CDC, Atlanta, GA.
 Three patients who had cardio-thoracic surgery (CTS) during one week in March 1992, developed invasive *Aspergillus fumigatus* (AF) infection. Two patients died. A case was defined as isolation of AF from blood, pleural fluid, or tissue of a patient who had CTS between 1/89 and 4/92. On review of hospital records, only one other case who had CTS in 1/92 was identified. To help identify the source of the aspergillosis outbreak, we performed a case-control study comparing the 4 cases with 14 control who had CTS within three days of the cases. Conducted review of operating room (OR) procedures and air-handling systems, and performed restriction endonuclease analysis (REA) on 21 AF isolates. The operation time of all cases was more than 6 hour... and one perfusionist assisted in the surgeries of all cases. However, neither association was statistically significant (p-value = 0.12 and 0.09 respectively). The cases had been operated on in two ORs with separate air-handling systems. Two construction projects were in progress near the ORs when the outbreak occurred. In addition, non-sterile latex examination gloves in use in the OR during the period of cases' surgery were observed to have black spots which grew AF. Simulation experiments of non-sterile-glove use in the OR showed that AF spores could be dispersed from the contaminated gloves to the OR field. However, results of REA did not demonstrate relationship between the isolates obtained from patients, the gloves, or the environment. Thus, the source of the outbreak remained unclear. However, after measures were instituted to control OR traffic and dust, no further cases have occurred.

13 **Bloodstream Infections (BSIs) in Neonatal Intensive Care Unit (NICU) Patients.** C.M. BECK-SAGUE, S. FONSECA, D.A. POWELL, R. BALTIMORE, P. AZIMI, W.R. JARVIS, CDC, Atlanta, GA, Yale University School of Medicine, New Haven, CT, Children's Hospital, Columbus, OH, Children's Hospital, Oakland, CA. Neonates admitted to NICUs are at increased risk of BSI. BSI was diagnosed in 42/376 (11.2%) infants followed prospectively between November 1989 and May 1991 in three NICUs. Patients with BSI were more likely to die during their NICU stay than other patients (6/42 vs 11/333, p=0.007). Pathogens included coagulase-negative staphylococci (48%), gram-negative organisms (21%), Candida spp. (14%) and Group B streptococci (7%). In a logistic regression analysis, risk of BSI was independently associated with low birthweight, respiratory tract disease at admission, and receipt of H-2 blockers. In 430 sepsis evaluations on 249 infants, logistic regression analysis showed that risk of isolation of a pathogen was independently associated with prolonged Broviac (>10days), umbilical vein (>7days) or peripheral veins (>3 days) catheterization at one insertion site. Rate of isolation of a pathogen was higher (15%) within 48 hours of a serum interleukin-6 (IL-6) level >0 pg/ml than a serum IL-6 level = 0 pg/ml (6%, p=.04). Conversely, prolonged exposure to antimicrobial (>4days) prior to sepsis evaluation was associated with lower risk of BSI in infant with prolonged intravascular catheterization. These findings indicate that low birthweight, respiratory diagnoses, H-2 blocker use, prolonged intravascular catheterization and detectable serum IL-6 are associated with BSI, and suggest a protective effect for antimicrobial use for NICU patients with prolonged catheterization.

14 **Very Low Birthweight as an Effect Modifier of the Incidence of Bloodstream Infection in the High Risk Nursery.** ADELE JOSEPHSON, GEORGE ALLEN, HELIDA ALONSO. SUNY-Health Science Center @ Brooklyn, University Hosp. of Brooklyn, Brooklyn, NY. Because University Hospital of Brooklyn's high risk nursery (HRN) experienced its highest incidence of bloodstream infection (BSI) in the ≤ 1500 gram birthweight group, we further stratified this population's outcome into three very low birthweight strata (≤ 750 grams; 751-1000 grams; 1001-1500 grams) to identify the potential for effect modification of very low birthweight on the incidence of central and umbilical GUI catheter associated BSI. Results: After a 24 month period we have observed 90 BSIs in the HRN: 46 were associated with C-U catheters. Among neonates whose birthweight was ≤ 1500 grams there were 37 BSIs in 1711 C-U catheter days for an incidence density (ID) of 21.6 BSIs per 1000 C-U catheter days, an incidence density ratio (IDR) of 2.77 and an etiologic fraction (EF) of 0.64. The following very low birthweight breakdown was observed:

Birthweight	ID per 1000 cath days	IDR	EF
≤ 750 grams	21.80	1.98	0.50
751-1000 grams	21.90	3.70	0.73
1001-1500 grams	21.30	3.10	0.68

Conclusion: While we found no differences in the ID of BSI in the three very low birthweight strata for those exposed to C-U catheters, birthweight specific differences in the background incidence of BSI as indicated by differing birthweight specific IDRs and EFs have implications for the initiation of effective intervention strategies as well as our ability to measure the effect.

1 **Malassezia pachydermatis Bloodstream Infections in a Neonatal Intensive Care Unit, Louisiana.** S H A R O N F. WELBEL, MICHAEL MCNEIL, ARUN PRAMNIK, RONALD SILBERMAN, ARNOLD OBERLY, GILLIAN MEGLEY, and WILLIAM JARVIS Centers of Disease Control, Atlanta, GA., Louisiana State Medical Center, Shreveport, LA, and St. John's Institute of Dermatology, London, England. *Malassezia pachydermatis* (MP), has been reported to cause sporadic nosocomial bloodstream infections (BSIs). However, outbreaks of nosocomial MP-BSI have never been described. We investigated a cluster of MP-BSIs in a neonatal intensive care unit (NICU). A case was defined as clinical evidence of BSI and a blood culture positive for MP in any hospital A NICU patient from January 1, 1989 to August 31, 1991. To identify risk factors for MP-BSI, we compared each case-patient to two randomly selected patients who were in the NICU during the period above and who had negative blood cultures (controls). We conducted two surface-culture surveys of all NICU infants 24 days apart, and an environmental culture survey. MP blood isolates from case-patients were sent to CDC for confirmation of identification, and to England for molecular typing. Five patients met the case definition. Case-patients received parenteral nutrition for twice as many days as controls (median: 83 vs 43 days). No environmental source of MP was identified. In the 24-day period between the two NICU patient-culture surveys, two infants in isolettes on each side of a previously identified MP-colonized infant also became colonized with MP. Chromosomal analysis of five MP-BSI isolates from two case-patients showed that all five had identical banding patterns. Our data show that MP may be transmitted from patient-to-patient, that prolonged receipt of parenteral nutrition and/or lipids may place neonates at an increased risk of invasive disease, and that MP can cause nosocomial outbreaks. Molecular typing of MP isolates may facilitate further characterization of the epidemiology of MP.

16 **Outbreak of Clostridium difficile (CD) infection in a neonatal intensive care unit (NICU).** RATHORE MH, GORDON V. Div. of Inf Dis, Dept of Pediatrics, Univ of Florida Hlth Sci Ctr, Jacksonville, FL. CD is known to be associated with antibiotic associated pseudomembranous colitis and causes bloody diarrhea. It is also a cause of hospital acquired infection. Recently we witnessed an outbreak of nosocomial CD associated infection in our NICU. We instituted aggressive infection control measures and were able to contain the further spread of the infection. Over a 6 day period 3 neonates, with bloody diarrhea and/or possible necrotizing enterocolitis (NEC), tested positive for CD toxin (CDT). The following measures were instituted:

- 1) Start education, with stress on hand washing.
- 2) Testing all neonates for CDT.
- 3) Contact isolation of the CDT @ neonates.
- 4) Cohorting of all the CDT @ neonates.
- 5) Testing of all neonates with suspected NEC for the presence of CDT.
- 6) Cohorting of the personnel.

Of the 32 neonates tested for CDT 9 (28%) were @. All neonates who were CDT @ had bloody diarrhea. 3 had NEC; 8 neonates who were CDT @ were treated with oral vancomycin and recovered without incident. One neonate who had been discharged and was asymptomatic was not treated with antibiotics. With the above control measures we were able to contain the outbreak of CD infection in our NICU. We believe that these measures can be very useful in preventing the spread of CD infection that may cause increase morbidity and mortality of the sick neonates.

17 **Microbiologic Comparisons at 48 and 120 Hours in Neonatal Ventilator Circuits.** M BATT*, S. BICCUH, R. O'DOWD, N. MARSHALL, B. ELLERSON. Lutheran General Hospital, Park Ridge, IL. Previous studies have suggested the lack of relevance of the mandatory 48 hour change of ventilator tubing. In the setting of our Neonatal Intensive Care Unit, using a pass-over wick humidifier, gravity prevents the minimal condensation which occurs from reaching the patient. We compared the flora in the tracheal aspirate at the time of intubation, at 48 hours, and at 120 hours in 20 neonatal ICU ventilated babies, over a 4-month period. We also cultured the patient connecting tubing and the humidifier water at 48 hours, and at 120 hours. Because of our interest in the comparability of distilled versus sterile water usage in this setting, we substituted distilled for sterile water in the humidifiers of the last 10 patients. Three of the patients who had not had gram positive cocci (GPC) by 48 hours had GPC by 120 hours. Only 2 patients had gram negative species cultured from the tracheal aspirate (1 E. coli, 1 Klebsiella) at 120 hours which were not present at intubation; on intubated patient lost the initial Acinetobacter by 48 hours, and it did not reappear at 120 hours. There were no differences in any of the humidifier cultures; in this setting all were sterile. We were unable to provide a microbiologic justification for changing respiratory circuits in a neonatal ICU at intervals less than 120 hours. Distilled water in this setting showed no deficiencies in comparison to sterile water, and was much cheaper.

18 **Management of Varicella Exposure in Hospitalized Neonates.** W.L. GOLD*, C. GOLDMAN, J. BOULTON, A. GERSON, S. STEINBERG, R. CHUA, D.E. LOW, A. MCGEER, Mount Sinai and Princess Margaret Hospitals, University of Toronto, Canada and College of Physicians and Surgeons, Columbia University, New York. Recommended management of a nursery exposure to Varicella-zoster virus (VZV) includes VZIG administration and isolation of neonates born <28 weeks' gestation and/or weighing ≤ 1000g at birth regardless of maternal history. Infants born to VZV immune mothers at ≥ 28 weeks' gestation and weighing > 1000g at birth are assumed to have been passively immunized. The exposure of 29 neonates to VZV in our neonatal intensive care unit prompted us to examine the relationship between gestational age and weight and the presence of maternally-acquired VZV antibodies. ELISA and latex agglutination assays were performed on the sera of 23 neonates with seropositive mothers. Results were as follow:

	Elisa+	Latex+	Both+	Either+
≤ 28wk, < 1000gm (N=12)	5	8	3	10
≥ 28wk, ≥ 1000gm (N=13)	4	5	2	7

The sensitivity and specificity of these two tests may not be the same as that in adult populations. Gestational age and weight does not appear to predict the presence of maternally-acquired VZV antibodies. Current recommendations may result in the unnecessary isolation and administration of VZIG to immune infants, and lack of intervention for some susceptible neonates. Both more precise definition of this relationship and of the preferred screening test for neonates are required in order to optimize recommendations for the management of exposed neonates.

19

Temporal Trends in Device-Associated Infection Rates in Intensive Care Units (ICUs) in the United States. J. EDWARDS*, R. GAYNES, D. CULVER, AND THE NATIONAL NOSOCOMIAL INFECTIONS SURVEILLANCE (NNIS) SYSTEM. CDC, Atlanta, GA.

To determine changes over time in device-associated infection rates in ICUs, we analyzed data from the ICU component of the NNIS system during 1987-1992. For ventilator-associated pneumonia (VAP) rates, we calculated the mean annual rate for five types of ICUs. Preliminary results suggest a dramatic downward shift in three types of ICUs--12%, 10%, 8% yearly decreases in VAP rates for medical, medical-surgical, surgical ICUs, respectively. For coronary ICUs, VAP rates decreased at an even steeper rate (21% per year), until 1991 when a significant increase in the VAP rate occurred. For pediatric ICUs, VAP rarer consistently increased (13% per year). Catheter-associated urinary tract infection rates for medical and surgical ICUs decreased 10% and 8% respectively during the same period. No changes were observed for the mean rates for coronary, medical-surgical, or pediatric ICUs. For central-line associated bloodstream infection rates we found no changes we, time. Although further analyses are needed to confirm these results, certain device-associated infection rates in ICUs appear to have changed dramatically over time. The use of distributions of these risk-adjusted infection rates as benchmarks for interhospital comparisons must reflect these temporal changes.

20

Catheter Related Infections in a Children's Hospital. MC FISHER,* D BILLMIRE, S DULCZAK, AM FREY K. FALKENSTEIN. St Christopher's Hosp. for Children. Phila., PA

Surveillance for catheter related infections (CRI) was conducted for 4 months in neonatal intensive care unit (NICU) and wards. In months 3 and 4, dressings of broviac type catheters were changed from transparent occlusive dressings to steri-strips with no covering or with gauze.

	Rate of infection per 1000 days				Cath #	Pts or #	#
	June	July	Aug	Sept.			
NICU-overall	24	16	5	17	646	32	10
NICU-broviac	23	10	5	17	57.5	30	6
NICU-no tunnel	29	37	0	-	73	13	2
wards-overall	0	6	4	5	603	70	3
wards-broviac	0	10	5	6	564	39	3
wards-no tunnel	0	0	0	0	79	18	0
wards-ports	0	0	0	0	140	16	0

There were 13 CRI in 6 pts: staphylococci (8), enterococci (5), **Candida** (1), **Klebsiella** (1). 7 of the 6 pts with CRI also had bowel disease; 3 pts had more than 1 CRI. Infection rate in NICU 10/648 (15/1000) was higher than on the wards 3/803 (4/1000) p=0.038. Rate with transparent dressings was 8/690 (12/1000) vs 5/761 (7/1000) with steri-strips. Newborns with bowel disease and infants with short gut syndrome were most likely to develop CRI.

21

Bloodstream Infections in Hemodialysis Patients. Maryland. SHARON F. WELBEL, KENNETH SCHOENDORF, CARMELLA GROVES, LEE BLAND, MATTHEW ARDUINO, BARBARA SCHABLE CAROLINE O'HARA, FRED TENOVER and WILLIAM JARVIS, Centers for Disease Control, Atlanta, GA, and Maryland Department of Health and Mental Hygiene, Baltimore, MD.

Most chronic hemodialysis (HD) patients in the United State use dialyzers that have been reprocessed for reuse. We investigated a cluster of gram-negative bloodstream infections (BSIs) occurring in a HD unit that reprocessed dialyzers to determine the source of the BSIs. We defined a case as a blood culture positive for a gram-negative bacterium in any patient on hemodialysis in unit A during April 10-24, 1992. We conducted a case-control study comparing dialysis sessions of case- and control-patients from April 10 through April 24, 1992. Interview* of unit A personnel were conducted. Patient and environmental samples were collected and sent to CDC for assay and typing of bacterial isolates. Six patient met our case definition. Case-patients were significantly more likely than controls to have been dialyzed on the night shift of Monday, Wednesday, or Friday (6/6 cases vs 6/16 controls, p<0.05). Technician X reprocessed dialyzers used on the night shift of April 10 (Friday) and did not change gloves during the shift. Technician X also worked in the dialysis treatment room and may have had contact with patient with K. pneumoniae abscess on April 10. All six case-patient blood cultures grew K. pneumoniae with similar plasmid profile: all were serotype K15. We hypothesize that Technician X's glove were contaminated with K. pneumoniae from a patient's draining wound. Because gloves were not changed, the case-patient dialyzers became contaminated during reprocessing.

22

Maximal Sterile Barriers (MSB) During the Insertion of Central Venous Catheters (CVC) for the Prevention of Infections: A Prospective Randomized Study. I. RAAD*, J. GILBREATH, N. SULEIMAN, D. HOHN, P. BRUSO, K. MARTS, and G. Bodey. U.T.M.D. Anderson Cancer Center, Houston, TX.

Between 2/91 - 11/91 we randomized 3 4 3 patients (pts) to have their non-tunneled CVC inserted either with MSB precautions (sterile gloves, gowns, large drapes, and nonsterile masks and caps), or with sterile gloves and small drapes (control C). All pts were prospectively followed up for 3 months with scheduled visits at 1 and 3 months. Removed CVC tips and subcutaneous segments were cultured by the roll plate (RP) and sonication (S) method. Local catheter infection (LCI) was defined as >15 CFU by RP or ≥100 CFU by S. Catheter related septicemia (CRS) was diagnosed by quantitative blood and catheter cultures. The 176 MSB pts and the 167 C pts were comparable as far as age, underlying disease, neutropenia, steroid use, chemotherapy including IL, duration of hospitalization, duration and site of catheterization, number of CVC lumen, CVC insertion difficulty, uses of CVC, and reason for CVC removal. Catheter-related infections (CRI) were as follows:

	MSB	C	P
No. of pts	176	167	
LCI	4	12	0.03
CRS	1	6	0.05

All of the CRI in the MSB group occurred after 2 mos postinsertion while most (67%) of the CRI in the C group occurred within 6 weeks postinsertion (P < 0.05). The use of MSB during CVC insertion ds- the risk of CRI.

23

Influence of Closed Suctioning System on Ventilator-Associated Pneumonias. *MICHAEL D. DECKER, AVA D. LANCASTER, ROBERT H. LATHAM, CHRISTOPHER P. BUNCE, NANCY R. BECKER, KATHY BURNS, Saint Thomas Hospital, Nashville, TN.

Endotracheal suctioning of intubated patients traditionally has been done with a single-use, disposable sterile catheter that is inserted by gloved hand into the ET tube after disconnecting the respirator. This technique is effective but cardiorespiratory complications can occur due to the interruption of mechanical ventilation, particularly in patients on PEEP. A new, multiple-use, closed system device (Ballard Medical Products, Midvale, UT) allows suctioning while maintaining mechanical ventilation. However, use of this device raises infection control questions. By reducing the risk of hand to catheter contamination, would it reduce ventilator-associated pneumonias? By allowing prolonged use of a catheter contaminated with the patient's secretions, would it increase ventilator-associated pneumonias. To evaluate these questions, all patients receiving mechanical ventilation from 6/1/90 to 6/18/91 were prospectively randomized to Ballard or traditional suctioning. Randomized patients were enrolled not intubated on admission, without pneumonia at intubation, and ventilated at least 48hrs. Enrolled patients were followed until death, discharge, development of pneumonia, crossover to the other device, or until 48hrs post-extubation. We randomized 2451 patients and enrolled 219. Pneumonia developed in 10 (10.9%) of 92 with traditional suctioning, versus 17 (13.2%) of 129 with Ballard (OR, 1.2; 95%CI, 0.51-3.21). We conclude that use of th. Ballard closed suction system does not affect th. rat. of ventilator-associated pneumonias.

24

An Outbreak of Mycobacterium chelonae abscessus Associated with Endoscopy. *S. MALONEY, S. WELBEL, B. DAVES, K. ADAMS, S. BECKER, G. BUCK, P. RISCH, L. BLAND, M. ARDUINO, and W. JARVIS. Centers for Disease Control, Atlanta, GA, and Kentucky Department of Health Services.

Numerous outbreaks of infection and pseudo-infection involving contaminated or inadequately disinfected endoscopes have been reported. We investigated an epidemic of pseudo-infection with *M. chelonae abscessus* associated with endoscopic procedures at Hospital A in Kentucky. To identify risk factors for pseudo-infection, we compared the rates of positive *M. chelonae* culture by age, type of endoscopy, and device used during the pre-epidemic (January 1, 1991-March 24, 1992) and epidemic (March 25-June 30, 1992) periods. We cultured endoscopes, inlet water, and the automated endoscope washer. Positive *M. chelonae* cultures from endoscopy were more likely in the epidemic than pre-epidemic period (17/1009 vs 1/3712, p <0.001). In the epidemic period, positive cultures were more likely during bronchoscopy than gastroendoscopy (16/87 vs 1/860, p <0.001), in procedures using flexible rather than rigid bronchoscopes (16/87 vs 0/62, p <0.001), in adult th. pediatric patients undergoing bronchoscopy (16/54 vs 0/33, p = 0.002), and in procedures using bronchoscopes disinfected using the automated washer rather than manually (16/54 vs 0/95, p <0.001). A phenotypically unique strain of *M. chelonae abscessus* was isolated from eleven of 15 patients, a flexible bronchoscope, the automated washer, and the inlet water source. Our data implicate the automated endoscope washer as the source of pseudo-infection, and demonstrate the potential for bacterial colonization of these machines.

25 Blood Isolates Resistant to Imipenem, Vancomycin, or Penicillin in New Jersey Hospitals. SINDY PAUL*, JEROME TOKARS, GILES CRANE, CAROL GENESE, & KENNETH SPITALNY. N.J. Dept. of Health, Trenton, NJ & CDC, Atlanta, GA.

Antibiotic resistance in an increasing problem. This is the first state-wide study of inpatient imipenem-resistant gram-negative bacilli (IRGNB), penicillin-resistant streptococci (PRS), and vancomycin-resistant gram-positive cocci (VRGPC) blood isolates. All 96 general hospitals licensed by the NJ DOH completed and submitted a monthly surveillance form from 1/92 through 6/92. 34 IRGNB isolates were reported from 18 hospitals with *P. aeruginosa* (79%) and *P. maltophilia* (8, 24%) reported most frequently. 63 PRS isolates were reported from 26 hospitals with *E. faecium* (34, 54%) and *Enterococcus* Group D (9, 14%) reported most frequently. 39 VRGPC isolates were reported from 18 hospitals including *E. faecium* (25, 64%), *Enterococcus* Group D (11, 28%), *Leuconostoc* species (1, 3%), and *S. equinus* (1, 3%).

Parameter	# Of Hosps	IRGNB	PRS	VRGPC
All Hospitals	96	18 (18.8%)	26 (27.1%)	18 (18.8%)
Beds	<300	10 (17.3%)	14 (19.2%)	8 (11.0%)
>300	23	8 (34.8%)*	12 (52.2%)*	10 (43.5%)*
Teaching	Yes	37	11 (29.7%)*	14 (37.8%)
No	59	7 (11.9%)	12 (20.3%)	6 (10.2%)

*p < 0.05

Although associated with large and teaching hospitals, the presence of these organisms in all types of hospitals emphasizes the need for proper infection control practices to prevent nosocomial transmission.

26 Epidemiology of Vancomycin-Resistant *Enterococcus faecium* (VRE). J.M. BOYCE, S.M. OPAL, J.W. CHOW, M.J. ZERVOS, G. POTTER-BYNOZ, R. ROMULO, S. FORTNA, C.B. SHERMAN, and A.A. MEDEIROS. Miriam Hospital, Providence, RI, Memorial Hospital, Pawtucket, RI, & William Beaumont Hospital, Royal Oak, MI.

During a 14-month period, *E. faecium* isolates resistant to ampicillin, vancomycin and high levels of gentamicin, but susceptible to teicoplanin, were recovered from 36 hospitalized patients (cases). An investigation included prevalence surveys in the ICU, pulsed field electrophoresis of *ApaI* and *SmaI* digests of genomic DNA from 10 isolates, electrophoresis of *EcoRI* digests of plasmid DNA from 16 isolates, environmental cultures, and case-control studies. Vancomycin MICs ranged from 16 to 256 ug/ml; teicoplanin MICs were \leq 2 ug/ml. Restriction endonuclease digest patterns of genomic DNA were very similar, suggesting that all isolates represented a single clone. VRE was recovered from urine (13), wound (10), blood (8), sputum (6) and other sites (12). 13 cases were in the ICU when identified, and another 7 were previously in the ICU. Comparison of 12 ICU-associated cases with 12 matched controls revealed that proximity to a known case and sharing a nurse with a known case were significant risk factors for acquiring VRE (both p = 0.007). VRE was recovered from patient gowns, bed linen and side rails, a stethoscope, pulse oximeter coupling, and overbed table. Cases often had diarrhea (3 had *Clostridium difficile*), which may have contributed to environmental contamination by VRE. Placing cases in private rooms and requiring use of gloves and gowns terminated the outbreak. Our findings suggest that environmental contamination resulting from diarrhea among affected patients may have served as an important reservoir for VRE.

27 Control of Endemic Glycopeptide-Resistant Enterococci, LOUISE DEMBRY*, KEKE UZOKWE and MARCUS ZERVOS. William Beaumont Hospital, Royal Oak, Michigan, and Wayne State University School of Medicine, Detroit, Michigan.

Increasing antibiotic resistance among enterococci causing serious nosocomial infections poses a considerable therapeutic challenge. In a large community teaching hospital, clinical isolates of vancomycin-resistant enterococci were first identified in January of 1991. Subsequent surveillance showed 5 resistant clinical isolates from 4 patients. All patients were located on a 24-bed renal unit of the hospital. A 3-month prospective, prevalence culture survey of all patients on the renal unit was then conducted. Patients had rectal cultures obtained bi-weekly and all clinical sites were also cultured. Two additional patients with vancomycin-resistant enterococci were identified. Laboratory evaluation showed 4 isolates were *E. faecium* (vancomycin MIC = 16-256 ug/ml), 2 were *E. faecalis* (vancomycin MIC = 64 and 128 ug/ml), and 1 was *E. isolatus* (vancomycin MIC = 8.0 ug/ml). All isolates were susceptible *in vitro* to teicoplanin. Rifampin MIC's were 25 ug/ml. Two *E. faecium* isolates were susceptible to tetracycline. Control measures included resistant organism barrier precautions. Two patients with *E. faecium* treated for 5 days with oral rifampin (300 mg/day) and doxycycline (100 mg/twice daily) had follow-up rectal cultures at 15 days and 30 days negative for resistant era-c. In the final 30 days of he culture survey and at 9 months there were no further patients with resistant enterococci identified. These results show elimination of rectal carriage of glycopeptide-resistant *Enterococcus* with combination oral antibiotic, barrier organism precautions and elimination of patient carriage may be useful measures for controlling the spread of low-prevalence, endemic resistant enterococcal isolates.

28 A Case Control Study of Nosocomial Ampicillin-Resistant Enterococcal Infection and Colonization at a University Medical Center. DANIEL J. SEXTON, LIZZIE J. HARELL, DEBRA L. HUNT, JACQUELINE J. THORPE, WILLIAM E. WILKINSON, Duke University Medical Center, Durham, NC

During an 18 month period we identified 44 cases of infection or colonization with ampicillin-resistant enterococci (ARE) and compared these cases with 100 cases of infection or colonization with ampicillin-sensitive enterococci. Using univariate analyses controlling for site of isolation, patients with ARE were significantly more likely to have received 3rd generation cephalosporins (OR=2.9, p<0.01) or clindamycin (OR=5.1, p<0.001) and to have been previously admitted to our medical center (OR=2.3, p<0.05). In addition, patients with ARE were significantly older (OR for 10 years of age =1.3, p<0.05) and more likely to have a fatal outcome (OR=2.6, p<0.02). Significant differences were not detected between the two groups with regard to race, sex, prior surgery service and hospital ward (including ICU residence), length of stay prior to first enterococcal isolate, device use (including ventilators, feeding tubes, central vascular lines and Foley catheters), or use of other antimicrobial agents. 85% of ARE were speciated as *E. faecium*. Whole plasmid DNA analysis of isolates of ampicillin-resistant *E. faecium* disclosed at least 16 different groups of banding patterns. Restriction enzyme analysis of plasmid DNA of resistant *E. faecium* isolates confirmed that multiple strains were present. Nosocomial acquisition of ARE is associated with prior use of 3rd generation cephalosporins, clindamycin and with prior admission to our medical center but is not associated with any specific service, location, procedures or device. These data suggest that multiple of ARE have become endemic since the first ampicillin-resistant isolate was discovered in our medical center in 1969.

29 INVASIVE PNEUMOCOCCI WITH HIGH-LEVEL PENICILLIN RESISTANCE AT A CHILDREN'S HOSPITAL. ROBERT J. LEGGIADRO, FRED F. BARRETT, P. JOANCHESNEY, YVONNE DAVIS AND FRED C. TENOVER, LEBONHEUR CHILDREN'S MEDICAL CENTER, UNIVERSITY OF TENNESSEE. MEMPHIS, AND CENTERS FOR DISEASE CONTROL (CDC), ATLANTA, GA.

WE PREVIOUSLY REPORTED 3 patients with penicillin- and cephalosporin-resistant pneumococcal meningitis at our 225-bed, university-affiliated children's hospital. As part of subsequent surveillance, we identified 203 pediatric patients from clinical microbiology laboratory records with blood and/or cerebrospinal fluid *Streptococcus pneumoniae* isolates from 10/6/91 to 11/16/92. (1.5%) demonstrated high-level (minimal inhibitory concentration (MIC) >1 ug/ml) penicillin resistance and two also demonstrated high (> 2 ug/ml) cephalosporin MICs.

Mean age was 13 mos. and clinical manifestations included nosocomial bacteremia (J.M.), bacteremic cellulitis (L.H.) and meningitis (J.R.). Blood isolate MICs (ug/ml) were performed in Mueller-Hinton broth with lysed horse blood at CDC:

	J.M.	L.H.	J.R.
Penicillin	8	4	2
Cefotaxime	8	1	8
Ceftriaxone	4	1	8
Vancomycin	\leq 1	\leq 1	\leq 1
Chloramphenicol	4	2	4

Modification of current treatment guidelines for invasive pneumococcal disease will depend on the regional incidence of penicillin- and cephalosporin-resistant strains. Monitoring of resistance is essential.

30 RESISTANCE TO CIPROFLOXACIN AMONG SELECTED NOSOCOMIAL PATHOGENS IN THE UNITED STATES. CORONADO VG*, GAYNES RP, EDWARDS J and the National Nosocomial Infections Surveillance (NNIS) System, CDC, Atlanta, GA.

Because of concerns that increased use of ciprofloxacin would lead to an increase in resistance to this drug among nosocomial pathogens, especially *Pseudomonas aeruginosa* and *Staphylococcus aureus*, we analyzed 1989-1992 NNIS ciprofloxacin susceptibility results data from 7834 *P. aeruginosa* and 6751 *S. aureus* isolates associated with nosocomial infections. For *S. aureus*, 26% of the isolates were resistant to ciprofloxacin; 27% were either intermediate-susceptible or resistant to the drug; 89% of all isolates were also methicillin resistant (MR). A logistic regression model found that resistance was more common among *S. aureus* isolated from the urinary and respiratory tracts, and isolates that were also MR. After controlling for these factors, the model showed 89% increase in ciprofloxacin resistance from 1989-90 to 1991-92. For *P. aeruginosa*, 5% of the isolates were resistant to ciprofloxacin; 7% were either intermediate-susceptible or resistant to the drug. Resistance to ciprofloxacin increased approximately 50% from 1989-90 to 1991-92. In conclusion, the frequency of resistance to ciprofloxacin is greater among nosocomial *S. aureus* than among *P. aeruginosa*. In addition, this analysis suggests that ciprofloxacin resistance is rapidly increasing among these nosocomial pathogens.

31 Human Immunodeficiency Virus (HIV), Hepatitis B Virus, (HBV), and Hepatitis C Virus (HCV) Serosurvey Among Hospital-Based Surgeons. *ADELISA L. PANLILIO, MARY E. CHAMBERLAND CRAIG N. SHAPIRO, PAMELA U. SRIVASTAVA, DAVID M. BELL, and THE SEROSURVEY STUDY GROUP, CDC, Atlanta, GA.

During Jan-Jun, 1992, we conducted a voluntary, anonymous, seroprevalence survey of HIV, HBV, and HCV infection among hospital-based surgeons (including obstetricians and gynecologists) in moderate-high HIV/AIDS incidence areas. Of 2,887 eligible surgeons, 770 (27%) participated. The participants reported practicing "ma." of 7.6 years since 1978, and, in the past year, performing a mean of 174 operating room procedures and sustaining . mean of 3 percutaneous injuries. On. (0.14%) of 740 surgeons not reporting nonoccupational HIV risk factors was HIV seropositive (upper limit 95% CI=0.64%). No". of 20 surgeons reporting nonoccupational HIV risk factors were HIV positive (upper limit 95% CI- 13.9%). None of 10 participants not responding to question on nonoccupational HIV risk factors were HIV positive. On. hundred "inst.." (15%) surgeons had . pattern of HBV serologic markers indicating past HBV infection: three (0.4%) had chronic HBV infection; all 3 were HBeAg-negative. Among participants, 520 (68%) reported receiving ≥ 3 doses of hepatitis B vaccine; of these, 77% had anti-HBs levels > 9.9 sample ratio units. However, 113 (15%) surgeons had received < 3 doses of hepatitis B vaccine and were susceptible to HBV infection. Seven surgeons (0.9%) were positive for anti-HCV. The serosurvey results, though not necessarily generalizable, do not indicate a high rate of previously undetected HIV infection among these surgeons . who trained and/or practiced in moderate-high HIV/AIDS incidence areas. While Hepatitis B vaccine us. among these surgeons was high, . significant percentage still need to be vaccinated.

32 HIV-infected Health Care Workers (HCWs): Lookback Investigation Update. * L. ROBERT M. CHAMBERLAND, R. MARCUS, B. GOOCH, H. JAFFE, D. MARIANOS, J. CLEVELAND, D. BELL, CDC, Atlanta, GA.

Transmission of HIV from a Florida dentist to 5 of 1100 Patients tested has been documented. To assess the risk of HIV transmission from infected HCWs to Patients, we aggregated data from retrospective investigations of HIV-infected HCWs. Excluding the Florida dental practice, as of December 31, 1992, data were available for 19,036 Patients treated by 57 HIV-positive HCWs (29 dentists, 13 surgeons/obstetricians, 11 physicians, and 4 others). Of these 57 HCWs, 20 were reported to have had AIDS. No seropositive persons were reported among 11,544 patients of 46 HCWs; 92 HIV-infected persons were identified among 7492 persons of the remaining 11 HCWs (5 surgeon/obstetricians and 6 dentists). Of the 92 seropositive patients, 59 had established risk factors: 7 were infected before receiving care from the HCW; 3 were from the practice of an HIV-infected surgeon and Preliminary information from the ongoing investigation suggests that all had risk factors: many of the remaining 23 Patients had other potential opportunities for exposure to HIV (e.g., exchange of sex for drugs). HIV genetic sequencing analysis was performed for 27 Patients of 3 HCWs; the viruses of the patients and the infected HCWs were found to be unrelated. In conclusion, HIV transmission from HCW-to-patient has been documented in only one practice. Available data continue to indicate that the risk of HIV transmission from an infected HCW to a patient during an invasive procedure is very small.

33 Multivariate Analysis of Needlestick/Sharps Injuries (SIs) - 10 New York State (NYS) Hospitals, 1991. M.H. MENDELSON*, L. SHORT, J. GODBOLD, C. SCHECHTER, X. WU, B.R. MEYERS, S.Z. HIRSCHMAN, L. CHIARELLO. Mt. Sinai School of Medicine, NY, NY and the NYS Department of Health.

In order to target priorities for injury reducing devices and strategies, an analysis of 1095 reported SIs from 10 NYS hospitals in 1991 was conducted. 58.7% SIs involved RNs, 16.4% MDs, 5.4% housekeeping/maintenance, 3.5% laboratory workers. Hollow bore needles (N) accounted for 75.4% (N/syringe 32%, N/IV tubing (IVT) 15%, butterfly N 8.5%; unattached N 5.3%, vacutainer N 4.5%. IV stylet 3.9%); sutures 7.1%, lancets 5.0%, scalpel blades 4.8% and glass 2.4%. Associated procedures included: IV delivery related (IVDR) 18.3%, phlebotomy (PHL) 11.7%, IM/SQ/ID injection 11.4%, finger/heelstick 5.7%, IV insertion 5.3%. Distribution of PHL SIs by sharp type: butterfly N 42.5%, vacutainer N 30%, N/syringe 25.8%, 40.2% SIs occurred during the procedure. 41% after use (5.8% recapping) and 17% during/after disposal. Log-linear analysis showed the distribution of sharp types for MDs (55% hypodermic (hypo) N, 25.8% butterfly NI to differ from that for RNs (45% hypo N, 23% N/IVT) (p < .01). IVDR SIs occurred less frequently in hospitals with vs. without safer systems: 1.47% vs. 12.53% (hep lock); 4.46% vs. 8.04% (IVPB) (p < .05). Devices with passive safety mechanisms should reduce SIs by 48-67%, and active mechanisms by 17-28%. A significant impact on worker safety and prevention of transmission of blood-borne pathogens should follow.

34 Influenza Vaccination of Internal Medicine Housestaff. DANIEL A. NAFZIGER* AND LOREEN A. HERWALDT. Univ. of Iowa, Col. of Med. and the VAMC, Iowa City, IA.

We assessed compliance with influenza vaccination among Intern. Medicine house officers at the University of Iowa. After hospital-wide, publicized vaccination program, 78 of 108 residents completed . one pegs survey. Forty (51%) residents were vaccinated. Vaccination status was not associated with age, Bender or year of residency. Of the vaccinated residents, 98% received the vaccine because of their status as health care workers. Reasons for not receiving vaccination included: 8% concern regarding side effects, 13% dislike shots, 16% doubts about vaccine efficacy, 24% "simply forgot", and 42% "no time to get the vaccine". Similarly, 21% knew they needed vaccination, but did not remember during time when the vaccine was offered. Forty percent of the unvaccinated group reported . willingness to be vaccinated if the vaccine had been available to them on the floor on which they worked. Knowledge of the indications for vaccination was good. Housestaff in general medicine clinics staffed by at least one Infectious Disease (ID) attending physician were more likely to be vaccinated than those staffed by faculty fro., other disciplines (OR-2.9, 95% CI 1.1-7.4). These findings suggest that vaccine carts or other methods of improving vaccine availability may be important in increasing vaccination rates of housestaff. Furthermore, contact with ID physician may improve vaccine compliance.

35 Is Measles Mass Immunization of Health Care Workers Cost Effective? K. HUANG*, A. DEFOREST, A. BRADLEY, M. SPENCE. Hahnemann University Hospital, and St. Christopher's Hospital for Children, Philadelphia, PA.

We determined the seroprevalence status of measles antibodies in 117 health care providers. All subjects were given the monovalent measles vaccine (ATTENUVAX, MSD). Measles antibody levels, as determined by enzyme-linked immunosorbent assay (EIA) and immunofluorescent assay (FA) were performed on all pre-vaccine and 4-6 weeks post-vaccine ser.. There were 2/15 (13%) males and 7/102 (6.9%) females who were seronegative before receiving the vaccine (p<.05). Eight of the 9 (89%) were born in or after 1957 (p<.05). OE the 117 subjects, only these 9 would have required immunization. The total expenditure for vaccinations was \$1053.00 (\$9.00 per person) while testing for antibodies cost \$409.50 (\$3.50 per sample). Comparing these expenses, we conclude that screening for antibodies would have been more cost effective than mass immunization in our hospital employee population.

	BORN BEFORE 1957	+PRE-VAC AB	-PRE-VAC AB	+POST-VAC AB	-POST-VAC AB
MALES	5	5	0	5	0
FEMALES	38	37	1	38	0
	BORN IN OR AFTER 1957	+PRE-VAC AB	-PRE-VAC AB	+POST-VAC AB	-POST-VAC AB
MALES	10	8	2	10	0
FEMALES	64	58	6	64	0

36 Scabies Epidemic: Price and Prejudice. JACYR PASTERNAK, ROSANA REICHTMANN, ANTONIO P.P. GAMME, EDWAL RODRIGUES, FERMINA B.M. SILVA, MARIA de LURDES HIRATA, SUELY CIOSAK. Hospital da Beneficencia Portuguesa, Sao Paulo, Brazil.

An 82 year old estonian man was admitted in our Emergency Room at Hospital da Beneficencia Portuguesa in Sao Paulo; it's a general 1300 bed hospital. He had cardiac arrthmia and crusted skin lesions all over his body; Norwegian scabies was one possible diagnosis suspected by the infection control nurse and she put the patient in an isolated private room and ordered his clothes and bedclothes to be bagged separately. Skin biopsy showed an amazing number of mites: in a long biopsy, 8 mites were counted and we calculated mites number 128,000 in his body. By a mistake his clothes and bedclothes were mingled in the laundry, and 4 days later the epidemic begun in the laundry. In 2 days 65 laundry workers were diagnosed with scabies. All laundry workers were treated, with or without signs of scabies in the same day and the epidemic stopped in that area. Unhappily 2 days later the first of scabies were seen in nursing personnel, first on the persons that gave nursing care to this patient, and 5 days later in many health care workers (HCW) that never had any contact with the patient, such as laboratory workers and clerks. The infection control comitee investigated the episode, and discovered that hospital has coinclave lockers, each locker being used by 5 or more HCW and they have to change clothes and put them in all the lockers before beginning work. The room was closed for 4 days, all HCW of the hospital, excepting medical staff were treated at the same day and the epidemic stopped. 196 HCW were contaminated. The hospital spent US\$ 38,333 in medication. Average wages for HCW are low in Brazil: they average 258 US\$ monthly. Each HCW with scabies got 3 days off so wage loss to the hospital was US\$625. Because of those low wages almost every HCW in nursing and many clerks work in other medical centers. The scabies epidemic became fastly known in the city, and many of our HCW received summons in their other place of work to be examined, they were told to treat prophylactically for scabies and they were even discriminated against.

The hospital did not stop admissions, surgeries or any procedures. No secondary cases of scabies occurred among patients. Some cases of scabies were noted in newly admitted patients, which is not unusual in Sao Paulo where common scabies is frequent. Total price for the hospital was US 44,858.

<p>51 Epidemiologic Review Of Hepatitis B (HBV), Hepatitis C (HCV), Human Immunodeficiency Virus (HIV), & Leishmaniasis (LSH) in Dept. of Veterans Affairs (DVA) Facilities. *G. ROSELLE, M. PETERSON, L. DANKO. VAMC, Cinti. Univ Of Cinti Col of Med, Cinti, OH, & VA Central Office, Wash, DC.</p> <p>Four bloodborne (BBP) pathogens (HBV, HCV, HIV, LSH) are currently of special interest concerning transmission among hospital pts., between pts. & health care workers, & to the public at large. Survey data were obtained from 167 VA facilities nationwide for a 12-month period. DVA is the largest health care system in the U.S., with approx. 93950 beds & an extensive outpt. network. Over 12 months there were 680 acute HBV cases with a tot. of 3083 pts. being HBV surface antigen pos. For the same period, 6613 pts. tested pos. for HCV. Four cases of LSH, all related to Oper. Desert Shield/Storm, also were reported. In addition, 1200 persons tested pos. for HIV over 12 months (16,000 total HIV+ persons seen). These data only represent those tested for any reason and therefore can be expected to underestimate the total group. While the geographical distribution of BBP varies, all states are represented. Therefore, we conclude that BBP should remain a national issue based on the wide distribution of possibly infectious persons in the health care setting.</p>	<p>52 Hepatitis B (HB) infection and sharps injury in laundry workers. *LUDWIG A. LETTAL, CONNIE STEED, and FRANK SEXTON, Greenville Hospital System, Greenville, SC. Hospital laundry workers are at risk of injury and infection when contaminated sharp objects are hidden in dirty laundry. We investigated the prevalence of HB and occurrence of sharps injury among 49 laundry workers at our 1,200 bed hospital system and did a mail survey of similar problems at other hospital laundries in 1990. In late 1992 we did a follow-up (post-OSHA) mail survey of hospital laundries. Of our 49 laundry workers, 852 were black and 654 were female. Eleven of 46 (24%) tested were positive for HB core antibody and 5 were HBsAg positive. None had definable non-occupational risk factors for HB. History of sharp object injury increased with years of laundry work but no correlation was found between HB infection and years of laundry work. The 1990 survey of 21 hospital laundries in 14 states (servicing a median of 356 hospital beds) found a monthly average of 56 sharps in dirty laundry (range 0.5-400) and a yearly average of 3 sharps injuries (range 0 to 15). Preliminary results of the post-OSHA laundry survey show improvement in all parameters but confirm persistent problems. The high HB seroprevalence in our laundry workers was more likely related to demographic factors than occupational risk. However, the continuing occurrence of sharps and other inappropriate objects in dirty laundry supports the use of HB vaccine and indicates an ongoing need for educational efforts and follow-up monitoring.</p>
<p>53 Exposure to Blood and Body Fluids (BBF) Among Healthcare Workers (HCW) in the Universal Precautions (UP) Era. B.J. FAHEY*, E. HALKER, D.E. KOZIOL, J.M.SCHMITT, and D.K.HENDERSON. N.I.H., Bethesda, MD.</p> <p>Objective: To evaluate the frequency of exposures to BBF among HCW five years after implementation of UP. Introduction: Our 550-bed tertiary referral hospital introduced UP in 1987. HCW previously completed confidential surveys to estimate frequencies of exposures to BBF during the year prior to UP implementation. Methods: HCW completed a voluntary confidential survey estimating numbers of exposures to BBF during 12-months from 7/1/91 through 6/30/92. Data collected included: job duties; UP training status; numbers of percutaneous (PE), mucous membrane (MM), and cutaneous exposures (CE) to BBF; and numbers of PE and MM formally reported to the Occupational Medical Service (OMS). Results: 1,167 (50.2%) of 2,325 HCW returned surveys; some, but not all, participating HCW had completed prior surveys. Respondents were: physicians (508 [43.5%]), nurses (496 [42.5%]), technicians/lab workers (138 [11.8%]), and miscellaneous (25 [2.1%]). 1,022 (87.6%) of 1,167 reported duties which included contact with human BBF. Of the 1,022, 985 (96.4%) reported completion of UP training. Prior to UP, HCW self-reported a mean annual CE rate of 35.8 (blood) and 77.8 (BBF). Five years after UP implementation, mean annual CE to BBF were: 16.6 (blood) and 35.9 (BBF). 76 HCW reported 104 PE; 52 reported 184 MM; of these, 67 PE (64%) and 69 MM (38%) were reported to OMS. Conclusions: Following UP implementation, mean CE declined significantly. PE and MM are not always formally reported, although, compared to published studies, PE reporting appears improved. Strategies must be developed to reduce exposures further and to encourage formal reporting of PE and MM.</p>	<p>54 Splashes and Needle Sticks in Occupational Exposure to Body Fluids: A Sixteen Month Experience at Two Health Care Facilities. NDIMBIE, O.K.*, MCNAMEE, J., REPOLOGE, N, MADEYA, G., WINKELSTEIN, A., Central Blood Bank and the University of Pittsburgh, Pittsburgh, PA</p> <p>OSHA standards on bloodborne pathogens were published in the Federal Register on 12/5/91. These address exposure determinations, universal precautions, engineering and work practice controls, hepatitis B prophylaxis, training and education and record keeping. In order to fulfil these requirements and to provide medical support, an Accidental Exposure Program has been offered to health care workers (HCW) since 1/91. As of May 1992, 159 persons had been evaluated; these included 51 blood bank (BB) and 108 hospital for women (HW) personnel.</p> <p>In this series, needle stick injuries, splashes, cuts, and punctures constituted 60%, 18%, 9% and 3% of the exposures, respectively. The type of exposure was not documented in 18 cases (11%). 71% of the injuries involved either the fingers or the hands. Ocular exposure occurred in 8%, oral in 3% and nasal mucosa in 1%. In addition to nurses, medical assistants (MA), laboratory technologists (LT) and physicians, supply, maintenance, custodial and clerical personnel also incurred accidental exposures.</p> <p>Detailed analysis of BB data by job title revealed that 75% of the reports in nurses (6) and MA (21) involved needles. By contrast, LT (22) were most susceptible to splashes (45%) and cuts (32%). These differences were statistically significant ($p \leq 0.05$).</p> <p>Many of these exposures could have been prevented by strict adherence to safeguards promulgated by the OSHA standards. The documentation of the importance of splashes in the laboratory should lead to decreased resistance to the use of barrier protection. Similarly, improved engineering and work practice controls can reduce the risk of needle stick injuries to personnel.</p>
<p>55 Occupational exposures to blood and other body fluids among medical students. *KATHLEEN TURNER-HUBBARD RN, NP, JANE WICKMAN RN, NP, ROBERT HARRISON, MD. University of California, San Francisco, CA.</p> <p>Purpose: This study was undertaken to evaluate the type, frequency, route, and exposure circumstances that present a risk of bloodborne pathogen infection among medical students. Methods: A retrospective review of the epidemiologic characteristics of occupational exposures reported to the needlestick hotline exposure program among UCSF medical students between 1989-1992 was conducted. Results: A total of 46 exposures were reported: 74% needlesticks, 9% injuries caused by other sharps; 17% mucosal splashes; and 0% cutaneous exposures. 24% exposures involved blood, 70% bloody body fluids, and 1% non-bloody fluids. The source was known to have HIV in 13%, HBV in 7%, HCV in 2%. The incidence density of exposure among medical students was 15.3 per 100 person-years; 33% of all students sustained an exposure during their first clinical year. Conclusion: Medical Students are at high risk for occupational exposure to bloodborne pathogens. Pre-clinical training, supervision, and competency certification should be considered before students are allowed to perform patient procedures.</p>	<p>56 Routine HIV Testing of Source Patients Following Significant Healthcare Worker Exposure to Blood or Body Fluids: Experience at a Midwestern Medical Center. F.A. MANIAN, N. DELANEY, St. John's Mercy Medical Center (SJMMC), St. Louis, MO.</p> <p>The CDC recommends routine HIV testing of all source patients (SP's) following significant exposure (E) of healthcare workers (HCW's) to blood or other body fluids. We report our experience with implementation of such policy at SJMMC where, by State Law, counseling prior to HIV testing is required, and where, by hospital regulation, a written informed consent is prerequisite to such testing.</p> <p>From 1990 - August 1992, 774 significant HCW E's occurred at SJMMC with 222 (28.7%) involving SP's who were not HIV tested for the following reasons: SP unknown (28.5%), SP discharged from hospital or ER prior to HCW report of the E to the Employee Health Dept. (28.0%), physician failure to obtain SP's consent for HIV testing (27.1%), E occurring in the outpatient surgery or clinics (6.8%), SP's refusal to consent to testing (4.5%) and miscellaneous reasons (5.1%). Of E's involving known but untested SP's, 19% occurred in the OR, 10.8% in the Lab, 8.9% in the ER and 63% in the OB/GYN ward or clinic. SP discharge prior to HCW reporting of E accounted for 36.7%, 78.6% and 47.5% of E's - for which SP was known but not tested - in the OR, ER, and Lab, respectively. Compared to 1990 and 1991, a significantly higher proportion of SP's in 1992 were not tested due to patient discharge (23.9% vs 41.5%, $p < 0.04$).</p> <p>In conclusion, SP's at our medical center often cannot be HIV tested for various reasons including the difficulty in obtaining consent following discharge. Alternative methods to facilitate such testing are needed.</p>

<p>S7 Bloodborne Pathogens Training: Evaluation of the Effect of Required Training and Documented Informed Refusal. M.M. SCHMID,* M.L. GARVIN, D.A. RASLEY, S.M. BLAKE I. PHILBERT, T. YANK & B.N. DOEBBELING. The University of Iowa, Iowa City, IA</p> <p>Bloodborne pathogens [BBP] training of health care workers [HCW] in universal precaution. [UP] was mandated by law effective in March 1992. We developed and assessed an educational program to train HCW (4,164 of a total 5,588 [75%] at risk) in the use of UP and information about BBP during spring 1992. Employees identified at risk for BBP exposure were requested by letter from the hospital administrator and hospital epidemiologist to participate. Training sessions were offered during each work shift. Didactic training consisted of lecture and videotape explaining UP and BBP and question-and-answer session. (N=146) during 1 hr. periods distributed over five months. Hepatitis B virus [HBV] vaccine was offered on-site at the time of the training during an additional 0.5 hr. period with documented informed consent or refusal required. To sustain the training initiative, an additional 2.5 hr. "Train the Trainer" program was developed for identified clinical teaching specialists (N=106) in each department and clinical area to be responsible for training new employees. Fourteen of the 39 departments had 100% compliance with training. A total of 3,451 of 5,588 (62%) HCWs at risk of HBV received the vaccine. The combination of on-site vaccine delivery, documented informed vaccine refusal and legally mandated BBP training appear to be effective in increasing HBV vaccine acceptance among HCWs previously unvaccinated despite the availability of free vaccine.</p>	<p>S8 Reported Blood and Body Exposures After Implementation of a Program for Reporting Exposures. *DENISE CARDO, M. LUIZA COSTA, FERNANDA PARRERA, SERGIO WEY. Hospital Sao Paulo, Escola Paulista de Medicina, Sao Paulo, Brazil</p> <p>In Brazil, most of the hospitals do not have any program for blood and body fluid exposures. In October 1992, we started a program for health care workers (HCW) to report blood and body fluid (BBF) exposures. It is a 600 bed teaching general Brazilian hospital in São Paulo, with 1 800 nursing personnel, 300 residents and 100 housekeepers. There is no adequate sharp disposal containers in the hospital. The Infection Control team carries a 24 hour beeper, seven days a week. From October 110 December 20, 67 exposures were reported, including 60 sharp injuries and 7 mucous/skin exposures to BBF. 83.3% of sharp injuries were related to contaminated needles. 8.3% to scalpel and 8.3% to other sharp instruments. The etiologies of the sharp injuries were 40.0% during use, 38.3% improper disposal, 15.0% recapping and 6.6% others. The health care workers exposed to BBF were: 37 (55.2%) licensed vocational nurses, 17 (17.9%) residents, 8 (11.9%) housekeepers, 5 (7.4%) registered nurses and 5 (7.4%) hospital service assistants. 52.2% of these HCW were not vaccinated against hepatitis B. Six Patients were anti HIV positive, two patients were HBsAg positive and in 22 exposures the source was unknown. We indicated hepatitis B vaccine for 36 HCW, hepatitis B immune globulin for three HCW and AZT for one. We believe that the number of reported exposures will increase with the continuation of this program. We conclude that the frequency of BBF exposures in Brazilian hospitals is similar or even higher than in the other hospitals, because of lack of protective devices. Programs for reporting and prevention of BBF exposures should be implemented in Brazil.</p>
<p>S9 Impact of a Needleless IV System in a University Hospital. K.GARTNER*, Infection Control Services Pittsburgh, PA.</p> <p>IV related needlestick injuries are a problem in the health care industry. Our hospital evaluated the number of IV related needle exposures over 5 years and the impact of a needleless IV system 6 months after its implementation. IV related injuries dropped from 17 per 6 months prior to the change to 2 per 6 months after the implementation (p (0.04). Other categories of exposure groups also showed a decrease; needle related (p<0.8), other sharps (p<0.8), and trash (p<0.3). The disposal of sharps into needleboxes showed a small increase. Our data suggests that discarded IV sets cause many trash injuries. Overall the data revealed a drop in injuries from 52 per 6 months prior to the change, to 25 per 6 months after the introduction of the needleless system.</p> <p>We show that a needleless IV system can be cost effective even though it is an expensive system to implement. Savings were realized when the cost of an employee needlestick was factored into the cost of the IV system. Our hospital reduced the number of IV medication administration sets from 75,120 per 6 months prior to the change, to 42,528 per 6 months after the change in the IV system. This study shows that a needleless IV system can significantly reduce the number of needle related injuries in a hospital and be cost effective.</p>	<p>S11 A Clinical Trial Of Intradermal (ID) Hepatitis B Virus (HBV) Vaccination. ELIZABETH HENDERSON*, KARAM RAMOTAR, THOMAS LOUIE, Univ. of Calgary, Faculty of Medicine and Calgary General Hospital, Calgary, Alberta, Canada</p> <p>Universal HBV vaccination for health care workers with patient contact was implemented at this 850 bed medical-teaching facility on January 1, 1992. Staff were offered the opportunity to participate in a trial of ID HBV vaccination in which subjects were given 3 options: ID injection with 0.15 ml (3 ug) of Engerix B at 0, 1 and 6 months; intramuscular (IM) vaccination with 1 ml (20 ug) Engerix B at 0, 1 and 6 months; or randomization to ID or IM regime. Between January and August, 762 subjects were enrolled; 464 (60.9%) were vaccinated ID: 298 (39.1%) were vaccinated IN. Baseline blood was drawn and 701 (92.0%) staff were negative for anti-HBs and anti-HBc using the Abbott IMx analyzer (automated solid phase ELISA). Of these, 559 (79.7%) have completed vaccination at this time. Screening for anti-HBs 3 months after 3rd dose of vaccine has been done on 180 subjects (ID:IM:70). Seroconversion rates were 93.6% (103/110) for subjects vaccinated ID and 92.9% (65/70) for those vaccinated IN. Seropositivity rates (>10 IU) were 88.2% (97/110) and 91.4% (64/70) for those vaccinated ID and IM, respectively. Data from 1 year screening will be presented. High dose ID vaccination could be an effective and cost-effective tool for the prevention of HBV infection in a general population.</p>
<p>S12 Acceptance of Hepatitis B Vaccine by Physicians in a Large Suburban Teaching Community Hospital. M.D. BATT*, TERRI RUSSO, Luthern General Hospital (LGH), Park Ridge, IL</p> <p>In August, 1991, a 65-year old LGH Obstetrician, unimmunized against Hepatitis B, developed Fulminant E AG Positive Hepatitis B. Following liver transplantation, he recovered from hepatic coma, but was obliged to discontinue clinical practice. His illness was widely discussed in his department. His case was reported in our Medical Staff Journal, and Hepatitis B vaccine was offered to physicians at a special Medical Grand Rounds with the transplant team and the recovered physician. Although several physicians accepted Hepatitis vaccine through these efforts, to better ascertain the further immunization needs of the medical staff for Hepatitis B vaccine, several Hepatitis questions were inserted in an extensive phone survey that had already been planned by the hospital's Marketing Department, targeting the 664 physician active medical staff. 562 (82%) of the MD's responded to the survey. Data analyzed for the Hepatitis survey showed striking variation by age, departmental affiliation, and employment status. 22% of all the immunizations were reported to have been begun in 1991. Overall immunization status of the staff was 45%. Of the 113 physicians who worked for the hospital (and thus were offered employer paid-for vaccine), 60% said they were immunized. Vaccine status for physicians less than age 40 was 60%; for MD's over age 60, 33%. 78% of surgeons under 40, and 38% of surgeons over 60 were immunized, but 62% of the obstetricians over 60 were immunized representing the response to the index case. Further targeted immunization efforts using this data are planned.</p>	<p>S13 Protective Levels of Hepatitis B Surface Antibody in Previously Vaccinated Health Care Workers</p> <p>NDMIBIE, O.K.* POTTGEN, P., WINKELSTEIN, A., BOWMAN, R. Central Blood Bank, University of Pittsburgh Medical Center, Med-Chek Laboratories, Pittsburgh, PA.</p> <p>Vaccine prophylaxis for hepatitis B has been available since 1981. Employers are mandated by the Occupational Safety and Health Administration to offer the vaccination at no cost to employees who are exposed to bloodborne pathogens.</p> <p>However the effectiveness of hepatitis B vaccines as well as the status of long-term immunity remain topics of debate. In an effort to determine immune status, we analyzed sera from 112 previously vaccinated and 170 unvaccinated medical laboratory, dental office, and mortuary and ambulance services workers in Western Pennsylvania. The vaccinated persons were tested for immunity to hepatitis B by Abbott Laboratories' (North Chicago, IL) AUSAB^R quantitative panel; the test gives a quantitative assessment of antibodies to hepatitis B surface antigen. A level of 10 mIU/ml indicates a minimum degree of immune protection. Of note, 25% (28) of the vaccinated cohort had antibody levels less than 10 mIU/ml suggesting that this group did not have protective immunity. An additional 35% had titers between 10 and 100 mIU/ml; and the remainder had level greater than 100 mIU/ml.</p> <p>Among the nonimmunized health care workers, three were HBsAb and HBeAb positive (1.7%), and one was HBeAb, and HBsAg positive (0.6%); the prevalence of seropositivity is similar to that in blood donors.</p> <p>CONCLUSION: A high percentage of individuals vaccinated for hepatitis B have suboptimal levels of HBsAb. Among them are persons who never responded to the vaccine and those whose antibody titers has dropped below the cutoff. The former may be more susceptible to infection than the latter. Routine post-vaccination antibody screening is recommended to identify candidates for boosters.</p>

<p>S14 Influenza Vaccination of Health Care Workers (HCW). K.M. ROCHE, B.J. FAHEY*, M.E. WILLY, D.E. KOZIOL, J.M. FEDIO, M. BRENNER, J.M. SCHMITT and D.K. HENDERSON, N.I.H., Bethesda, MD.</p> <p>Introduction: The US Public Health Service recommends that HCW receive influenza vaccine annually. We initiated a campus-wide influenza vaccine campaign in 1985 and continue to encourage employees who have patient contact to receive immunization annually. Objective: To identify motivating factors leading HCW to obtain influenza vaccination.</p> <p>Methods: Free immunization was offered to NM employees in our Occupational Medical Service clinic. We asked HCW presenting for immunization to complete a brief, voluntary, anonymous questionnaire: 1) to collect demographic data, 2) to identify successful components of the vaccine program, and 3) to identify strategies to encourage more HCW to participate. Results: From 1985 to 1992, doses administered to HCW rose from 219 to 3,205. As of 12/18/92, 3,162 doses have been administered in the 1992-93 program; 2,994/3,162 (95%) returned completed questionnaires. 1,804 (61%) are female; 1,246 (42%) work in our hospital; 851 (29%) provide direct patient care; 292 (10%) are physicians; and 250 (8%) are nurses. 27% reported first time vaccination, 60% had been vaccinated 2-5 times previously. The primary motivating factors for vaccination were: 1) to avoid influenza illness (88%) and 2) to prevent nosocomial and/or home transmission of infection (54%). HCW most commonly learned about vaccine availability through a campus publication (68%) or from a co-worker (21%). Conclusions: Substantial progress has been made in immunizing our HCW; however, vaccine acceptance among HCW who provide direct patient care is surprisingly low. Further educational efforts should focus on patient-care providers.</p>	<p>S15 Occupational Risk of Infection with <i>Mycobacterium tuberculosis</i>. STEPHANIE ZAZA, H. BLUMBERG, C. BECK-SAGUE, C. WOODLEY, C. PARRISH, M. PINEDA, J. CRAWFORD, J. MCGOWAN, W. JARVIS. Centers for Disease Control and Prevention and Grady Memorial Hospital.</p> <p>Healthcare worker (HCW)-to-HCW transmission has not been documented in previous nosocomial tuberculosis (TB) outbreaks but has been considered a theoretical risk. We investigated an outbreak of active TB and tuberculin skin test (TST) conversions among HCWs at Hospital H. All patient* (PTs) with a <i>M. tuberculosis</i> isolate hospitalized on the two wards during January 1, 1991-March 31, 1992, and all HCWs working ≥ 1 shift on the two wards during this period were included in our studies. Rates of TST conversion were calculated and compared among HCWs working shifts with colleagues with active TB and with PTs with active TB. Restriction fragment length polymorphism (RFLP) was used to compare TB genomes. TST conversions occurred in 43/106 (41%) HCWs, including 8 HCWs who developed active TB. HCWs exposed for >1 shift to HCWs or PTs with active TB were more likely to have TST-conversion than were HCWs who were not exposed (HCW exposure: 33/55 vs 10/51, relative risk [RR]=3.1, $p<0.001$; PT exposure: 41/84 vs 2/22, RR=5.4, $p<0.001$). Delays of ≤ 2 months in diagnosis, treatment and work restriction of HCWs with active TB were identified. PT and HCW isolates from one putative chain of transmission were identical by RFLP. We conclude that HCW-to-HCW TB transmission, facilitated by delayed identification and treatment of HCWs with symptomatic TB, and PT-to-HCW TB transmission occurred during this outbreak. Infection control and employee health programs should emphasize the importance of prompt evaluation and treatment of all HCWs with symptoms compatible with TB.</p>
<p>S16 METHICILLIN-RESISTANT <i>Staphylococcus aureus</i> (MRSA) NOSOCOMIAL INFECTIONS IN BARCELONA (SPAIN). *ANTONI TRILLA, FRANCESC MARCO, JOSEP MENSA, ANDREU PRAT, MONTSE SALLES, ELADIO SORIANO and MARIA TERESA JIMENEZ DE AMTA. Univ. of Barcelona Hospital Clinic, Barcelona (Spain)</p> <p>Although MRSA infections are a well known problem in many countries around the world, they have seldom been reported in Spain before 1989 (prevalence of MRSA: 1.5%). Since then many Spanish hospitals started suffering nosocomial MRSA outbreaks (current prevalence of MRSA: 11%).</p> <p>In March 1992, we conducted a questionnaire survey that was mailed or faxed to all public network hospitals (n:40) located in Barcelona and surrounding area (population: 4,000,000). All Barcelona large hospitals (>500 bed, n:9) answered the survey, as did 15 non-large hospitals (<500 bed, n:31). A second random sample survey of 30% of the non-respondent hospitals produces results very similar to the reported by the respondent ones. All nine large hospitals (average size: 824-bed, average admissions/year: 22900) reported having outbreaks of MRSA nosocomial infections. The average new MRSA cases per month was 8.0 ± 5.9. Among the 15 non-large hospitals (average size: 149-beds, average admissions/year: 4200) only four reported cases of MRSA infections (average new cases/month: 1).</p> <p>The main infection control procedures used were: active search for carrier status (100%), isolation precautions for infected patients (100%), special isolation wards (66%), decolonization of carriers among HCW (88%, using mupirocin in 66% of cases), and labeling of the "MRSA condition" in the discharge report (100%). MRSA infections with multiply-resistant epidemic strains are nowadays an important problem in Barcelona (prevalence 19%). The infection control procedures currently recommended for MRSA are widely accepted and followed. However, they seem to be only partially successful once applied.</p>	<p>s17 Acquisition Over Time of Methicillin-Resistant <i>Staphylococcus aureus</i> (MRSA) on Two Wards. Endemic MRSA. JOSEPH R. THURN*, CLAUDINE E. FASCHING, MARY D. WEILER, LEANN C. ELLINGSON, STUART JOHNSON, KEITH E. WILLARD and DALE N. GERDING. VA Medical Center and University of Minnesota Medical School, Minneapolis, MN.</p> <p>MRSA has become endemic in many health care facilities and is an increasing problem in long-term care (LTC). To better understand the epidemiology of MRSA in LTC, a 6-month surveillance study using weekly cultures and whole cell (genomic) DNA restriction endonuclease analysis (REA) was performed on 2 adjacent LTC wards at the Minneapolis VA Medical Center. MRSA was acquired by 21 patients on the 2 wards after a mean of 6.3 weeks (range 1-39). Although it appeared that the 10 acquisitions on ward F occurred earlier after admission than the 11 acquisitions on ward E [mean 3.9 wks, range (2-5) vs. mean 8.5 weeks (range 1-39), the difference was not significant ($p = 0.4$, wilcoxon rank sum). By REA typing 2 major groups of MRSA were acquired. Similar to the acquisition for wards, group 1 isolates appeared to be more acquired earlier after admission than group 2 isolates (mean 3.8 weeks, range (1-9) vs. mean 6.6 weeks, range (2-39)), but the difference was not significant ($p > .10$, wilcoxon rank sum). While 21/47 (45%) of initially positive patients had REA group 2 isolates, 16/21 (76%) of the acquisitions were of group 2. Conclusions: Acquisition of MRSA occurred soon after transfer to LTC with endemic MRSA. REA typing may offer additional information for studying the epidemiology of MRSA and may be particularly useful for following the epidemiology of MRSA in areas where it is endemic.</p>
<p>S18 Elimination of Methicillin Resistant <i>Staphylococcus aureus</i> (MRSA) from a neonatal intensive care unit by handwashing with Triclosan. JOAN WEBSTER, *JOAN L. FAOAGALI, DAVID CARTWRIGHT. Royal Women's and Royal Brisbane Hospital's Department of Infection Control, Microbiology and Intensive Care, Brisbane, Queensland, Australia.</p> <p>Evaluating hand-wash products in terms of user acceptability and effectiveness against methicillin-resistant <i>Staphylococcus aureus</i> (MRSA) has been part of a long term strategy to eliminate endemic MRSA from the neonatal intensive care unit at the Royal Women's Hospital (Brisbane). Following the introduction of a new hand-wash disinfectant (triclosan 1% w/v) new cases of MRSA colonization were monitored for a 12 month period. In addition, the use of antibiotics, the incidence of multiply resistant gram negative cultures and neonatal infections were noted. No changes were made to any procedures or protocols during the period of the trial. Handwashing with triclosan resulted in the elimination of MRSA colonization within 7 months of introduction and in the subsequent 9 months period no new MRSA isolates have been reported. Reduction in the use of vancomycin has resulted in a cost saving of approximately \$17,000. The total number of gram negative isolates has not increased although <i>Pseudomonas aeruginosa</i> is now reported more often. Compared with the previous 12 months, fewer antibiotics were prescribed ($p = < 0.001$) and the nosocomial infection rate was significantly lower ($p = < 0.004$).</p>	<p>s19 Methicillin-resistant <i>Staphylococcus aureus</i> Decolonization Using Minocycline, Rifampin and Mupirocin. ALLAN M. SALZBERG, *PHYLLIS A. KEPHART, KATHLEEN L. ROMAN, MARK S. FEULNER, ERIC CARVER, VA Medical Center, Bath, NY</p> <p>Methicillin-resistant staphylococcus aureus is a serious and growing nosocomial pathogen which tends to be persistent once established. Previous attempts at elimination using trimethoprim/sulfamethoxazole and rifampin plus nasal ointments resulted in an 11% carriage rate among our longer term patients with sporadic serious illnesses. There are indications that a combination of minocycline and rifampin have high activity against methicillin-resistant staphylococcus aureus. Our in vitro studies showed only one minocycline resistant strain in the first one hundred organisms tested. This has resulted in a new protocol which includes minocycline, rifampin and mupirocin. Virtually all patients cleared using this regimen and at present there is only a 1.6% carriage rate. This appears to be a very effective regimen and we suggest that it could be used to further the armamentarium currently in use to attempt eradication or decolonization with methicillin resistant staphylococcus aureus.</p>

<p>S20 Minocycline Therapy of Resistant <i>Staphylococcus aureus</i> Infections. S. LEWIS*, and B. LEWIS.</p> <p>Marianjoy Rehabilitation Center, Wheaton, IL.</p> <p>Methicillin resistant <i>Staphylococcus aureus</i> (MRSA) is a nationwide hospital infection problem for which few therapies are available. The spectrum and severity of MRSA infections observed in our 100 bed rehabilitation facility was compatible with enteral therapy, but isolates were resistant to enteral antibiotics. Because minocycline is well absorbed after enteral dosing, can be dosed 12 hourly, is active against MRSA and effective in MRSA infections,, it is a promising antibiotic for MRSA therapy in this population. 98% of our MRSA isolates were susceptible to minocycline, including tetracycline resistant isolates. 57 patients with MRSA infections were treated with minocycline with only 1 adverse reaction. of 19 patients with follow up cultures, MRSA was eradicated from 84% of infection sites. In 7 nasal carriers, minocycline alone failed to eradicate carriage. Enteral minocycline is well tolerated, and effective clinically and bacteriologically in the therapy of MRSA infections. Eradication of MRSA from sites other than urine may require combined therapy with rifampin or mupirocin.</p>	<p>S21 Familial Carriage of Methicillin-Resistant <i>Staphylococcus aureus</i> (MRSA) and Subsequent Infection in a Newborn Sibling. *RICHARD J. HOLLIS, JOAN BARR AND RICHARD WENZEL. Univ. of Iowa College of Medicine, Iowa City, IA</p> <p>During routine surveillance of NICU patients with MRSA, an alert infection control practitioner confirmed the relationship of the newborn in question (C) with an infant sibling (H) who had been admitted to the hospital 7 months previously with an MRSA infection. Nasal cultures were obtained from C's parents, siblings and grandparents. MRSA was found in two more members of the family, the mother (M) and another sibling (N). The strains were typed by antibiogram, plasmid and restriction fragment length polymorphism of genomic DNA (RFLP) and compared to isolates from C and H. H, M, N, and one isolate from C were found to be identical by all techniques. Host isolates from C shared the same RFLP phenotype but had no detectable plasmids. These isolates were homogeneously resistant to methicillin in contrast to the heterogeneous resistance found in all other isolates. The presence of these isolates implies that transmission of this strain occurred at least three times within this family and that one family member was colonized by this strain for at least 7 months. Our findings raise the question of whether eradication of MRSA carriage is important to prevent subsequent colonization in family members and reduce infection risks to newborns.</p>
<p>S22 Molecular Epidemiologic Analysis of Methicillin Resistant <i>Staphylococcus aureus</i> Isolates in a Tertiary Care Center. C.A. GUSTAFERRO*, R.L. THOMPSON, N.K. WENDT, J.R. UHL, D.H. PERSING. Mayo Clinic and Foundation, Rochester, MN.</p> <p>Molecular epidemiologic techniques were utilized to investigate an insidious increase in MRSA isolates in our tertiary referral center and affiliated hospitals over the past 15 months. Strict isolation has successfully prevented spread of this virulent organism over several years. 62 MRSA isolates from 39 medical center patients and 2 employees were collected. The initial 13 isolates were typed utilizing RFLP analysis via pulsed field gel electrophoresis (PFGE) (CHEF-DRIL, Bio-Rad), chemiluminescent ribotyping, and methicillin resistance gene probing by conventional hybridization and polymerase chain reaction. PFGE provided the greatest strain to strain resolution, and was therefore utilized for the remainder of the isolates. PFGE analysis with 5ml distinguished 6 clusters of identical strains, with all others being genetically distinct. Epidemiologic investigation of each cluster revealed that in 3 clusters, good correlation was found: a nasal isolate from a nurse matched 2 patients residing in the same ICU; 2 patients with identical strains and extensive skin disease received care from a common source, and 4 identical strains were isolated from residents of a local nursing home. The other 3 clusters of 2, 3 and 3 isolates each have not shown a common link to date; further investigation is ongoing. In summary, strict isolation was associated with only limited spread of MRSA in our tertiary care center. PFGE was a sensitive method for strain determination and a powerful tool in a comprehensive analysis of a nosocomial outbreak of MRSA.</p>	<p>S23 Diversity of Methicillin-Resistant <i>Staphylococcus aureus</i> (MRSA) Strains from Carriers Using Restriction Endonuclease Analysis (REA). CLAUDINE E. FASCHING, DALE N. GERDING*, KEITH E. WILLARD, STUART JOHNSON, LEANN C. ELLINGTON, MARY D. WEILER and JOSEPH R. THURN. Univ. of MN and the VA Med Ctr., Minneapolis, MN</p> <p>Repetitive MRSA isolates obtained from hospitalized patients during a six month surveillance study were compared using REA of total genomic DNA. Typing was done using both unique REA profiles (types) and closely related REA profiles (groups). MRSA isolates from single body sites and between body sites in the same patient were compared over time. Forty-seven patients with a mean of 13 isolates (range 2-43) were studied. A single type, regardless of body site, was carried by 31/47 (66%) patients and 39/47 (83%) carried a single group. 36/45 (66%) nasal carriers had a single type in their nares and 41/45 (91%) carried a single group. 18/29 (62%) non-intact skin site positive patients carried a single type at these sites, and 22/29 (75%) of these carried a single group. The proportions carrying a single group did not differ between nasal and non-intact skin sites (41/45 vs. 22/29, P > .10). Isolates from both nares and skin sites were found in 27 patients. 25/27 (92%) had the same REA types at a skin sites as was found in their nares, while 9/27 (33%) also had additional types found at a skin sites. In all 27, the skin site REA group was also found in the nares, while 4/27 (15%) had additional groups at a skin sites. Although there is a correlation between MRSA REA types found at the nares and at skin sites, there may be a diversity of strains carried by one patient over time and between sites. Typing using unique REA profiles (types) vs. similar REA profiles (groups) accounts for some variability. However, because patients may harbor multiple strains, particularly at a skin sites, epidemiologic links between patients with MRSA strains may be difficult to establish.</p>
<p>S24 In Vivo Stability of Plasmid-Based Typing for Methicillin-Resistant <i>Staphylococcus aureus</i> (MRSA) CHARLES L. PHELPS*, MAURY E. MULLIGAN and ALAN I. HARTSTEIN, Indiana Univ Med Ctr, Indianapolis, IN, U. of California, Irvine, CA and VAMC, Long Beach, CA.</p> <p>To assess the in vivo stability of plasmid-based typing tests for MRSA, we analyzed 156 isolates from 25 patients. Patients had 2 to 18 isolates over ≥ 30 days and all were typed by restriction enzyme analysis of plasmid DNA (REAP). 82% of sequential same patient isolates had a REAP type identical to that of the preceding isolate. The remaining sequential isolates demonstrated differences by REAP and were typed by restriction enzyme analysis of chromosomal DNA using pulse field gel electrophoresis (PFGE) and immunoblotting (IB). Of the 23 pair comparisons with different REAP types, 7 pairs were also different by PFGE and IB, suggesting true strain differences. The other 16 pairs had identical PFGE or IB types. Analysis of these possibly identical strain pairs suggested plasmid loss (5 pairs), gain (4 pairs), or loss and gain (5 pairs) as an explanation for most REAP differences. The 39 isolates tested by all methods demonstrated the most types by REAP followed by I,,. REAP is thus a discriminatory and reasonably stable typing test for MRSA, but REAP differences among patient isolates may occasionally not reflect true strain differences.</p>	<p>S25 Treatment of Colonization with Methicillin-Resistant <i>S. aureus</i> (MRSA). *KIM M. MAEDER, VIRGINIA J. GINUNAS, HANNA N. CANAWATI, JOHN Z. MONTGOMERIE. Rancho Los Amigos Medical Center, Downey, CA.</p> <p>This study reviewed the use of antibiotics to clear colonization with MRSA. Nose, throat, perineum, urine, wounds and other potentially colonized sites were screened for MRSA. Positive sites were monitored weekly. All sites were culture negative (x 3 wks) before the patients were cleared. Thirty-seven patients that had not spontaneously cleared of the MRSA were treated with combinations of novobiocin or SXT with rifampin and topical antibiotics (bacitracin or mupirocin) to the nares and other colonized sites for 10-14 days. Susceptibility was confirmed before treatment. The body sites colonized were nares (35), throat (28), wounds (16), sputum (15), trach. sites (14), perineum (12) and urine (7). Twenty-two of 37 patients (57%) cleared with combination therapy. only 6 of 17 patients with MRSA colonization of sputum and/or trach. site cleared. The use of antibiotics to clear colonization with MRSA may be warranted in selected patients.</p>

<p>S26 Restriction Endonuclease Analysis (REA) of MRSA Carriage and Acquisition on Two Long-Term Care Hospital Wards. STUART JOHNSON*, CLAUDINE E. FASCHING, DALE N. GERDING, KEITH E. WILLARD, MARY D. WEILER, LEANN C. ELLINGSON, and JOSEPH R. THURN. VA Med Ctr and Univ of MN Med Sch, Minneapolis, MN.</p> <p>In order to study the acquisition and carriage of Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA), a 6-month surveillance was conducted on 2 adjacent long-term care wards where MRSA was endemic. REA typing of MRSA isolates obtained by weekly culture of all patients on the 2 wards revealed 2 major groups of restricted DNA fragment profiles. Each of these groups contained subgroups (REA types) with minor profile differences. Results from the first 2 weeks of cultures revealed different prevalences of the major REA groups between the 2 wards: 19 of the initial 26 (73%) MRSA patient isolates on Ward F were REA group 2 compared with 1 of 9 (11%) isolates on Ward E ($P = .002$). During the 6-month surveillance period, 21 of 190 (11%) initially cultured-negative patients acquired MRSA. Similar numbers of REA group 1 (4) and group 2 (7) acquisitions occurred on Ward E whereas 9 of the 10 (90%) on Ward F were REA group 2 isolates with identical REA types. 4 of the 21 patients who acquired MRSA had roommates with MRSA, but none of the roommates carried identical REA types. 6 of 65 (9%) health care workers carried MRSA in their nares. 2 of the 4 colonized health care workers on ward F carried an REA type identical to that acquired by the patients. REA demonstrated that 2 different groups of MRSA strains were predominant on 2 adjacent chronic care wards and that 1 MRSA strain was almost exclusively acquired on a ward where that strain was endemic.</p>	<p>S27 Prevalence of Methicillin Resistant <i>Staphylococcus aureus</i> (MRSA) in Ontario Long Term Care Facilities (LTCFs). M. McARTHUR, K. O'QUINN, R. JAEGER, D.E. LOW, A.E. SIMOR, *A. McGEER. Princess Margaret/Mount Sinai Hospitals and MDS Laboratories, Toronto.</p> <p>In some areas of the US, residents of LTCFs are an important reservoir for MRSA. In most of these areas, MRSA is well established in acute care facilities and the identified LTCFs are predominantly Veteran's Administration facilities. Because no data are available on the possible contribution of residential LTCFs for the elderly in areas where MRSA is still uncommon in acute care facilities, we conducted a study to determine prevalence of MRSA colonization in residents of Ontario LTCFs (in no Ontario acute care facility does MRSA represent more than 2% of all SA). A 20% sample of residents from 108 randomly selected LTCFs for the elderly (bedsize ≥ 25) were sampled. Resident selection was biased to those who might be at higher risk. Residents included were those who had been recently hospitalized ($n=674$), had open skin lesions ($n=554$), or were confined to bed ($n=969$). Several residents fit more than one criterion. When such residents did not complete a 20% sample, additional residents were randomly selected ($n=451$). Nasal swabs were taken from all residents and wound swabs from those with skin lesions. MRSA was isolated from 12/2709 (0.4%) residents; 9/2632 (0.3%) nasal swabs and 6/533 (1.1%) wound swabs ($p=0.03$). Although all colonized residents had at least one potential risk factor, there were too few isolates for the association to achieve statistical significance ($p=0.11$). MRSA colonization was identified in 8/108 facilities (7.4%, 95% confidence limits 2.5-12.3%). Four facilities had 1 colonized resident and the other 4 had 2 residents colonized. Only one facility had previously recognized the presence of MRSA. Even in areas thought to have low overall prevalence of MRSA, LTCF residents may be an unrecognized significant reservoir. LTCFs in these areas must develop policies and increase staff awareness of the implications of MRSA in their facilities, and acute care facilities may find that this population is an important source of new MRSA isolates.</p>
<p>S28 Epidemiology of Methicillin-Resistant <i>Staphylococci</i> (MRS) in a Dept of Veterans Affairs Nursing Home Care Unit (VANHCU). *BRUCE S. RIBNER, JAMES T. RUDRIK, SUSANNE R. FERRIGNO, MARCIA C. STRANGES, Medical Univ of S.C., DVA Medical Centers, Charleston, S.C. and Asheville, N.C.</p> <p>Residents in a VANHCU were prospectively cultured for colonization with methicillin-resistant coagulase-negative (MRCNS) or coagulase-positive (MRSA) staphylococci. During the one-year period, 67% and 10% of residents acquired colonization with MRCNS and MRSA, respectively, at least once. When present, colonization was found at an average of 2 body sites. Residents colonized with MRCNS, compared to those never so colonized, had a relative risk (RR) of 3.5 of developing a subsequent infection with MRS. Residents colonized with MRSA had a RR of subsequent infection with MRS of 5.0 and a RR of subsequent infection with MRS of 5.5. 632 of patient care employees monitored over the same period had at least one nasal or hand culture positive for MRCNS. Colonization was as likely to be present at the beginning of the work shift as at the end. These employees were negative for MRCNS when cultured after vacations >6 days. Employees not involved in patient care were never culture positive for MRS.</p>	<p>S29 Control of Methicillin-Resistant <i>Staphylococcus aureus</i> (MRSA) in a Long-Term Care Facility (LTCF). A.E. SIMOR*, A. AUGUSTIN, J. NG, S. BETCHEL and M. McARTHUR, Baycrest Centre for Geriatric Care and Mount Sinai Hospital, Univ. of Toronto, Toronto, Canada.</p> <p>In the past 5 years, 1-2 MRSA infections were detected in our LTCF annually. After identification of 2 residents with MRSA in early 1992, we investigated the epidemiology of MRSA among elderly LTCF residents. Nose and skin lesion swabs were obtained from 252 residents and 83 staff. MRSA isolates were typed by phage-typing (PT), restriction endonuclease analysis (REA) and pulsed-field gel electrophoresis (PFGE). Five LTCF residents were found to be infected or colonized with MRSA; all isolates had the same PT, REA and PFGE profiles, which were different from those of epidemiologically unrelated isolates. Four of the residents had been on the same ward during 2 weeks in Jan. 1992. The index case likely acquired MRSA while hospitalized in Oct. 1991. MRSA was not isolated from any staff. Control measures included isolation of infected residents and use of topical mupirocin \pm rifampin and cotrimoxazole. This treatment successfully eradicated MRSA carriage. MRSA was not detected in follow-up cultures from 307 residents 3 and 6 months later. Early detection and aggressive interventions may be effective in limiting the spread of MRSA in LTCFs.</p>
<p>S29.1 Severity of an Epidemic Outbreak of Methicillin-Resistant <i>Staphylococcus aureus</i>. Study of the Bacteremic Episodes. MARGARITA RUBIO, ELISA AGUDO, ANTONIO FUERTES, JOSE ROMERO, *JUAN J. PICAZO. Hospital Universitario San Carlos, Madrid, Spain.</p> <p>The number of MRSA isolates in our hospital, before 1950 was less than 1.5% of the total isolates; at the beginning of this year an increase of this microorganism was observed, reaching the figure of 56.1% in October 1950. During 1951 the number of MRSA isolates oscillated between 41% to 54% and at the end of this year a decrease was detected.</p> <p>Since January 1950 to December 1952, 752 patients had MRSA isolates in clinical samples. The number of <i>Staphylococcus aureus</i> isolated in our hospital increased, and this was directly due to MRSA isolates because the number of methicillin-sensitive <i>Staphylococcus aureus</i> (MSSA) remained in the habitual rates.</p> <p>The control measures for the epidemic outbreak were implemented at the end of the third quarter of 1950. These measures were not useful to eradicate the microorganism but decreased the "umber of serious infections like bacteremia. In 1950, 191 patients had MRSA infection, 35 of them (18.3%) with bacteremia, in 1951 the number of patients was 384 and 36 (19.4%) had bacteremia and in 1952 the number of patients was 217 and 23 of them (10.6%) with bacteremia.</p> <p>During this period (1950-1952) the patients with MRSA bacteremia (94) and a group of patients with MSSA were studied and compared prospectively. The MRSA bacteremias were nosocomial acquired, the mean age of patients with MRSA bacteremia was higher, had more serious underlying diseases and the prognosis of these bacteremias was worse. The MSSA bacteremia was more frequent in drug users.</p>	<p>S30 Altering Antimicrobial Resistance In A Neonatal Intensive Care Unit (NICU) By Changing Antibiotic Use. JILL FOSTER, MARGARET FISHER, DEBORAH BLECKER, JOEL MORTENSEN, St. Christopher's Hospital for Children, Temple University School of Medicine, Philadelphia, PA</p> <p>In 3/92, it became evident that gentamicin (gent) resistant gram negative rods (GRGNR) were emerging in the NICU. Surveillance cultures of the nasopharynx and stool were done; 46% of all patients (pts) had GRGNR. 71% of patients with positive cultures had GRGNR. Standard empiric antibiotic therapy was changed from ampicillin/gent (AG) to ampicillin/amikacin (AA). No other interventions were made. <i>Klebsiella species</i>, <i>Escherichia coli</i>, <i>Pseudomonas aeruginosa</i> (PA) were the predominant organisms. After 6 months of AA, SC revealed a decrease to 22% with GRGNR (28% of those with + cultures) with PA the only GRGNR. One pt, initially with 4 different GRGNR had 3 gent sensitive GNR at 6 months. Empiric therapy was changed back to AG with SC repeated 3 months later. Only 18% of pts had GRGNR. The only pt present in both SC 2 and 3 had <i>K. pneumoniae</i> which was initially sensitive and became resistant (and was the only resistant <i>K. pneumoniae</i> isolate in SC 3). PA was 100% resistant to gent in all 3 screenings but was sensitive to amikacin (as were all other isolates). This demonstrates that changing empiric antibiotic therapy can alter the resistance pattern in a unit. Change after 6 months was cost effective, yet resulted in reduction of the number of GRGNR.</p>

<p>s31 Epidural Opiate Analgesia Contamination with <i>Pseudomonas cepacia</i> (Pc.) LAUREN V. HOBRATSCH*, GREGORY BOND, ANDREW MCDAVID, E. WARNER AHLGREEN. Scott and White Memorial Hospital, Texas A&M Health Science Center, Temple, Texas.</p> <p>We report an outbreak of epidural opiate analgesia fluid (EOAF) contamination with Pc. Preservative free EOAF was batched weekly in pharmacy using aseptic technique, followed by turbidity testing. When EOA was discontinued, the epidural catheter tip and an aliquot of EOAF were cultured. Three months into the EOA program, Pc was isolated in 11 patients receiving EOAF from a single batch.</p> <table border="1"> <thead> <tr> <th>Cultures</th> <th>Positive</th> <th>Negative</th> <th>Not Cultured</th> </tr> </thead> <tbody> <tr> <td>EOAF</td> <td>9</td> <td>0</td> <td>2</td> </tr> <tr> <td>Cath tip</td> <td>4</td> <td>6</td> <td>1</td> </tr> <tr> <td>Both</td> <td>3</td> <td></td> <td></td> </tr> </tbody> </table> <p>Initial turbidity testing of this batch was (-), but repeat testing at 10 days revealed turbidity, as well as growth of Pc in culture. Environmental cultures and cultures of suspect lot numbers of fentanyl and bupivacaine were (-). All patients were notified and evaluated. All 11 patients had fever, but only 2 were febrile to 102°. None have manifested late sequelae since the outbreak 18 months ago. As a result of the outbreak, more rigorous infection control techniques for the preparation of EOAF were instituted. The EOA program was resumed without further event in the subsequent 18 months.</p>	Cultures	Positive	Negative	Not Cultured	EOAF	9	0	2	Cath tip	4	6	1	Both	3			<p>S32 Molecular Typing of <i>Acinetobacter baumannii</i>: A Comparison of DNA Typing Methods. LOUISE M. DEMBRY*, SUSAN DONABEDIAN, ROBERT BROWN, DONALD LEVINE, JOSE VAZQUEZ and MARCUS J. ZERVOS. William Beaumont Hospital, Royal Oak, MI and Wayne State University School of Medicine, Detroit, MI.</p> <p>Nosocomial outbreaks of multi-antibiotic resistant <i>Acinetobacter baumannii</i> are increasingly being recognized. The lack of an adequate typing system for <i>A. baumannii</i> has hindered epidemiologic investigations. It is not known which of available DNA typing methods should be applied to acinetobacter. We compared two DNA typing methods in the evaluation of 35 clinical isolates of multi-antibiotic resistant <i>A. baumannii</i> from different patients collected over a 5 month period from an outbreak at a university hospital. Control strains included 4 <i>A. baumannii</i> from patients that were epidemiologically unrelated. We evaluated plasmid content, plasmid DNA with restriction enzyme analysis (REA) using EcoRI and HindIII and contour clamped homogeneous electric-field electrophoresis (CHEF) of chromosomal DNA digested with SmaI and SfiI. Plasmid analysis showed 2 strain types. 74% of isolates had plasmids; all plasmids were identical but one. CHEF revealed 9 strain types. one strain type was common to 17 patients including 6 isolates that did not contain plasmids. All strains were typeable by CHEF. When strains contained plasmids, REA did not distinguish strains differentiated by CHEF. CHEF is less labor intensive, yields banding patterns that are easily compared and allows the differentiation of strains that do not contain plasmids or have lost their plasmids and therefore, better differentiates strain types than REA plasmid analysis. This study shows CHEF more useful in typing DNA for epidemiologic studies of <i>A. baumannii</i> as compared with plasmid analysis.</p>
Cultures	Positive	Negative	Not Cultured														
EOAF	9	0	2														
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Both	3																
<p>S33 Analysis of <i>Xanthomonas maltophilia</i> Isolates using Contour-Clamped Homogeneous Electric Field Gel Electrophoresis (CHEF) analysis. CAROLYN J. VAN COUWENBERGHE, STUART H. COHEN, U. of California and California State U., Sacramento, CA.</p> <p><i>Xanthomonas maltophilia</i> is an increasing cause of nosocomial infection*. The mode of transmission of this organism is not well known. <i>X. maltophilia</i> was recovered from 47 sites in 42 patients in a 5 month period. The culture sources were: Respiratory (n=30), wound (n=7), urine (n=5), blood (n=3) and others (n=2). Clustering of 8 and 2 patients occurred in 2 ICUs. Surveillance cultures were negative except for the hands of one nurse. We analyzed 17 isolates (16 patient and 1 nurse) using CHEF of chromosomal DNA digested with XbaI (200 volts, 20 hours, 10-60 second ramp) or EcoRI (200 volts 12 hours, 5-35 second ramp). These conditions detected differences between most epidemiologically unrelated strains and similarity between some epidemiologically related strains. However, several strains initially presumed to be related because of proximity of the patients involved were determined to be independent infections by CHEF analysis. We conclude that analysis by CHEF should help elucidate the epidemiologic spread of <i>X. maltophilia</i> in the hospital.</p>	<p>S34 <i>Acinetobacter anitratus</i> (AA) Bacteremia: A Five Year Review. L. KUMAR, G. SCHWARZ, J.L. SILBER*. Thomas Jefferson University, Philadelphia, PA; Cooper Hospital/Robert Wood Johnson Medical School, Camden, NJ.</p> <p>We retrospectively reviewed the demographic features, underlying illnesses and other risk factors, clinical features, antibiotic susceptibility, therapy, and outcome in all patients (pts) with AA isolated from at least one blood culture between Jan 1987 and Mar 1992. Fifty-four pts (29 male, 25 female) were identified during the study period. In 20 cases a 2° source of infection was identified (an intravascular catheter in 7 of these). Forty percent of the bacteremias were polymicrobial. APACHE II score at admission was a 10 in 24/39 adult pts. Pts acquired bacteremia on day 17.1 ± 35.3 of hospitalization and had mean length of stay of 39.2 ± 5.14 days. One-third had suffered major trauma; half had had surgery during hospitalization. Twenty-four (44.4%) had at least one prior nosocomial infection during hospital stay. Thirty of 35 nosocomial cases had received prior antibiotics for a mean of 33.9 antibiotic-days (median 14) prior to developing bacteremia.</p> <p>Twelve pts were in shock at the time of their bacteremia. Six had acute pulmonary infiltrates. Nineteen pts (35.2%) died during hospitalization, though death was attributable to AA bacteremia in only 3 cases. Mortality among nosocomial cases was 48.6% vs. 10.5% for community-acquired cases (RR 4.6, 95% CI 1.2-17.9). Susceptibility rates were ≤70% for all drugs except imipenem (100%), amikacin (85.3%), ceftizoxime (78.9%) and mezlocillin (72.2%).</p> <p>AA is a pathogen of increasing clinical importance. AA bacteremia occurs in seriously ill pts who have had prolonged hospital stay, prior nosocomial infections and antibiotic therapy. Multiply-resistant strains are frequent. Mortality among these pts is high, especially if nosocomial in origin.</p>																
<p>S35 <i>Acinetobacter calcoaceticus</i> (AC) Isolates in Outpatients. *Richard A. Pokreifka, Cameron Cover, R. Michael Massanari, Henry Ford Health System, Detroit, MI.</p> <p>AC has been reported in association with nosocomial infections in chronically ill patients. In a recent survey of all AC isolates in a large regional health care system, we noted that 61/225 (27%) unique isolates during 1991 were obtained from outpatients. This report is a descriptive analysis of clinical conditions associated with the isolation of AC. The Henry Ford Health System has approximately 2 million patient encounters per annum. All microbiology specimens are processed in a central laboratory. The rate of AC isolation was greater during late summer and early fall. Medical records were available for detailed review in 52/61 outpatients. Nineteen (36.5%) of the isolates were obtained from children <14 years. Almost half (42%) of the isolates were obtained from eyes, often mixed with other pathogens. Only 1/19 children was chronically ill. Among 33 adults with AC isolates, 85% were chronically ill. The most frequent site of isolation in adults was skin (33.3%) or urine (30.3%). Although its role in pathogenesis cannot be ascertained from this study, AC is isolated with regularity in otherwise healthy, ambulatory subjects.</p>	<p>S36 Clinical Experience with <i>Achromobacter xylosoxidans</i> at a University Hospital. M.M. SHOCNET* and W.M. GREENE. SUNY - Stony Brook, Stony Brook, N.Y.</p> <p>We retrospectively reviewed the occurrence of <i>A. xylosoxidans</i> at SUNY-Stony Brook from January 1989 to June 1991. A total of 46 patients (pts) with 87 isolates cultured <i>A. xylosoxidans</i> from various sites; 37 were single isolates. Culture sites included sputum, wound, IV catheter tips, and others. We reviewed 41 of 46 charts of whom 16 were thought to have infection (inf) with <i>A. xylosoxidans</i>, all isolated from sputum, and 5 of which were single isolates. Presence of inf was judged on clinical and laboratory criteria. Ten of these 16 pts expired, and in 5 of these, <i>A. xylosoxidans</i> inf occurred within 2 weeks of their demise. In those pts that were considered inf, central venous catheters, Foley catheters, mechanical ventilation and nasogastric tubes were more frequent than in colonized pts. A clustering of pts was noted in the surgical and medical intensive care units and a surgical floor. The prevalence of <i>A. xylosoxidans</i> colonization increased during the study, and there was a decrease in the percentage of isolates sensitive to Tobramycin, Trimethoprim-Sulfamethoxazole and Ciprofloxacin. Five of the 13 pts that developed resistant isolates had received the antibiotic in question prior to the emergence of resistance; and 4 of these 5 had received Ciprofloxacin prior to developing resistance. An additional 6 pts who did not receive the antibiotic in question and developed resistance were part of the pt cluster. In our institution antibiotic resistance of <i>A. xylosoxidans</i> appears to be increasing rapidly. This warrants both special monitoring of its susceptibility, and efforts to reduce its nosocomial transmission.</p>																

<p>S37 Transmission of Gram Negative Bacilli in Intensive Care Units (ICUs). PLOENCHAN CHETCHOTISAKD*, CHARLES L. PHELPS and ALAN I. HARTSTEIN, Indiana Univ Med Ctr, Indianapolis, IN.</p> <p>We assessed the possibility of <i>E. coli</i> (EC), <i>K. pneumoniae</i> (KP), <i>Acloacae</i> (EB) and <i>Ps. aeruginosa</i> (PA) transmission among a prospectively followed 1719 patient cohort in 5 different ICUs of 3 hospitals over a 6 month interval. All cultures were obtained because of suspected infection. Isolates were typed by plasmid profile analysis (EC, KP and EB) and/or chromosomal DNA analysis (all PA, other bacteria without plasmids, other bacteria with a single plasmid, and other bacteria with similar or identical plasmid profiles). 48, 28, 25 and 44 patients had EC, KP, EB and PA, respectively. 64% of these patients were in an ICU for more than 2 days at the time of culture. All EC and KP isolates from patients in the same unit were different types. Only 2 patients in one ICU had EB isolates which were identical. 2 patients in each of 2 ICUs and 4 patients in another ICU had PA isolates of an identical type. The types affecting more than one patient in these 3 ICUs were different. 8 of the 10 patients with identical EB or PA isolates were in the ICU for more than 2 days at the time of culture. We conclude that PA transmission was likely in our ICU patients. EC, KP and EB transmission appeared rare during the same interval and within the same ICUs.</p>	<p>S38 Infectious Diseases and Mortality Among Nursing Home (NH) Residents. C. M. BECK-SAGUE, M. E. VILLARINO, L. M. LATTI, D. GIULIANO, W. R. JARVIS, CDC, Atlanta, GA, Orange County, CA.</p> <p>It has been estimated that 15% of NH residents may acquire an infection during their stay, yet no NH surveillance system exists for infections, or for mortality related to NH-acquired infections. To determine the incidence and types of infections in NH residents and to identify predictors of death among residents with infections, we initiated a surveillance system of infections acquired at 13 long-term care facilities in California from October 1989 through March 1990. We identified 835 infections in 1754 residents (48 per 100 residents). The most common were urinary tract infections (UTIs) (286, 34%), respiratory tract infections (RTIs) (259, 31%), of which 69 (27%) were pneumonias, and skin infections (150, 18%). Antimicrobials were prescribed for 646 (77%) of the episodes of infectious disease. Residents with pneumonia were more likely to die than residents with other infections (4/69 vs 12/766, p=0.04). Altered body temperature (fever, hypothermia, chills) and change in mental status during infections were also associated with an increased risk of a fatal outcome (10/260 vs 6/575, p=0.01 and 7/127 vs 9/708, p=0.004, respectively). These data suggest that UTIs, RTIs and skin infections were the most common infections, and that pneumonia, mental status changes and temperature alterations associated with infections were associated with increased risk of death. The frequency of infections in NHs, and the high risk of associated mortality underscores the need for surveillance, epidemiologic study and intervention evaluation in NHs.</p>
<p>S39 Epidemiology of Resistant Aerobic Gram-negative Bacilli (RGNB) in a</p> <p>Univ of S.C. and DVA Medical Centers, Charleston, S.C. and Asheville, N.C.</p> <p>To establish the importance of colonization with RGNB, all residents in a VANHCU were prospectively cultured for the acquisition of RGNB over a one-year period. Cultures of nose, throat, urine, rectum, skin defects, and any foreign bodies (feeding tubes, etc.) were obtained on each resident. 107 residents were entered into the study. At some point 42 of the 107 residents became colonized with RGNB. Average duration of colonization was 77 days (range of 6 to 350 days). 6 residents developed infections with RGNB after becoming colonized. In 6 others infection with RGNB preceded colonization or was detected at the same time as initial colonization. Colonized and non-colonized residents did not differ in average age, mortality, or underlying illnesses. However, colonized residents were 2.5 times more likely to have a clinical infection requiring antibiotic therapy. Hand cultures obtained from personnel caring for these patients were negative for RGNB.</p>	<p>S40 Bladder Management and urinary tract infections.</p> <p>D.J. STICKLER*, J. ZIMAKOFF, B. PONTOPPIDAN, S. OLESEN LARSEN, Statens Serum Institut, National Center for Hospital Hygiene, Copenhagen, Denmark and Univ. of Wales, School of Pure and Applied Biology, Cardiff, UK</p> <p>The objectives of this study were a) to establish the prevalence of symptomatic urinary tract infection (UTI) in patients in Danish hospitals, nursing homes and home care and b) to examine the relationship between these infections and bladder management. RESULTS: Data were collected on 1581 hospital patients, 1341 nursing home residents and 743 patients receiving home care. The prevalences of indwelling catheters in the three groups were 13.2%, 4.9% and 3.9% respectively. The equivalent figures for condom drainage systems were 1.5%, 0.8% and 1.2% and for napkins 10.1%, 52.2% and 34.1%. The prevalences of symptomatic UTI (Center for Disease Control (CDC), Atlanta 1972 criteria) in the three types of institution were 3.2%, 2.7% and 1.1% (94 cases). Comparatively, a significantly smaller number of symptomatic UTI met the CDC 1988 criteria (69) and some 65 cases met both definitions. Overall, 13.2% of catheterized patients and 8.1% of the patients undergoing external drainage had UTI (CDC 1972). Logistic regression analysis of risk factors associated with urinary tract infection showed that when corrected for patient related confounders such as female sex, age >60y, incontinence and immobility, the use of a condom was the factor most significantly related to infection, followed by an indwelling catheter and a napkin. CONCLUSION: There is a need to identify host, pathogen and management of factors that increase the risk of infection if effective bladder care protocols are to be produced for patients with condoms or napkins.</p>
<p>s41 Surveillance Definitions as a Determinant of Infection Rate. S. LEWIS*, and B. LEWIS. Marianjoy Rehabilitation Center, Wheaton, IL.</p> <p>Surveillance definitions influence nosocomial infection rates. Compared to acute (ACF) and extended care facilities (ECF), the incidence of nosocomial bacteriuria (NB) reported in rehabilitation facilities (RF) is high based on culture. Neurological and cognitive deficits in RF inpatients impair clinical classification, and may result in under reporting of symptomatic bacteriuria (SNB) but over reporting of asymptomatic bacteriuria (ANB). Definitions for ACF's distinguish SNB from ANB, and for ECF's report only SNB's. We compared the NB rate in a 100 bed RF using three surveillance definitions. We detected 131 NB's in 1044 admissions for a NB rate of 12.6%. Using ACF criteria the rates were: NB 5.5%; SNB 3.4%; ANB 2.1%. With ECF criteria the rates were: NB 2.0%; SNB 2.0%. We propose a new classification system with the following rates: Bacteriuria 1.7%; Bacteriuria with pyuria 6.6%; Bacteriuria with signs/symptoms 4.2%. Methodological discrepancies must be accounted for in comparing infection rates between facilities. Uniform surveillance definitions are needed for use in rehabilitation inpatients.</p>	<p>s42 Epidemiology of <i>Clostridium difficile</i> Colitis in Rehabilitation Inpatients. S. LEWIS*, and B. LEWIS. Marianjoy Rehabilitation Center, Wheaton, IL.</p> <p><i>Clostridium difficile</i> colitis (CDF) is an important nosocomial infection in acute care hospitals, but has not been examined in rehabilitation inpatients. In our 100 bed rehabilitation hospital, 85% of admissions are patients from acute care hospitals with major illness, and 47% receive antibiotics after admission. A high incidence of CDF would be expected. During 42 months, 341 CDF toxin assays were ordered, of which 69 (20%) were positive. 54 (78%) of the diagnosed CDF cases were admitted with CDF, and only 15 (22%) were nosocomial. Moderate diarrhea without fever was the most common presentation, and was obscured by frequent fecal incontinence in this neurologically and cognitively impaired population. Although nosocomial CDF does occur in rehabilitation inpatients, undiagnosed CDF on admission accounts for most CDF disease. Diagnosis requires a high index of suspicion early in admission. The unexpectedly low incidence of CDF colitis after admission suggests that the risk decreases during rehabilitation despite frequent antibiotic exposure.</p>

S43

Pneumococcal Vaccination Among the Institutionalized Elderly. *RAMA GANGULY and TATJANA WEBSTER. James A. Haley Veterans' Hospital, Bay Pines VA Medical Center, St. Petersburg, Florida, and University of South Florida, Tampa, Florida.

Factors affecting pneumococcal vaccine acceptance among the elderly, residing at the VA nursing home care unit (NHCU) in Florida, were determined in this study. Greater than 70% of these veterans were smokers with chronic disease(s) and an average length of stay at the NHCU of 12 months. The 200 subjects studied were mostly males, aged >65 years. A questionnaire was developed to survey the veterans regarding pneumococcal vaccine acceptance and knowledge. Forty-one of the 200 subjects surveyed (20.5%) were immunized against pneumonia. The remaining 159 subjects were either not immunized (42.8%), not sure of their immunization status (31.8%) or did not reply (4.5%). Uncertainty about the need of immunization and where or how to get it free of charge emerged as the major obstacle to vaccine compliance (55.2% of all important reasons given for nonimmunization). Amotivation and fear of shots or side effects also deterred the subjects from immunization (both 16.2% of all important reasons). Health education intervention measures are necessary to rectify this low immunization rate among the NHCU elderly at high risk of complications and death from pneumonia.

S44

Reliability of interpretation of Tuberculin testing in the elderly: implications for practice. *A. McGEER, M. McARTHUR, I.G. NAGLIE, M. NAUS, W. GOLD, A.E. SIMOR, Princess Margaret, Mount Sinai and Toronto Hospitals and Ontario Ministry of Health, Toronto, Canada.

To assess the feasibility of measuring the incidence of tuberculous infection in elderly residents of LTCFs by serial tuberculin (TB) skin testing, we had each of 5 trained readers interpret the skin tests of 435 residents of 2 LTCFs. Two methods were used (pen method of Sokol versus CDC recommended method). Readers recorded both transverse and vertical diameters of induration for each test. Of the 435 skin tests, 32% had some degree of induration and 10% (range 8.5-12.9% by different readers) were positive (≥ 10 mm). Reliability was not different for the two reading methods, and only minimally improved by taking the mean of two diameters versus only one. Agreement between pairs of readers using categories of tests (positive vs negative, or groups at 5mm intervals) was moderate to good when assessed by kappa statistics - values ranged from 0.6-0.8. However, for the 5 readers, the mean range of an individual test readings was > 6 mm. This variation in interpretation may have a significant impact on the estimated rate of infection. Estimates of false positive "conversion" rates created by having a second reader interpret the test are as follows:

Definition of conversion	False conversion rate
Negative to positive	2.3 %
Neg to Pos, plus ≥ 6 mm diff	1.2 %
Neg to Pos, plus ≥ 15 mm diff	0.15 %

Rates of false positive conversions in our population may thus be of the same order of magnitude as true infection. The positive predictive value of conversion may be less than 50% in this setting. The sensitivity of a 15 mm increase in induration for this population and the negative predictive value of lack of conversion are unknown. Because of these factors, the TB skin test is of very limited value in guiding individual treatment decisions, or assessing the epidemiology of tuberculosis in this population.

S45

A Prospective Study of Nosocomial Infection in a University Hospital in Shanghai, China. LI SHU-ZHEN, YU YUE-QIN, The Second Military Medical University Hospital Shanghai, China.

A Prospective study of nosocomial infection (NI) in 7 units was carried out in a university hospital in Shanghai, China. During the period from January to December 1991, 3698 patients were surveyed for NI. The overall incidence of NI was found to be 8.44%. The incidence of urinary tract infection, lower respiratory tract infection and surgical wound infection was 23.1%, 22.75% and 20.14%. These three kinds of infection accounted for 65.99% of the total infections. The pathogens causing NI, mainly opportunistic, were mostly gram-negative bacteria. 1222 microbiologic isolates were obtained from the patients with NI. The relative frequency of nosocomial pathogens by site was Echerichia coli (21.8%), staphylococcus aureus (20.13%), staphylococcus epidermidis (17.5%) pseudomonas aeruginosa (13.34%). Nine common pathogens in total were tested prospectively for high level resistance to antibiotics commonly used in the hospital. Staphylococcus aureus are important nosocomial pathogens, more than 75% showed resistance to penicillin, oxacillin sodium, cardenicillin.

S46

One Year Risk Factor Analysis of a Hospital Infection in Brazil. EDUARDO M. NETTO, NANCY SILVA, FERNANDO BADARD, CARLOS B. ALVES, RODOLFO TEIXEIRA & *ROBERTO BADARO. Hosp. Aliança, Salvador-Bahia, Brazil.

This is a 2 years old private hospital in Bahia, Brazil, designed to treat medium-high socio-economic class, with 100 bed capacity. The infection control programme of this Hospital comprises a full active case-detection, universal precaution, and rational use of antibiotic. Throughout our epidemiology control unit all inpatients are analysed to detect HI. We had 4540 hospital admission with 88 nosocomial infections (1.9%). The main infections were bacterial pneumonia (27 cases), sepsis (12 c.), neonatal conjunctivitis (10 c.) and lower urinary tract (10 c.). The mean and median age were 41 yr, 59% of the admissions were females. The mean permanence time were 4.5 days (4.0 days for patients without and 25.4 with HI). We had 717 (16%) patients admitted with community infection. Sex was associated with HI (RR=1.7[1.1-2.6]). Women stayed less time than men in hospital (3.8 versus 5.3 days; p=0.002). The intervention procedures most associated with HI were: a) long-term parenteral nutrition (RR=17.6[11.0-28.0]); b) central venous catheter (RR=11.2[7.5-16.8]); c) blood transfusion (RR=5.5[5.6-12.8]); d) nebulization (RR=6.7[4.4-10.31]); e) mechanical ventilatory assistance (RR=4.4[2.9-6.61]) and f) corticotherapy (RR=4.7[2.8-7.8]). Bladder catheterism had low association with HI (RI=2.8[1.6-4.2]). There were no association of PI and immune-deficiency. In spite of our highly sophisticated nosocomial control program, high risk patients still is a challenge to prevent HI.

S47

Nosocomial Viral Infections in a Children's Hospital. MARGARET C FISHER,* and ADAMADIA DEFOREST, St Christopher's Hospital for Children, Temple University School of Medicine, Philadelphia, PA

Hospital wide surveillance was conducted from 1988 through 1992: in June 1990 the hospital moved to a larger, new facility. 176 viral and 889 bacterial infections were identified; 107 viral and 500 bacterial prior to the move vs 69 and 565 after the move. Respiratory syncytial virus (RSV), rotavirus, influenza viruses, and parainfluenza viruses were the most common isolates:

Year	RSV	rotavirus	influenza	parainfluenza	other	total viruses
1988	4	5	1	1	1	12
1989	27	7	7	3	6	50
1990	10	29	3	9	5	56
1991	10	7	5	1	4	27
1992	11	11	3	3	7	35

Other viruses included adenovirus (10), cytomegalovirus (7), varicella (3), enteroviruses (2), measles (1), and herpes simplex (1). 27% of viral infections occurred in intensive care units. The median hospital day on which a viral infection occurred was 30. Viruses accounted for 17% of all identified nosocomial infections. Viral but not bacterial infections decreased after the move to a facility with only 1 and 2 bed rooms. Viral infections were most often recognized patients with prolonged hospitalization.

S48

Long Term Trends in Utilization of Parenteral Antimicrobials (ATM) at a Tertiary Care Hospital. M. NETTLEMAN* R. DICK, R. PALLARES, R. WENZEL Univ of Iowa College of Medicine, Iowa, City, IA

Although the increase in resistant pathogens is strongly linked to ATM usage patterns, few data exist on long-term trends in ATM utilization. We reviewed doses of parenteral ATMs used per 1,000 patient days for the 15 years prior to 7/92. Chloramphenicol and tetracycline use decreased, while use of penicillin G, antistaphylococcal penicillins, first generation cephalosporins and aminoglycosides remained relatively stable. In contrast, there was a sharp increase in the use of other ATMs, principally the second and third generation cephalosporins (7 fold and 6.5 fold increase, respectively), vancomycin (161 fold increase), metronidazole (32 fold increase) and amphotericin B (35 fold increase). Throughout the 15 year period, more doses of aminoglycosides were given than any other class of ATM. A sharp increase was noted in nosocomial bacteremias due to \square ethicillin-resistant gram positive bacteria, but gentamicin-resistance remained at low levels. During the past 14 years, the percentage of patients receiving at least one parenteral ATM rose from 23% to 44%. Among patients receiving ATMs, the average number of different agents used per patient increased from 1.6 to 2.1. When newer ATMs were available, use of older agents rose modestly. When never alternatives were not available, use of older agents rose sharply.

<p>S49 Fluoroquinolone Use and Microbial Resistance in a 300-bed Community Teaching Hospital. MICHAEL F. PARRY, MARYELLEN PATZUK, MARIE YUKNA, and DEBRA ADLER-KLEIN, Stanford Hospital, Stanford, CT, and Columbia University College of Physicians and Surgeons, New York, NY.</p> <p>The susceptibility of clinical isolates to ciprofloxacin (CP) at Stanford Hospital was studied prospectively from 1984 through the last quarter of 1992. Fluoroquinolone use rose from 0 in 1985 to 910 grams per quarter in 1991-1992, or 3.4 grams per occupied bed per quarter. CP resistance averaged 0.5% of all clinical isolates in the 3-year period prior to FDA approval of CP. Within one year of approval and unrestricted inclusion in the hospital formulary, CP resistance had risen to 3.X of all isolates in 1989-1990 and 7.1% in 1991-1992. Staphylococci were the most frequently isolated resistant organisms: 10.6% of <i>S. aureus</i> (SA) and 39.2% of coagulase negative Staph (CNS) in 1991-1992 were CP resistant compared to 0 and 1.5% in 1984-1985. <i>Ps. aeruginosa</i> resistance rose from 0.6% in 1984-1985 to 8.6% in 1991-1992. CP resistance correlated with oxacillin (OX) resistance in both SA and CNS: 61% of OX-resistant Staph were 6 resistant compared with only 6% of OX-sensitive staph.</p> <p>Consideration must be given to closer monitoring and control of fluoroquinolone use in the hospital setting in order to minimize the clinical impact of drug resistance.</p>	<p>S50 Nosocomial Transmission of Multidrug-Resistant <i>Mycobacterium tuberculosis</i> among Intravenous Drug Users with Human Immunodeficiency Virus Infection. CORONADO VG*, VALWAY S, FINEZLLI L. et. al., CDC, Atlanta, GA.</p> <p>In addition to the resurgence of tuberculosis since the beginning of the HIV epidemic, nosocomial transmission of multidrug-resistant <i>M. tuberculosis</i> (MDR-TB) has emerged as a life-threatening occurrence. From June 1990 to April 1992, MDR-TB caused by <i>M. tuberculosis</i> strains resistant to isoniazid and rifampin was diagnosed in 13 intravenous drug users patients at one New Jersey hospital; 11 died within a median of 5 weeks of diagnosis. To identify risk factors for MDR-TB, we compared MDR-TB patients to drug-susceptible TB patient! who were at the hospital during the same period. Four case- and six control-patient isolates were available for genomic typing by restriction fragment length polymorphism (RFLP) analysis. Risk factors for MDR-TB were HIV-seropositivity (13/13 vs 20/33, $p < 0.01$) and excluding the possible index case, hospitalization for ≥ 30 days before their diagnosis of TB on the same ward as a smear-positive patient whose isolate had the same resistance pattern (11/12 vs 3/33; Odds Ratio 110.0; $p < 0.001$). RFLP patterns for the four case-patient isolates were identical. RFLP of three of the six control-patient isolates matched each other but did not match those of the case-patients; of the three control-patients with matching isolates, two were exposed to the third while he was sputum smear positive. Positive pressure in isolation rooms, and lapses in infection control and isolation procedures were documented. In conclusion, these data support nosocomial transmission of both MDR-TB and drug-susceptible TB in the hospital and underscore the need for effective isolation practices and facilities in health-care institutions.</p>
<p>S51 Risk Factors for <i>Staphylococcus aureus</i> (SA) Colonization with <i>Staphylococcus aureus</i> in HIV-infected Outpatients. CRAVEN DE*, FALGOUT M, STEGER KA, GIAN J, HOLTSKY C. Boston City Hospital, Boston University School of Medicine, Boston, MA.</p> <p>Objective: To assess the risk factors for NP colonization with <i>S. aureus</i> in a cohort of consecutively screened HIV-infected clinic outpatients.</p> <p>Methods: We obtained NP swabs on all consenting eligible patients (N=204) obtaining care in the outpatient HIV clinic between 11/91 and 3/92. Swabs were streaked onto blood agar plates and cultured per routine bacteriologic methods. Medical data, obtained by chart review or patient interviews, were compiled on standard forms and analyzed using SPSS.</p> <p>Results: Of the 204 participants in the study 78% were male; 42% were white, 48% minority; and 60% reported intravenous drug use as their HIV risk factor. The majority 83% had HIV symptoms or "AIDS"; 53% had CD4 lymphocyte counts $\leq 200/\text{mm}^3$. <i>S. aureus</i> was the most common isolate occurring in 100/217 (46%); 77 (36%) of the population had <i>S. aureus</i> nasal colonization, 25 (11%) had pharyngeal colonization; and 11 (5%) with both. Other organisms isolated were: yeast (28%); <i>Haemophilus</i> (16%); Gram-negative rods (7%); beta-hemolytic streptococci (5%) and pneumococcus (1%). Using stepwise logistic regression analysis, <i>S. aureus</i> colonization was independently associated with prior <i>S. aureus</i> infection ($p < 0.02$) and absence of trimethoprim-sulfamethoxazole (TMP-SMX) therapy ($p < 0.009$). There was a trend ($p < 0.1$) toward increased colonization in patients who smoked, had a history of pneumonia, vaccination against influenza and a protective effect was noted for rifampin.</p> <p>Conclusions: NP colonization with <i>S. aureus</i> is common in HIV-infected patients and is strongly associated with past history of <i>S. aureus</i> infection. TMP-SMX therapy appears to protect against <i>S. aureus</i> colonization. Since other studies have shown a relationship between NP colonization and <i>S. aureus</i> infection, colonized patients who require prophylaxis against <i>Pneumocystis carinii</i> pneumonia should be treated with TMP-SMX.</p>	<p>ss2 Colonization Pattern of Resistant <i>Enterococcus faecium</i>. ELENA YAMAGUCHI*, FELICISIMA VALENA, SHARON M. SMITH, ARLENE SIMMONS and ROBERT H.K. ENG, VA Medical Center, East Orange, NJ and New Jersey Medical School.</p> <p>Understanding the colonization pattern of Vancomycin-resistant <i>Enterococcus faecium</i> (VREF) may help in designing eradication strategies and isolation precautions. 14 patients (pts) with a positive (+) culture for VREF from any site were randomly selected. 1" each of these pts 8 body sites were cultured for colonization by VREF: nares, oral cavity, behind ears, axilla, groin, popliteal fossa, stools and the original site. Fomites on the pts' rooms were also cultured. An area of 5x5 cm was swept by moistened twin applicators (Culturette II set) and inoculated into campylobacter agar media containing Vancomycin. The only consistently + site for VREF was stool. In 3 pts with diarrhea and soiling of stools, popliteal fossa and groin were +. No VREF was isolated from nares or 30 fomites cultures. Conclusions: The limited colonization of VREF to the enteric tract except in those with diarrhea may potentially enable these organisms to be eradicated from the host.</p>
<p>ss3 An Experimental Model of <i>Candida</i> Survival and Transmission in Healthy Volunteers. SIGFRIDO RANGEL-FRAUSTO, ALISON HOUSTON, MARTHA BAILE, and RICHARD P. WENZEL. Univ. of Iowa College of Medicine, Iowa City, IA.</p> <p>Although autoinfection seems to be the most important mechanism for transmission of <i>Candida</i>, cross-infection has been responsible for several outbreaks. The hands of health care workers may be involved in transmission. To explore this, we determined 1) the survival of different <i>Candida</i> species on the hands of volunteers, 2) hand transmission from one volunteer to another, and 3) hand transmission to and from inanimate surfaces. Five species of <i>Candida</i> with high and low hydrophobicity were used: <i>albicans</i>, <i>tropicalis</i>, <i>parapsilosis</i>, <i>krusei</i> and <i>glabrata</i>. Survival was determined by depositing an average of 6.5×10^6 organisms onto the palms. <i>Candida</i> was recovered from the hands by the broth-bag technique. Serial dilutions were plated and incubated until growth. Transmission experiments were done using a similar inoculum; hands were rubbed 10 times against another hand, then both were cultured by the broth-bag method. Although half-lives for inoculum survival on hands with <i>C. albicans</i>, <i>krusei</i>, <i>glabrata</i> and <i>tropicalis</i> and <i>parapsilosis</i> were 2.7, 2.2, 2.0, 6 and 1.5 minutes respectively, <i>Candida</i> was routinely recovered from the hands 2 hours after inoculation. There were no differences in survival stratified by hydrophobicity. <i>Candida</i> transfer occurred in 11/16 (69%) experiments from one hand to another and from the second hand to a third hand in 6/11 (54%). Transmission of <i>Candida albicans</i> to and from inanimate surfaces was possible beyond 2 hours after the inoculum was dry in all experiments. Thus, <i>Candida</i> can survive on the hands of healthy individuals for long periods of time and can be transmitted easily to and from hands or surfaces.</p>	<p>ss4 Only Delayed-Type Hypersensitivity Skin Test Responses to <i>Candida</i> Correlate with CD4 Cell Counts Among Human Immunodeficiency Virus-1(+) Patients. *KEITH M. RAMSEY, CLIFFORD L. MCDONALD, JOSEPH LEE, CHARLES J. HOFF. University of South Alabama, College of Medicine, Mobile, AL.</p> <p>The Centers for Disease Control recommend mumps, <i>Candida</i>, and tetanus as controls for PPD skin testing. However, it is not clear which antigen(s) are the best predictors of lower CD4 cell counts. We examined reactions to mumps, tetanus, PPD and <i>Candida</i> antigens among 167 HIV-1(+) patients, and CD4 cell counts were measured by flow cytometry. The data were analyzed for significance using a one way analysis-of-variance, and p-values were adjusted for the number of tests conducted. There was a significant difference in CD4 counts between those with a (+) <i>Candida</i> test (401 ± 271) vs (-) <i>Candida</i> test (213 ± 247) ($p < .01$). There was no statistical significance between mumps and/or tetanus skin tests and CD4 counts. The small sampling of patients with (+) PPD skin tests (10) did not allow far analysis. In conclusion, our data: (1) indicate a positive correlation between DTH response to <i>Candida</i> and CD4 cell counts; (2) support the use of <i>Candida</i> for DTH testing in HIV-1(+) patients.</p>

S55

Inactivation of Human Immunodeficiency Virus by Chlorine Dioxide. * R. WESLEY FARR and CHERYL WALTON, west Virginia Univ. Health Sciences Center, Morgantown, WV.

The ability of a medical waste disposal process utilizing chlorine dioxide (ClO₂) to inactivate human immunodeficiency virus type 1 (HIV-1) was studied. Stock HIV-1 (HTLV IIIB strain) was treated with ClO₂ under the following settings: cell culture medium alone, culture medium with 252 blood, culture medium with medical supplies treated by the Condor® machine (Winfield Environmental Corporation). MT-2 cells in 96-well tissue culture plates were inoculated with serial 10-fold dilutions of treated and untreated HIV-1. Cytopathic effect was read on Day 5 and the TCID₅₀ was calculated. Treatment of HIV-1 with ClO₂ resulted in the following reductions in TCID₅₀: culture medium alone- 5.25 log₁₀ reduction; 25% blood- 6.25 log₁₀ reduction; medical supplies treated in the Condor® machine- 4.75 log₁₀ reduction. ClO₂ inactivated HIV-1 in the presence of blood and in the presence of medical supplies under conditions that simulated the conditions existing in the Condor® machine.

S56

A New Ex Vivo Porcine Model for Evaluating Antiviral

Antiseptic Efficacy. JON WOOLWINE, JULIE LOUISE GERBERDING, University of California San Francisco, San Francisco, CA.

Standards for antiviral antiseptic efficacy are not yet established by FDA; although EPA criteria for surface disinfectants are used instead, their validity is unproven. Purpose: To validate a new model (ex vivo porcine cutaneous tissue) for determining efficacy of antiviral antiseptics relevant to hospital infection. Methods: 10 ul (10¹¹ pfu/ml) MS2 bacteriophage (a hydrophilic virus similar to enteric viruses known to resist disinfection) was applied to 3x3 cm shaved ipsilateral skin sections, dried 10 min, treated with 1ml disinfectant or saline at 25°C for 1 minute, and recovered by immersing skin sections 10 min. in 20 ml stripping buffer. Surviving virus was titered in an E. coli plaque assay with toxicity controls. Log-reductions in recoverable virus in saline disinfectant treated samples were compared using the new porcine model and traditional methods under similar test conditions. Results: Mean log reduction in virus titer (5 replicates for each condition):

Method	100% Bleach	Glutaraldehyde	Iodophor	Chlorhex	H ₂ O ₂	Et-OH	Iso-OH
Suspension	6.63	1.24	1.24	0.44	0.26	0.12	0.14
Class Slide	5.67	4.37	1.17	0.14	0.00	0.46	0.18
Ceramic Tile	4.40	5.27	0.77	0.00	0.06	0.44	0.12
Fingerpad	1.37	N/A	0.40	0.07	0.19	0.23	0.51
Porcine Skin	2.07	1.65	0.72	0.15	0.04	0.00	0.32

Bleach/glutaraldehyde were efficacious for P. aeruginosa (2.4 log reduction) against this resistant phage with some methods. Efficacy in the porcine model correlated with the human fingerpad model, and was lower than that seen with carrier/suspension tests. Conclusion: Current EPA criteria for surface disinfectants may overestimate the efficacy of antiseptics. The porcine model may provide a reliable, safe, and inexpensive method for evaluating antiseptics.

s57

A new test model for the control of automated washer / disinfectors for endoscopes.

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The number of reports on nosocomial infections related to fiber endoscopic interventions is increasing steadily. One reason is the difficulty to establish standardized disinfection measures for these instruments. This leads to a wide variety of practices and procedures for reprocessing endoscopes that require, at the very least, high level disinfection. Several automated washer/disinfectors for endoscopes were introduced on the market without even standardized procedures to ensure their microbiological safety. We developed a test model which allows to control the efficacy of the disinfecting process. Dummy endoscopes consisting of up to 5 endoscope channels of varying diameters (0.8 to 2.5 mm) was provided by 2 endoscope manufacturers (Fuji, Pentax). A test suspension with coagulating blood and a bacteria suspension containing 10⁸ cfu E. faecium and P. aeruginosa was filled into each channel. removed by injecting air and then dried for 1 hour. The dummy was inserted into the machine and underwent the regular contamination process. Thereafter all channels were flushed with nutrient broth containing inactivating substances and checked for bacterial growth. At the same time water samples from the machine were controlled for remaining test organisms. We conclude from our test model that a chemothermic endoscope washer / disinfectant can be regarded as microbiologically safe if the initial bacterial test load is reduced at least by 10⁵ and no contaminants can be recovered from the washing solution.

s57.1

Prevalence of Hospital-Acquired Infections in Spain, 1991

VICENTE MONGE*, ANGEL ASENSIO, JOSE VAQUE, JUAN G. CABALLERO and EPINE WORKING GROUP. Hospital Ramon y Cajal, Madrid, Spain

In May, 1991, a prevalence survey of hospital-acquired infections was conducted in 136 hospitals in Spain, in which 42,185 patients were studied. There was a 7.8% prevalence of infected patients and an 8.9% prevalence of infections. The most common infections were those of the urinary tract (26.3%), surgical wound (21.4%), lower respiratory tract (16.9%) and bacteraemia (8.9%). There was a 5% prevalence of patients with surgical wound infection and a 3.5% prevalence after clean surgery. Gram-negative bacteria was the dominant microorganism group. Escherichia coli and Pseudomonas aeruginosa being the most prevalent followed by Gram-positive Staphylococcus aureus and spidermids; 34.5% of the patients were receiving antimicrobial agents. The following procedures were shown to be significantly associated with hospital-acquired infections: urinary catheterization, parenteral nutrition, degree of contamination during surgery, mechanical ventilation and tracheostomy.

M1

Assessing Data Quality in the National Nosocomial Infections Surveillance (NNIS) System. *T. GRACE EMORI, ROBERT P. GAYNES, AND THE NNIS SYSTEM. Centers for Disease Control and Prevention, Atlanta, GA

The primary goals of the NNIS system are to describe the epidemiology of nosocomial infections and provide data useful for intrahospital comparisons. Meeting these goals depends on high quality data from NNIS hospitals. As part of a comprehensive plan to examine the quality of NNIS data, we analyzed accumulated data from individual hospitals to determine if the data suggested lack of adherence to the surveillance protocol, thus biasing the NNIS database.

In 1992, 53 hospitals used the hospital-wide component to report 12,080 infections. In this component, infections are monitored at all sites on all inpatients on the acute care services. Of the reported infections, 32% were urinary tract infections (UTI); 16% pneumonia; 15% surgical site infections; 14% bloodstream infections (BSI); and 24% from other sites. Hospitals with site distributions substantially different from the aggregated data were contacted. One hospital where UTI and BSI each accounted for 20% of the infections had initiated a highly successful UTI prevention program, but the increased use of intravascular devices on patients resulted in more BSIs. Another hospital with a similar distribution was a children's hospital where intravascular devices were used on many patients, but urinary catheters were rarely used. By these measures, it appears that NNIS hospitals using the hospital-wide component were monitoring infections at all sites as required in the protocol. These findings, however, underscore the importance of adjusting for differences in patient populations when comparing accumulated data from a hospital to an aggregated database.

M2

Hospital Epidemiology and the Assessment of Clinical Practice Variation: Primary Cesarean Section Rates.

*STEPHEN B. KRITCHEVSKY, BRYAN P. SIMMONS, SANDRA BASSETT, Univ. of Tennessee and Methodist Health Systems, Memphis, TN, 38163.

There has been increasing interest in using epidemiologic methods to understand variations in patterns of clinical practice. The authors examined the distribution and determinants of obstetricians' primary cesarean section rates (PCSR) at an urban mid-south hospital in 1988. Among the 19 obstetricians performing more than 30 deliveries, the PCSR varied more than 6 fold from a low of 6.2% to a high of 39.1%. The average rate was 23.2%. The distribution of PCSR's appeared to be bimodal with one group of obstetricians having a PCSR of about 20% and the other a rate of about 30%. Further analysis showed that many of the high modal obstetricians regularly cross-covered for one another. While there was no difference in the distribution of c-sections by day of the week, there was a difference in the times of day at which the c-sections were performed. Compared to low modal obstetricians, the high modal obstetricians were more likely to perform a primary c-section between the hours of 10:00 and 11:59 and less likely between the hours of 20:00 and 23:59 (p<0.01). The high modal obstetricians were two times more likely to diagnose fetopelvic and/or obstructed labor (p < 0.001). This propensity explained the difference in the PCSR between the two groups. These findings suggest that there were two different sets of diagnostic criteria used to determine either fetopelvic disproportion or obstructed labor. Feeding back PCSR's to obstetricians failed to affect individual primary c-section rates.

<p>M3 Epidemiology of Hemorrhage Related to Cardiac Surgery (CS) *L. HERWALDT, S. SWARTZENDRUBER, T. PERL, R. EMBRY, K. KUHN, K. WILKERSON, R. WENZEL. University of Iowa College of Medicine and VAMC Iowa City, IA.</p> <p>v. studied the epidemiology of CS-related hemorrhages at the University of Iowa Hospital. Hemorrhages on the adult CS service at the University of Iowa Hospital were identified by concurrent surveillance using the criteria of return to surgery for bleeding or >800 cc of blood drained over 4 hours. During 1991-92, 93/509 (18%) CS patients hemorrhaged, 19 (20%) of whom required repeat surgery. A case-control study was performed to identify factors associated with hemorrhage. Each of 21 patients who hemorrhaged from 6/91-9/91 were matched by age and procedure to 2 controls. Thrombocytopenia (14%) cases and no controls died (p=0.03) and 7/21 (33%) cases required repeat surgery. Cases were more likely than controls to: receive platelets during surgery (p=0.052) and in the ICU (p<10⁻⁷); receive FFP (p<10⁻⁴) in the ICU; and have postop hypotension (p=0.004). OR times (mean 261 vs 223 min, OR=1.13, CI₉₅=0.99-1.28, p=0.06) and postop PTIs (49.6 vs 41.4 sec, OR=1.49, CI₉₅=0.94-2.36, p=0.09) were longer for cases. Previous sternotomy, preop aspirin or heparin, end preop lab values did not predict bleeding. Prolonged surgery and elevated postop PTIs may identify patients at risk for hemorrhage. Patients with CS-related hemorrhage may require increased blood products and repeat surgery and have higher mortality than controls.</p>	<p>M4 Epidemiology of Patient Falls in a Teaching Hospital. *J. POTTINGER, L. HERWALDT, J.R. ADAMS, K. WILKERSON, S. SWARTZENDRUBER. Univ. of Iowa Hospital (UIH) and VAMC. Iowa City, IA.</p> <p>Patient falls (PF) have been reported in different settings and ages. Many investigators have described factors that increase the risk for fall, but definite causes have not been identified. The purpose of this study was to describe the epidemiology of PF from 1989-92 at the UIH, a 900 bed teaching facility. Data on PF were obtained from a concurrent surveillance system for adverse occurrences. 1675 patients sustained 1925 falls for a rate of 2.6/1000 patient days; 250 patients had >1 fall during an admission. 44% of PF occurred on the Medicine Service, 46% within 7 days of admission, and 45% in patients >60. 14% experienced 56% of the PF and about 1/3 of PF occurred on each nursing shift. Adverse outcomes were noted in 27% of PF, or 8.1/10,000 patient days. Abrasions, lacerations, and bruises were the most common adverse outcomes. Over the 4 year period, the rate of fall-related fractures declined from 11.5 to 3.9/100 falls. A case-control study was designed to evaluate risk factors for falls in patients >65 who are treated on ch. Medicine Service. Each of 44 cases will be matched with 2 controls by unit, age, and length of stay. The unique surveillance system provided valuable data on trends and risk factors for PF and facilitated analytic study of this common noninfectious adverse occurrence of medical care.</p>
<p>M7 Reduced Costs and Length of Stay (LOS) With Decreased Surgical Wound Infection (SWI) Rates Following Coronary Artery Bypass Graft Surgery (CABG). J. SELICK* and J. MYLOTTE. SUNY at Buffalo; Buffalo General Hospital, Buffalo, NY.</p> <p>We previously described our experience with SWI following open heart surgery (<i>Infect Control Hosp Epidemiol</i> 1991;12:591), in which there was a significant decline in deep sternotomy and deep vein donor site SWI rates after a change from razor blade to electric clipper hair removal. Incisional (superficial) SWI rates did not change. Patient management department computer data for patients (P) having only CABG during this time period were reviewed. 1988, 746 P had CABG and 44 developed SWI. Average (Avg) LOS for uninfected P was 13.25 days and for infected P was 22.30 days (Avg attributable ↑ LOS due to SWI = 9.05 days). Avg hospital charges for uninfected P were \$20,540 and for infected P were 533,810 (Avg attributable charges due to SWI = \$13,271). 27/44 P requiring readmission for treatment of SWI had additional Avg LOS = 9.74 days and Avg charges = 166,824. In 1989, 862 P had CABG and 40 developed SWI. Avg LOS for uninfected P was 12.69 days and for infected P was 14.35 days (Avg attributable ↑ LOS due to SWI = 1.66 days). Avg hospital charges for uninfected P were \$21,870 and for infected P were 523,465 (Avg attributable charges due to SWI = \$1,595). 25/40 P requiring readmission for treatment of SWI had additional Avg LOS = 5.92 days and Avg charges = 53,484. There was a decrease in LOS and charges after reduction of SWI rates following CABG, apparently due to reduced deep SWI. We currently are attempting to determine which groups of infected patients had the highest LOS and charges and subsequent reductions.</p>	<p>M8 Long-Term Outcomes in Patients with Gram Negative Septicemia (GNS). *R. MICHAEL MASSNARI and LUCILLE ARKING. Henry Ford Hospital, Detroit, MI.</p> <p>Recent experimental trials of the efficacy of immunotherapy for acute GNS have used 30-day mortality as an end-point. Although useful in assessing efficacy, these short-term outcomes are of limited utility when comparing the value of expensive interventions against alternative strategies. We conducted a historical-cohort study of 333 patients with documented GNS at a large tertiary care hospital. The infected cohort was compared with controls matched for age, sex, primary and secondary diagnoses, and time of admission. Exposed (GNS) and unexposed cohorts were followed for mortality over the next 12 months. Ph. exposed cohort received traditional therapy for GNS (no immunotherapy). Survival in the GNS cohort was 72.7% at 30 days; 53.8% at 90 days; 43.8% at 1 year. Survival in the unexposed cohort was 86.8% at 30 days; 81.7% at 90 days; 65.5% at 1 year. Despite recovery from GNS, the exposed cohort exhibited excessive mortality throughout the year of follow-up. Whether the excess mortality in the GNS cohort reflects more advanced underlying disease or sequelae of GNS cannot be ascertained from this study.</p>
<p>M9 Novel Evaluation of Inpatient Antibiotic Use. *KELLEY R. LEE, ROBERT J. LEGGIADRO and KELLY J. BURCH. LeBonheur Children's Medical Center and University of Tennessee, Memphis, TN.</p> <p>We initiated a novel evaluation of inpatient antibiotic (AB) use at our 225-bed, university-affiliated children's hospital as a quality assessment activity. All inpatient bacterial culture and sensitivity results over a one week period were reviewed monthly. Medication administration records were evaluated against criteria established by the investigators. The primary parameter was that AB therapy should match the sensitivity of the organism. Exceptions included appropriate substitutions and the use of synergistic drug combinations. Failure to tailor therapy and sensitivities were also noted. Process indicators included use of the least costly AB, appropriate dose, interval and route of administration. The medical record was reviewed for all patients whose management did not initially appear to meet criteria.</p> <p>Ten (7.4%) of 135 patients reviewed over four months had the following deviations: failure to treat (1), treatment of contaminant (2), use of more costly agent (2), failure to tailor therapy (1), two agents from same class given concurrently (1), organism resistant to only agent given (1), organism resistant to one of two agents given (1), inappropriate route (1), and inappropriate empiric antibiotic (1). No trends in type of deviation or individual prescriber were noted.</p> <p>Follow-up monitoring will assess the impact of educational efforts (e.g. letters, newsletters, conferences) on the incidence of deviations.</p>	<p>M10 Indications for Echocardiograms in Bacteremic Patients. *Kwan Kew Lai. University of Massachusetts Medical School and Medical Center, Worcester, MA.</p> <p>Echocardiogram (ECHO) is routinely used by clinicians to diagnose infectious endocarditis (IE) by the presence of vegetations (VEG) in bacteremic patients (BPs) and to help to decide on the length of antimicrobial therapy (Rx). This study is to determine whether risk factors for endocarditis (RFIE) can be used to define a subgroup of BPs in whom ECHO findings are likely to modify Rx. RFIE were defined as valvular heart disease, previous IE, presence of prosthetic valve, intravenous drug use, recent dental cl-g or GU manipulations, prolonged bacteremia, changing or new heart murmur and embolism.</p> <p>The charts of 43 consecutive BPs who had ECHO were retrospectively reviewed. 32 (74%) pts with and 11 (26%) pts without RFIE were identified. Four of 32 pts (13%) with RFIE had VEG. Additionally, ECHO identified 1 pt with thrombus in the region of the Eustachian valve and 1 pt with paravalvular leak. None of the 11 pts without RFIE had VEG. ECHO abnormalities were common among pts with RFIE: 91% vs 18% in pts with no RFIE. The length of Rx was not decreased by the finding of absolutely normal ECHO in BPs with WIE.</p> <p>The routine use of ECHO to R/O VEG in BPs without RFIE does not appear justified on the basis of the data. Clinicians who ordered ECHO to R/O IE in BPs with RFIE continued to treat for a 4 to 6 week course of Rx. ECHO abnormalities were common among these pts and might overwhelm the clinicians with potentially confusing and misleading information.</p>

<p>M11 The Epidemiology of Saphenous Vein Harvest Site Wound Infections (SVHSWI) After Cardiothoracic Surgery. *E. MORALES, L. HERWALDT, R. EMBRY, K. KUHNIS, T. PERL. Univ. of Iowa and VAMC. Iowa City, IA.</p> <p>Over 300,000 Coronary Artery Bypass Grafts (CABG) are done annually in the US. Although the wound infection rate following CABG is LO-12%, little is known about the epidemiology of SVHSWI. From 1990-92 the rates of mediastinal/sternal wound infection post-CABG decreased from 6% to 3.49 while the rate of SVHSWI increased from 7.3 to 11.6%. We compared 70 patients "who developed postoperative SVHSWI to 141 patients without infection (controls). These patients were in a" observational study in which all wounds were examined and abnormal wounds were cultured. Infections were identified by a concurrent surveillance system using standard definitions. Gender, age, post-operative and coral length of hospital stay (LOS) were analyzed. The median age of cases and controls was 67 and 64 years, respectively. Wound were 24 of 70 cases and 30 of 141 controls (OR = 1.93, CI₉₅ 1.02-3.64). Postoperative LOS of cases "as 14 days compared to 10 days for controls (p = 0.007). Total LOS for cases was 19 days compared to 14 days for controls (p = 0.0006). Using a" increased LOS of 4.5 days and a hospital bed cost of \$1000/day, we estimate that each infection increased the cost of hospitalization by \$4500. Our data suggest that gender might be a risk factor for developing SVHSWI, and that these infections add substantially to the cost of medical care.</p>	<p>M12 The Association of Severity of Underlying Illness with Mortality from Nosocomial Infections *CHARLES SALEMI, M.D., M.P.H.; SALLY PADILLA, B.S., C.I.C., Kaiser Permanente Medical Center. Pomona, CA</p> <p>Nosocomial infection (NI) mortality data from the Centers for Disease Control have not included the association of severity of underlying illness. Hospital Infection Control data from the years 1987 through 3rd Quarter, 1992 were analyzed. There were a total of 1152 NI's studied. Blood stream infections (BSI) 216, nosocomial pneumonia (NP) 383, and surgical wound infections (SWI) 411. In patients with NI's who died, the death certificate was used to determine which NI's were direct or contributable causes of death. NI's associated with death: BSI 11%, NP 15%, and SWI 1%. Beginning in 1990, 573 patients with NI's had a subjective estimate of possible risk of death during the current hospital admission and prior to the onset of NI. There were 168 patients at risk of death grouped in severe illness class (SIC) and included 21 deaths, 13% mortality. The SIC group comprised 75% of deaths from NI. There were 405 patients in the non-SIC group with 8 deaths, 2% mortality. NI: #pts, mortality rates in SIC prs: BSI 8 (11%), NP 11 (13%), SWI 2 (17%); non-SIC pts: BSI 0 (0%), NP 5 (4%), SWI 2 (1%) NI site mortality rates between both SIC and non-SIC patients were statistically significant with P value < .05. The majority of deaths in patients with NI's occur in severely ill patients who were at risk of death prior to onset of NI's.</p>
<p>M13 Bringing Your Control Program Up to Scratch With a Scabies Outbreak. R.M. BANATYNE, B. WELLS*, S. MACMILLAN, T. PATTERSON, G. CUNNINGHAM, R. TELLIER. INFECTION CONTROL SERVICE, ST. MICHAEL'S HOSPITAL, TORONTO, CANADA</p> <p>A cluster of seven cases of scabies in nursing staff from the same ward presenting within a two-day period triggered the search for a malignant reservoir. A case of typical but unrecognized Norwegian scabies was identified in an immunosuppressed patient who had been in hospital for almost six weeks. The clinical diagnosis was confirmed by demonstration of the mite. Contact tracing identified secondary cases in staff(45), patients(32)and family contacts(8). Thirty staff members were treated with two courses of either 1% gamma benzene hexachloride or 5% permethrin cream. Fifteen additional individuals required three courses. Scabies recurred in seven due to reexposure, incomplete treatment or incorrect application of medication. Five hundred and 228 exposed-but-asymptomatic staff and inpatients respectively were treated prophylactically with a single scabicide treatment course. Five pregnant staff received 10% croctamiton cream. The index unit was closed for 4 days to allow for intensive treatment of patients and staff and thorough housekeeping. Handwashing, gloving and gowning practices for ski contact with infected patients was reemphasized. Extensive telephone and written notifications with health departments, health care facilities, physicians, discharged patients and their families were undertaken and multiple inservice information sessions were conducted. Complete resolution of the outbreak was achieved in four months. Based on labour costs, ward closures, absenteeism, overtime, medications, increased hospital stay and administrative costs the outbreak consumed \$100,000 Canadian.</p>	<p>M14 Nosocomial Mite Outbreak In A Tertiary Care Hospital. *PERMJIT SURI, BARBARA DEVRIES, ANDREW MACKENZIE, PETER JESSAMINE, SHEILA ALDWORTH, RAPHAEL SAGINUR. Ottawa Civic Hospital and University of Ottawa, Ottawa, Canada.</p> <p>A medical student discovered mites on his laboratory coat while examining a patient on June 9, 1992. The mites were subsequently identified as <i>Ornithonyssus sylviarum</i>. Both patients in the involved room were infested. Active surveillance of patients, staff, and visitors to that room over the ensuing 8 days revealed a total of 12 cases in 28 individuals at risk, with a minimum duration of exposure of approximately one minute. There were 4 patients, 1 visitor, and 7 staff. Nine complained of itching 2 had rashes. There was great upset amongst ward staff and patients. The room was cleaned 4 times, and sprayed with insecticide twice. It was closed a total of 4 days. New cases continued to arise until a nest containing two infested starling chicks was identified on the outside wall below the window sill of the room, removed, and a missing brick replaced. Cost to the hospital, excluding infection control staff wages, was 53966. A mite outbreak caused trivial illness, great consternation, and significant financial impact. Mite outbreaks in hospitals imply the presence of a nearby reservoir in infected birds, and control requires elimination of the reservoir.</p>
<p>M16 A Pseudomonas Pseudoepidemic Due To A Contaminated Waterbath. MERMEL, LEONARD A. Dept. of Medicine, Brown University School of Medicine and Rhode Island Hospital, Providence, RI.</p> <p>From 4/15-5/7/92, 4 bone allografts cultured just before implantation in 3 patients grew non-aeruginosa pseudomonads, one of which was <i>P. Cepacia</i>. All allografts were culture-negative at procurement. One of the 3 patients developed a deep wound infection and cultures revealed enterococcus. No pseudomonads were cultured from 98 other bone allografts during 1991-92. Sonication was begun 3/92 to increase yield of bone cultures. From 3/92-5/92, 17 bone Specimens were cultured by 9 different medical technologists, a single technician cultured all 4 contaminated bone allografts and none of the other 13 bone allografts (P=0.004). This technician placed bone in sterile containers but laid these in the sonicator waterbath without use of a beaker or rack and sonicated it for 10-20 minutes. Waterbath cultures revealed non-aeruginosa pseudomonads with exact antibiogram matches in 3 of the 4 strains when tested with 19 different antibiotics. No further cases have occurred after the bone culture methodology was changed.</p>	<p>M17 Investigation of a Pseudo-Outbreak of Orthopedic Infections Caused by <i>Pseudomonas aeruginosa</i>. *KEITH ST. JOHN, WENDY FORMAN, ROSE VITAGLIANO, MARCIA REDDEN, VILAS SATISHCHANDRAN, ALLAN TRUANT, JUDY O'DONNELL, PETER AXELROD. Temple University Hospital, Philadelphia, PA.</p> <p>In November 1992, the Infection Control section was informed by one orthopedic surgeon (surgeon A) that an unusual number of his patients had developed deep post-operative wound infections; all 4 were caused by gram negative bacilli. We investigated this outbreak. A case was defined as an orthopedic patient with suspected wound infection after surgery performed between 10/1/92 and 12/1/92. Cases were identified by surgeon A, review of I.D. consults, and a computerized medical records search. 3/5 cases had cultures which grew <i>P. aeruginosa</i> (PA); 1/5 had no growth but a gram stain identical to the PA cases. The infection rate for all orthopedic surgeons during the epidemic period (2.2%) did not differ from baseline (2.0%) but rates rose for surgeon A (.79 to 9.5%) and surgeon B (1.0 to 2.8%). Positive cultures showed more temporal clustering than did the implicated operations. Operating room (OR) cultures failed to grow PA. Chart reviews and OR observation revealed no point source. During the investigation, a bottle of "sterile" saline used in tissue processing in the lab was found to be contaminated with PA (diluted, but not undiluted, bronchoscopic sampler grew PA). All orthopedic specimens which grew PA had been processed with this saline. Susceptibility profiles of orthopedic isolates matched the contaminant's. One pt. had anaphylaxis on abx. Unnecessary abx were discontinued, and the lab changed its procedure for processing tissue.</p>

<p>M18 Isolation of <i>Pseudomonas pickettii</i> in a Sinus Clinic. A HUANG, D STAMLER, P EDELSTEIN, D. SKALINA, PJ BRENNAN*, Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania</p> <p><i>Pseudomonas pickettii</i> (PP) was recovered from ten patients who had undergone sinus endoscopy in an otorhinolaryngology (ORL) clinic between November 1991 and April 1992. Six (6) isolates were from sinus cultures and four (4) from nares. An investigation for a source of PP was initiated. Cultures from three sinus endoscopy rooms in the ORL clinic recovered PP from 1% ephedrine solutions (IZES) contained in atomizers. An unopened pharmacy stock bottle in ORL also harbored the organism. Cultures from other ORL sites were negative. IZES was produced in the hospital pharmacy by reconstituting crystalline ephedrine with deionized (DI) water. PP was isolated on two separate dates from 100cc volumes of water from the pharmacy DI water. All clinical isolates and the one water isolate tested had similar antibiograms. The DI system was installed in the pharmacy in August 1991. IZES "as produced using DI water for the first time in November 1991 and the first three isolates occurred later in the same month. The use of sterile water in production of IZES eliminated the problem. Hospital water systems may be a source of contamination of pharmaceutical production. Topical and ingestible pharmaceuticals should be monitored for microbial contamination.</p>	<p>M19 Outbreak of Surgical Wound Infection Related to Hand Scrubbing</p> <p>*GRIMBAUM, RS; MENDONÇA, JS; CARDO, DMZ HOSPITAL DO SERVIÇO PÚBLICO ESTADUAL, ESCOLA PAULISTA DE MEDICINA SAO PAULO, BRASIL</p> <p>During an 1-year period of active surveillance of postoperative infections we detected an outbreak of surgical wound infections (SWI) in vascular procedures. Six SWI were diagnosed by CDC criteria in nine patients whose procedures were performed in a period of four days. Cultures of purulent discharge disclosed <i>E. coli</i> and Coagulase-negative Staphylococci in one patient each.</p> <p>We did a case-control study using as control group seventeen patients whose procedures were performed 30 days before or after the outbreak period and did not develop SWI. Characteristics of the groups are shown in the table.</p> <table border="1"> <thead> <tr> <th></th> <th>SWI GROUP n=6</th> <th>NON-SWI GROUP n=17</th> <th>p</th> </tr> </thead> <tbody> <tr> <td>Sex (male)</td> <td>3 (50.0%)</td> <td>11 (64.7%)</td> <td>NS</td> </tr> <tr> <td>Mean age (years)</td> <td>64</td> <td>63</td> <td>NS</td> </tr> <tr> <td>Lower limb amputation</td> <td>2 (33.3%)</td> <td>4 (23.5%)</td> <td>NS</td> </tr> <tr> <td>Arterial surgery</td> <td>4 (66.7%)</td> <td>13 (76.5%)</td> <td>NS</td> </tr> </tbody> </table> <p>NS: NON SIGNIFICANT</p> <p>We analysed risk factors for development of SWI (Sex, age, procedure, underlying diseases, prophylaxis, ASA status, wound class, duration of surgery, surgeon, preoperative stay, other site infections) and found no statistical differences between case and control groups. The only difference noted was the fact that during outbreak period operating room was not provided with PVP-I, the antiseptic used for hand scrubbing. Vascular surgeons replaced PVP-I by plain soap but other surgeons replaced by 70% alcohol with 2% Iode. During the same period, active surveillance detected no SWI in abdominal procedures. We conclude that SWI was probably related to hand scrubbing with plain soap without antiseptics.</p>		SWI GROUP n=6	NON-SWI GROUP n=17	p	Sex (male)	3 (50.0%)	11 (64.7%)	NS	Mean age (years)	64	63	NS	Lower limb amputation	2 (33.3%)	4 (23.5%)	NS	Arterial surgery	4 (66.7%)	13 (76.5%)	NS
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<p>M20 <i>Clostridium difficile</i> Outbreak Associated With Contaminated Blood Pressure Cuffs and Portable Commodes. L. MEYERS*, J JENNE, F. MANIAN St. John's Mercy Medical Center (SJMCC), St. Louis, Missouri</p> <p>From September-December 1990, 26 cases of nosocomial <i>C. difficile</i> infections were diagnosed at SJMCC, compared to 10 cases reported during the previous 8 months. A case-control study failed to reveal any significant differences in age, average number, type and duration of antibiotics received by cases. Geographic clustering of cases in the intensive care unit was noted and accounted for 54% of the cases.</p> <p>A total of 170 environmental cultures of rooms associated with cases was performed. These included bed rails, floors, call lights, blood pressure (BP) cuffs, portable commodes, bedpan storage areas, thermometers, and bedside tables. Six (3.5%) samples grew <i>C. difficile</i>: 2 from BP cuffs, 2 from portable commodes and 2 from bedpan storage areas. Additional cultures of BP cuffs and commodes revealed an overall contamination rate of 10% for each of these items. One contaminated BP cuff was associated with a room in which a case of nosocomial <i>C. difficile</i> infection was diagnosed three months earlier. Neither the nursing nor the housekeeping department claimed responsibility for cleaning or disinfecting these items on a regular basis.</p> <p>A policy specifically addressing periodic disinfection of BP cuffs and portable commodes went into effect on 1/91, with no subsequent clusters of nosocomial <i>C. difficile</i> infection occurring in the hospital during the ensuing 2 years.</p>	<p>M21 Epidemic Invasive Meningococcal Disease (IMD) Among University Students: Possible Transmission in Campus Bars. P.B. IMREY, L.A. JACKSON, P.H. LUDWINSKI, A.C. ENGLAND III, B.C. FOX*, L.B. ISDALE, J.D. WENGER. Univ Illinois Urbana-Champaign, Ctrs for Dis Cntrl, Atlanta, GA, Champaign-Urbana Pub Hlth Dist, Covenant Med Ctr and Carle Fdn Hosp, Urbana.</p> <p>Between February 1991 and April 1992, 9 undergraduates developed group C IMD; 3 died. The attack rate was 56 times that expected in persons 18 to 22 years of age. All 8 available isolates were subjected to multilocus enzyme electrophoresis (MLEE); the result was consistent with an epidemic clone. An extensive vaccination program was conducted in February 1992: only 1 case (a vaccine nonresponder) occurred thereafter.</p> <p>An epidemiologic investigation was conducted: 20 controls for each participating case were matched for gender, college, and year. The general student population (N=867) and employees and patrons of campus bars (N=107) were studied for meningococcal throat carriage.</p> <p>The case group had substantial campus bar exposure 2- to 14-days prior to onset, especially 1 (Bar A) of the 16 establishments. Case-control analysis revealed that cases were more likely to patronize bars than controls (6/6 v 6/9116, 95% CI for OR:1.4-∞), particularly Bar A (OR=24.4, p=0.006).</p> <p>The group C meningococcal carrier rate was 0.2% in students who had not patronized campus bars, 0.5% in patrons of any bar, 4% in patrons cultured at Bar A, and 14% in employees of any bar. Preliminary MLEE revealed that the only employee carriers of the epidemic strain worked at Bar A (2/22 [9%] v 0/63 in employees of other bars); only 1 student carried that strain (0.1%).</p> <p>We conclude that transmission of the epidemic strain may have occurred in campus bars, particularly in Bar A. Student and campus bar employee carriage are being restudied.</p>																				
<p>M22 Foodhandler Associated Salmonella Outbreak in a University Hospital Despite Routine Surveillance Culture of Kitchen Personnel. NAJWA KHURI-BULOS*, MAHMOUD ABU KHALAF, ASEM SHEHABI, KHALED SHAMI. Jordan Univ. Hospital (JUH), Amman, Jordan.</p> <p>An outbreak of salmonella gastroenteritis occurred at the JUH between 9/24-9/30/1989. 195/619 individuals who ate the lunch meal at the hospital cafeteria on 9/23 became ill. 169 were employees and 26 were patients. The incubation period ranged 16-72 hours in 183. Sx. were, diarrhea 88%, fever 71%, abd. pain 74%, bloody stool 5%. 84 pts were hospitalized. Culture of 8 uncooked food items were negative, but stool culture on 90/180 pts yielded salmonella gp D. case control history on 108 pts and 111 controls showed correlation with eating Meal A (combined steak, peas, potatoes dish) with diarrhea. Odds ratio (OR), steak 10.06 CI 5.11-19.98, peas OR 6.19 CI 3/04-12.77, potatoes OR 19.98 CI 8.27-46.14, OR Meal B was 0.11 CI 0.05-0.22. 11/61 kitchen employees grew salmonella gp D on stool culture. One of these asymptomatic employees prepared the mashed potatoes on 9/23. All of these employees had negative stool cultures 3 months earlier.</p> <p>While it is impossible to be certain, this outbreak was most probably due to massive contamination of the mashed potatoes by the contaminated hands of the food handler. Routine stool culture of foodhandlers is not cost effective and should not be used as a substitute for education and proper hygienic practices.</p>	<p>M23 An Outbreak of Legionnaires' Disease. MERMEL, L.A. DEMPSEY, J. PARENTEAU, S. GENTILE, S., JOSEPHSON. S., STOLZ, S., Brown University, Rhode Island Hospital and University of Wisconsin Hospital. Providence, RI and Madison, WI.</p> <p>During 3/92, 2 patients developed fatal nosocomial Legionnaires' disease. No nosocomial Legionnaires' disease had been documented at the involved institution since 1986. Extensive environmental cultures revealed widespread contamination with <i>Legionella pneumophila</i> (serogroups 1 and 3). Cooling towers have been hyperchlorinated since 1986 and have since been without growth of <i>Legionella</i>. One of the 2 patient isolates (<i>L. pneumophila</i> serogroup 1 Philadelphia subtype) marched with the environmental isolate collected from the water faucet in the patient's room. These isolates were also concordant by pulsed-field gel electrophoresis. The other patient isolate (serogroup 8) was not found in any of the other environmental isolates collected. Control measures included superheating water used in all patient care areas to 75°C for 72 hours and flushing superheated water thru faucets and showers. All showerheads were sonicated and sterilized. The temperature of hot water storage tanks was raised from 43°C to 52°C. Since these interventions were made, multiple repeat environmental cultures have been without growth of <i>Legionella</i> and no further cases of nosocomial acquired Legionnaires' disease have been documented.</p>																				

M24 Cluster of Pneumocystis Carini Pneumonia in a Renal Transplantation Unit: A Case-Control Study. TREMBLAY, C., PELLETIER, J., CLAVEAU, S. LALIBERTE, O., L'Hotel-Dieu d. Quebec and Public Health Department of St.-Sacrament, Quebec City.

Since the advent of cyclosporine, no case of PCP had been observed in our renal transplantation unit. From November 1987 to October 1989, 2 clusters of PCP were observed, totalizing 11 cases. After ruling out a "pseudo-epidemic" we performed a case-control study to identify host-related and environmental risk factors. Each case (PCP) was randomized with 3 paired controls matched for the transplantation period. 13 variables were studied, including immunosuppression, coexisting infections, respiratory therapy and geographic factors. TO evaluate a possible human transmission, we defined the "contagious period" of a cs. as 7 days before or after a PCP diagnosis was made. A positive PCP contact was then defined as being hospitalized in our geographic a beds unit during a PCP "contagious period". Statistical analysis was made with the Fisher's exact test (2-Tail). Odds ratio (OR) are also presented. Of all the studied factors, 2 were associated with an increased risk of developing PCP: 1) high doses of colmedrol (≥ 500 mg total do.) during the first month after transplantation ($p = 0.03$, OR = 9.4); 2) "contact" with a PCP during his contagious period ($p = 0.029$, OR = 7.0). The results suggest that besides immunosuppression, human to human transmission may play a role in PCP pathogenesis.

M25 COMMUNITY-ACQUIRED BACTERMIAS FROM CENTRAL LINES *Brown RB, MD; Cipriani D., RN, BSN; Schulte M., RN, MA, CIC; Corl A., RN; and Pieczarka R., LPN, CIC; Baystate Medical Center, Springfield, MA USA. Central lines have become a common method for rendering outpatient IV therapy. However, safety has not been well studied. We conducted a one-year (April '91-March '92) retrospective evaluation of bacteremias associated with the use of central IV lines by a single Home Health Care vendor associated with Baystate Medical Center. Central lines were inserted in the Operating Room using the usual sterile procedures. Dates of line insertions and removals were obtained from both the hospital operating room and the Home Health Care Company. Line care was managed by internal protocols. Total line days were calculated. Community-acquired bacteremias (defined as occurring more than six days after hospital discharge) were determined from records available in the Infection Control Department. Sixty-eight patients received IV therapy from the vendor during the study period. Total line days were 5548 (average 82/pt). Eleven bacteremias occurred in five patients, providing a rate of 1.98 infections/1000 pt days. Two patients, both under age four, accounted for seven of the infections: obth had short bowel syndrome. Based on historical comparisons, outpatient IV therapy appears to be associated with smaller risks of bacteremia than therapy in-hospital. Evaluation of this complication may also allow a method for comparing different vendors.

M26 Incidence of Staphylococcal Blood Stream Infections in Patients at a Tertiary Care University Hospital. *CHRISTIAN RUEF and RUEDI LEUTHY. University Hospital Zurich, Zurich, Switzerland.

OBJECTIVE: To assess the incidence and causes of bacteremias caused by coagulase negative staphylococci (SE) and Staphylococcus aureus (SA) in patients hospitalized in the medical service of a tertiary care University Hospital during 1991. **METHODS:** Retrospective laboratory based detection of all bacteremias caused by SE or SA and chart review to determine time, circumstances and outcome of the bacteremias. **RESULTS:** Staphylococcal bacteremias (SB) occurred in 40 of 5193 hospital admissions to the medical service in 1991 (incidence rate 0.8%/year). Nosocomial infections were responsible for 60% of these infections (incidence rate 0.46%/year). Bacteremia was polymicrobial in 20.8% of nosocomial and 12.5% of community acquired infections. Underlying diseases were present in 95.8% of patients with nosocomial bacteremias, including immunosuppression as a result of disease or treatment in 57% of patients with SA and 70% of patients with SE bacteremia. HIV infection or ultravenous drug use were present in 55% of patients with community acquired SA bacteremias. SE caused 71% (17/24) of nosocomial and 43.8% (7/16) of community acquired SB. Infected intravascular catheters were responsible for 79% of all SB (SE 14/19=74%; SA 5/19=26%). In 21% of the patients bacteremia occurred during a stay in ICU. Overall 5 of 40 patients with SB died (12.5%). The outcome of bacteremias by SA was lethal in 28.6% of nosocomial and 22% of community acquired infections. No death was attributed to SE nosocomial bacteremias. None of the nosocomial bacteremias by SA were caused by a methicillin-resistant strain. **CONCLUSIONS:** Nosocomial bacteremias by staphylococci were observed more frequently in our department in 1991 than community acquired infections. Intravascular catheters are the predominant source of SB. Catheter-associated infections by SA account for 31.3% of all SA infections and 71.4% of nosocomial infections by this pathogen.

M27 Epidemiological Features of Pneumococcal Bacteremia. C. EZPELETA*, J. UNZAGA, P. BERDONCES, E. GOMEZ, I. LARREA and R. CISTERNA. Hospital Basurto, Bilbao, Spain.

Despite the availability of effective therapeutic agents against *S. pneumoniae* mortality of invasive illness has remained high, particularly for infections complicated by bacteremia. The protective efficacy of pneumococcal polyvalent polysaccharide vaccine has been demonstrated in many trials and has been considered necessary for a public health strategy of immunization of persons at high risk to be cost effective.

We had realized a prospective study about epidemiological features of pneumococcal bacteremias have occurred in our hospital during 1992, focusing on indications for pneumococcal vaccination in this group of patients.

S. pneumoniae accounts 8.39% of true bacteremias in our hospital. During 1992, 36 patients had pneumococcal bacteremia. Meanage was 42.54 years (range 0-89), 27 males and 9 females. Clinical findings: 33 pneumonia, 2 meningitis and 1 orbital cellulitis. Hospital acquired bacteremia: 4 cases (11.11%). Penicillin resistance was found in 8 isolaments (22.2%) CMI range between 0.03 - 2 μ g/ml. Rapidly fatal underlying illness was present in 4 patients, while 19 had ultimately fatal and 13 had nonfatal illnesses according to McCabe and Jackson classification. Indications for pneumococcal vaccination were present in 29 patients (80.5%) and were as follows: A- 13 patients had HIV infection. B- 3 patients aged >55 years without other risk factors. C- 10 patients aged > 55 years with another risk factor: 4 COPD, 4 malignance, 2 hepatopathy, 1 diabetes mellitus, 1 splenectomized, 1 congestive heart failure. D- 1 COPD and 1 hepatopathy in patients younger than 55 years. Overall mortality until discharge was 22.2%. Noneone of 36 patients had received previously the pneumococcal vaccine in spite of 29 had indication for receiving it.

We believe that pneumococcal vaccine must be widespread utilized in our hospital. The level of Penicillin resistance in our country should provide increased impetus for its wider use.

M28 Observations of Functional Status (FS) in Patients with Community (CI) and Hospital-Acquired (NI) Bloodstream Infections. *TRISH M. PERL, NING, LI, KENNETH M. FLEGEL. Royal Victoria Hospital, McGill Univ., Montreal PQ Canada and Univ. of Iowa College of Medicine, Iowa City, IA.

Although FS predicts outcome in many chronic medical conditions, it is not known if FS predicts outcome in acute infections. Thus, we prospectively studied 132 patients with bloodstream infections admitted to the Royal Victoria Hospital, a large municipal hospital. Karnofsky (K), Barthel (B) and the Eastern Cooperative Oncology Group (ECOG) performance status scores were obtained for pre-hospital baseline (pre-infection), obtained retrospectively at the time of infection, the time of infection and discharge (or 3 weeks post-infection). Seventy-six (58%) of the episodes were NI. Patients with CAI and NI had similar demographic and clinical characteristics, and therapy. Severity of underlying illness, assessed by the McCabe and Jackson classification and by the types and # of diagnosis was similar among patients with NI and CAI. Of the 24 deaths, 50% (n=12) occurred in patients with NI. At baseline and infection, each of the mean FS scores was significantly worse for patients with NI versus CAI. At discharge, the mean K and ECOG were significantly worse in NI ($p=0.0033$, $p=0.0269$, respectively). Irrespective of infection type, mean scores for all FS measures were significantly lower at the time of infection (from baseline) and then increased at discharge. Although, 42/76 (55%) patients with NI and 38/56 (68%) with CAI returned to baseline FS ($p=NS$), the mean FS scores did not return to baseline levels. Using a repeated measures model to test for the significance of effects and to control for patient differences, decrease in FS from baseline to infection and increase in FS from infection to discharge was significant and associated with NI. Poor FS may be a marker for patients hospitalized and who develop NI. Patients with poor FS and NI may be less likely to return to baseline function. Further investigation of the impact of FS on outcome in NI and CAI would be useful.

M29 Blood Culture Contamination: Epidemiology And The Role of Immunoblotting. R SHERMAN, *M MULLIGAN, W GORNICK, R KWOK, L FLIONIS, T NGUYEN, J KONSTANTARAKIS, M DECKER, R HOLLIS, M PFALLER AND L THRUPP. Univ of California, Irvine; VA Medical Center, Long Beach; and Oregon Health Sciences University.

Of 5266 sets of blood culture specimens obtained during 6 months at a university hospital, 11% were positive. Of these, approximately 24% were due to non-hospital-acquired infections, 35% due to nosocomial infections, and 41% contaminated. The most common contaminating organisms were coagulase negative staphylococci (CNS). Information about anatomic site of blood draw, type of phlebotomist, and patient location was available for 2482 (47%) of these cases. Contamination rates by site were: femoral, 10.4%; catheter, 6.2%; scalp, 4.5%; upper extremity, 3.7%; lower extremity other than femoral, 2.7% ($p=0.05$). For the upper extremity cultures (81% of the total), contamination rates were 3.8% for physicians (MD's) and nurses (RN's) but 1.3% for certified phlebotomists ($p<0.05$). Of upper extremity cultures drawn by MD's and RN's only, contamination rates were 25% when drawn in the medical wards and 4.9% when drawn in the intensive care units ($p<0.05$). Immunoblot typing of selected CNS representing each ward and phlebotomist group gave reproducible results and distinguished strains within species, offering the possibility of determining whether contaminants are of patient or phlebotomist origin.

<p>M30 Nosocomial Pneumonia in a Teaching Hospital in Guatemala City, Guatemala. D.E. BERG*, R.A. WEINSTEIN, C.A. RAMIREZ, Y. ALVAREZ and R.C. HERSHOW University of Illinois, Chicago, IL and Hospital Roosevelt, Guatemala City, Guatemala.</p> <p>For 3 months, patients admitted to the adult medical-surgical ICU in an 800-bed public hospital in Guatemala were prospectively followed for development of nosocomial pneumonia (NP). Using CDC criteria, we diagnosed NP in 41 of 123 admissions: 37 (53%) of 69 patients on a ventilator had pneumonia compared to 4 of 54 cases not on a ventilator (RR 7.24 $p < .001$). In 19 (49%) of the 41, NP contributed to death. NP was seen in 54% of head trauma patients and in 28% without head trauma (RR 1.92 $p < .01$). The most common respiratory pathogens were <i>Pseudomonas aeruginosa</i> (19%), <i>Acinetobacter</i> spp. (17%), <i>Staphylococcus aureus</i> (16%), <i>Klebsiella</i> spp. (11%) and <i>E. coli</i> (10%). In comparison, <i>Acinetobacter</i> spp. represent only 3% of ICU respiratory pathogens in CDC NNIS hospitals. Respiratory suction catheters were stored in acetic acid at each patient's bedside; there were also two containers of sterile rinse water (SW) which were changed with the catheters every 8 hours. We obtained daily tracheal aspirates (TA) and SW samples in 12 consecutive patients: 7 (58%) of 12 had pneumonia. Six (86%) of the 7 had causative pathogens recovered from SW prior to pneumonia. <i>Acinetobacter</i> was the most common organism found in TA and SW. Acetic acid and fresh suction catheters were sterile. In addition, forty hand cultures from ICU nurses and housestaff revealed 4 positive cultures, 3 (7.5%) of which demonstrated <i>Acinetobacter</i>. These data suggest that respiratory suctioning using "sterile" rinse water contaminated by hands of personnel may contribute to NP. We are evaluating methods of removing this risk that will be feasible in an ICU in a developing country.</p>	<p>M31 Two Methods of Estimating the Economic Impact of ICU Patients Who Acquire a Nosocomial Lower Respiratory Infection: Estimating the Excess LOS and Financial Losses. *JULIAN JOLLON, Green Hospital of Scripps Clinic, La Jolla, CA.</p> <p>During 1991, 43 Intensive Care Unit patients acquired a Nosocomial Lower Respiratory Infection. These LRI's are represented by 18 cases of Pneumonia and 25 cases of Bronchitis (Tracheobronchitis). We quantified the Excess Length-of-Stay of these cases by performing a Matched Case-Cohort study. Forty-one of the 43 patients were matched with similar patients on the following criteria: same sex; age within 10 year; had undergone the exact same Surgical Procedures; had the exact same DRG; and had the exact same diagnosis. In performing the Financial Analysis, a Cost-Charges Ratio (CCR) was determined for the ICU (79%). All patient charges were then adjusted by the CCR to yield a more reliable "cost". Final reimbursement figures were deducted from the adjusted patient charges to yield the Gain/Loss per case. Results confirm that patients who suffered from Nosocomial Pneumonia required 20 extra days stay at a mean Loss of \$52,010. Those who acquired Bronchitis required 13 extra days stay at a mean loss of \$38,115. For the year 1991, we concluded that the institution lost \$1,877,362 with a total excess LOS of 681 days due to Nosocomial Lower Respiratory Infections.</p>
<p>M32 Ventriculoperitoneal (VP) shunts complicated by cryptococcal infection. * CERIS INGRAM, HUBERT HAYWOOD, VICKI MORRIS, and JOHN PERFECT, Raleigh Infectious Diseases, Raleigh, NC and Duke Univ Med Center, Durham, NC.</p> <p>Two patients (pts) presented with symptoms of progressive hydrocephalus in August 1991. Each pt received a VP shunt on the same day by the same surgeon using materials from a common vendor. Both pts presented within 6 to 8 weeks with symptoms of fever, headache and rash and cultures of spinal fluid (CSF) that yielded <i>Cryptococcus neoformans</i>. Each pt recovered after therapy with amphotericin B and flucytosine followed by several months of fluconazole, although one pt required replacement of the VP shunt for cure. Review of each pt's history and CSF prior to the shunt suggested reactivation of a preexisting infection. Isolates of <i>C. neoformans</i> from each pt were submitted for analysis by colony morphology, biochemical testing, and karyotyping by pulse field electrophoresis. Each isolate was found to be unique. The appearance of cases of cryptococcal VP shunt infection appears to be a complication of shunts placed in a previously infected person rather than nosocomial transmission of <i>cryptococcus</i> during placement.</p>	<p>M33 A Clinico-Epidemiologic Analysis of Recurrent Nosocomial <i>Clostridium difficile</i> Diarrhea. *MATTHEW SAMORE, DEBORAH LICHTENBERG, RICHARD GIARDINA, J. DAVIS ALLAN, PAOLA DEGIROLAMI, DALE GERDING, ADOLF KARCHMER, New England Deaconess Hospital, Boston, MA, Minneapolis V.A. Medical Center.</p> <p>Recurrences of <i>C. difficile</i> diarrhea add to the difficulty of controlling this nosocomial infection. Active surveillance of <i>C. difficile</i> diarrhea was initiated at NEDH in 1988. The clinical characteristics of recurrent <i>C. difficile</i> diarrhea were reviewed. Using restriction endonuclease analysis (REA) of <i>C. difficile</i> isolates, strain and risk of recurrence were correlated in 39 pts (24 non-recurrent diarrhea; 15 recurrent diarrhea). Recurrent episodes were defined by diarrhea and a positive stool cytotoxin > 10 days after the initial positive stool. Of 652 patients (pts) with <i>C. difficile</i> diarrhea between Jan/88 and Dec/92, 83 (13%) had recurrences (total number of recurrences: 104). The risk of recurrence was similar in pts treated with vancomycin vs metronidazole (13% vs 14%). Surgical ICU patients had 2 fold higher risk of recurrence than non-ICU pts (11/45 (24%) vs 72/607 (12%); $p = .02$). The median interval between recurrences was 33 days (range: 11-911 days); the interval was > 60 days in 32% of recurrences. Thirty-four percent of recurrences occurred prior to discharge. <i>C. difficile</i> strains from 15 pts with recurrent diarrhea were typed by REA. REA types from initial and recurrent episodes were identical in each of the 6 pts whose isolates were typed from both episodes (median interval between episodes: 31 days). Three REA groups (W,Y,G) were significantly more frequent in patients with recurrences than pts without recurrences (14/15 vs 9/24; $p = .001$). In conclusion, approximately 1/3 of <i>C. difficile</i> recurrences occurred prior to discharge and 1/3 occurred > 60 days after the initial episode. The association between specific REA groups and recurrent diarrhea suggests that distinct toxigenic strains may differ in virulence.</p>
<p>M34 Predicting Multiple Nosocomial Infections in Intensive Care Units: A Case Control Study. *WT SHOCKOR, DK MORRIS, M. FOSTER, B MCTAGGART, RA KHAKOO, West Virginia University, Morgantown, WV.</p> <p>Nosocomial infection (NI) contribute to patient morbidity and the cost of health care. Our goal was to identify important risk factors for the development of multiple NI among patients admitted to intensive care units (ICU) that could be easily obtained on admission to the unit. Cases (n=75) were randomly selected from all patients who developed more than one NI while hospitalized in a ICU between January 1987 and December 1990. Controls were confirmed not to have any NI, and matched for unit type and date of admission. Chart were abstracted twice by reviewers blind to case-control status. Cases developed 3 to 5 NI: 53 urinary, 52 blood, 41 respiratory, 23 wound, and 18 other infections. Upon admission to the ICU, cases had more invasive devices (6 vs 5, $p = 0.0005$), more medical problems (5 vs 4, $p = 0.02$), and higher APACHE II scores (16 vs 13, $p < 0.006$). They were more likely to die (38% vs 22%, $p < 0.04$). Exposure to antimicrobials, chemotherapy, steroid, hyperalimentation, dialysis, radiation, or invasive device before admission to the ICU was associated with case-control status, "or was length of hospitalization before admission to the ICU, only "number of invasive line during the first 2 day of ICU admission had independent effect on case-control status. No simple stratification system discriminated well between case and control. We did find that use of invasive devices and measures of severity of ill... (APACHE II and number of medical problems) were strongly associated with the development of multiple nosocomial infection* in the ICU.</p>	<p>M3.5 INFECTIONS IN NEUTROPENIC PATIENTS</p> <p>* P. CARLISLE, R. GUCALP, P.H. WIERNIK ALBERT EINSTEIN CANCER CENTER, BRONX, NY 10467</p> <p>During the 54 month period between 7/88 and 12/92 we performed continuous prospective surveillance for nosocomial infections (NI) in neutropenic patients (NP). The population consists of patients with hematological and solid malignancies undergoing high dose chemotherapy with and without bone marrow transplantation. Criteria and definitions of infection for NP (absolute neutrophil counts $1000/mm^3$) were developed and surveillance was carried out by a certified infection control nurse and a senior oncology fellow. A total of 575 NI were identified in 1241 NP during 12,587 days of neutropenia for an overall rate of 46.3 per 100 NP or 45.7 per 1000 days at risk. The rate of blood stream infection per 100 NP was 14.5 (gram positive 9.9; gram negative 5.2; candida 1.2). Other site specific rates were urinary tract 5.2; respiratory 5.2; thrush 5.9; skin 2.9; and GI tract 3.3. Among 509 pathogens identified, there were 187 (37%) gram positive cocci, 137 (27%) gram negative rods, 80 (16%) candida, 53 (10%) gram positive rods, 27 (5%) viruses, and 15 (3%) aspergillus.</p>

<p>M35.1 Bacteremia in Patients with Hematological Disorders: A Survey of 175 Bacteremia Episodes. MARGARITA RUBIO; LUISA PALAU, JOSE ROMERO, JOAQUIN DIAZ-MEDIAVILLA, JUAN J. PICAZO Hospital Universitario de San Carlos, Madrid</p> <p>In order to assess the aetiology and clinical outcome of bacteremia episodes (BE) in patients with hematological malignancies, all BE from patients of the Hematology Unit of our hospital appeared during 1990-1992 were studied retrospectively. Clinical, analytical and evolutive data from 170 BE corresponding to 101 patients were recorded.</p> <p>From January 1990 to December 1992, 2.166 BE were detected in our hospital. Aerobic gram positive bacteria caused 1.073 BE (49.54%) and aerobic gram negative bacteria 733 BE (34.02%). In hematological patients aerobic gram positive bacteria were isolated in 1.07 BE (69.93%) and aerobic gram negative bacteria caused 30 BE (19.61%). In both groups, the most frequent pathogens were: coagulase negative <i>Staphylococcus</i> (13.7% in the hospital and 34.83% in the Hematology Unit), <i>S. aureus</i> (17.36% and 11.23 respectively), <i>E. coli</i> (14.73% and 7.3%). The fourth bacteria in frequency at the Hematology Unit was <i>S. viridans</i> group (4.49%) while at the hospital were <i>Enterococcus</i> and <i>S. pneumoniae</i> (4.29% both). Polymicrobial BE were more frequent in hematological patients (14.04%) than in the others inpatients (6.68%).</p> <p>When comparing neutropenic and non-neutropenic hematological patients, a more frequency of BE caused by <i>S. viridans</i> group and anaerobic bacteria was observed. A total of 34 hematological patients died; 18 of these patients were neutropenic. Seven neutropenic and nine non-neutropenic patients died during the BE.</p> <p>Conclusions: 1. The number of BE detected in patients with hematological disorders was fivefold the number of BE detected in non-hematological patients. 2. Bacteremias due to gram positive bacteria were more frequent in hematological patients ($p < 0.01$). 3. In neutropenic hematological patients BE due to anaerobic bacteria and <i>S. viridans</i> group were more frequent than in non-neutropenic hematological patients ($p < 0.05$). 4. The mortality rate was similar in neutropenic and non-neutropenic patients. 5. The mortality during bacteremia due to gram positive and gram negative bacteria was similar.</p>	<p>M36 An Integrated Computer-based Surgical Wound Surveillance Program (SWSP). ELIZABETH HENDERSON*, KAREN MYRTHU HOPE, DONNA LEDGERWOOD THOMAS LOUIE, University of Calgary, Faculty of Medicine and Calgary General Hospital, Calgary, Alberta, Canada</p> <p>An integrated computer-based SWSP has been used for 10 years at this 850 bed medical-teaching facility. In 1990, the database was upgraded and switched from mainframe to PC. The SWSP consists of 4 parts. The OR enters Part I which consists of operative data on each patient. All procedures performed in the OR are coded using ICD-9 procedure codes by clerical staff in Infection Control (Part II). Prospective surveillance using laptop computers is done by ICPs to compile patient risks (Part III) and infection data (Part IV). Patient risk data includes ASA physical status classification, NNIS surgical risk index, prophylaxis use and foreign body insertion data. Infection data consists of criteria for diagnosis, grading of infection severity, antimicrobial therapy and length of stay. CDC definitions for nosocomial infections are used. Part IV is used to record culture and sensitivity results. Eighteen months of data from the database will be presented. Prospects for the future include extension of the database to post-discharge, ICU and other high-risk unit surveillance as well as integration of databases from the laboratory and pharmacy. Portable databases can be used to compile information from a variety of data sources without duplication of effort.</p>
<p>M37 How to Compare Surgical Site Infection (SSI) Rates Using Aggregated Data from the National Nosocomial Infections Surveillance (NNIS) System. TERESA HORAN*, DAVID CULVER, ROBERT GAYNES. Centers for Disease Control and Prevention, Atlanta, GA.</p> <p>Improvement in the quality of patient care requires proper interpretation of rates of adverse events associated with hospitalization. In 9/91 we published aggregated NNIS SSI rates by operative procedure and risk index category. Since then the data in this two-way table have been grouped into four risk "strata": Low (L), Medium Low (ML), Medium High (MH), and High (H). The SSI risk for procedures in each stratum is as follows: L risk, <2%, ML risk, 2% to <5%, MH risk, 5% to <9%, and H risk $\geq 9\%$. For example, laparotomy with one risk factor and gastric surgery with no risk factors are both considered ML risk procedures. By combining procedures with similar risk category rates into risk strata, more accurate estimates of SSI rates may be calculated since the denominators will include more procedures. Once a hospital's data have been grouped in this way, it is possible to use the NNIS rates as benchmarks for comparison. The NNIS SSI rates can be compared with the following representative rates in a hospital by using the Z-test: 1) procedure-specific stratum rates (e.g., for MH risk cardiac surgery), 2) procedure-pooled stratum rates (e.g., for all ML risk procedures done by Dr. X), and 3) risk stratum-adjusted rates. By following the examples provided, hospital epidemiologists will have an important tool with which they can influence the quality of care in their institutions</p>	<p>M38 Nosocomial Pneumonias Following Surgical Procedures. *PATRICIA LEMON, AUDREY ADAMS, KATHI MULLANEY AND MICHELA T. CATALANO, Montefiore Medical Center, Bronx, New York</p> <p>The Infection Control Unit in our 749 bed teaching hospital performs ongoing Surgical Surveillance as a member of the National Nosocomial Infection Surveillance System (NNIS). Descriptive analysis was performed on data from November 1988 through November 1992, of 3,061 post-operative patients who were prospectively followed until discharge, for the development of nosocomial pneumonias. The operative procedures included Coronary Bypass (17%), Cardiac (7%), Cholecystectomy (9%), Colon (3%), Craniotomy (11%), Ventricular Shunt (4%), Joint Prosthetics (11%), Mastectomy (4%) Open Reduction Fracture (12%), Spinal Fusion (10%) and Vascular Surgery (12%).</p> <p>A total of 184 patients developed pneumonia for an overall rate of 6.03%. The onset of pneumonia ranged from 1-85 days post-operation. The mean duration of onset was 7.3 days and the median was 4 days. Ninety-one of the pneumonias were ventilator-associated (60%). Ten of the patients developed secondary bacteremias (6%). When the pneumonias were stratified by risk index levels (0-3, as defined by NNIS), a correlation between the levels and increased pneumonia rates was observed (1.15%, 4.18%, 9.72% and 10.53%, respectively). The most frequent isolated pathogens were <i>S. aureus</i> (8.09%), <i>P. aeruginosa</i> (12.74%) and <i>Enterobacter species</i> (9.91%). No pathogen was identified in 12.28% of the pneumonias. When stratified by procedure, Cardiac Surgery had the highest rate (9.42%), followed by Craniotomies (8.36%) and Vascular Surgery (8.68%). The lowest rate (80%) occurred following Ventricular Shunt procedures. This data analysis has provided an overall review of post-operative pneumonias, and identified a correlation with risk index levels.</p>
<p>M39 Surgical ICU <i>C. albicans</i> Cluster: Investigation of Transmission by Karyotyping with CHEF Electrophoresis. ANDREAS VOSS*, MICHAEL A. PFALLER, RICK J. HOLLIS, J. RHINE-CHALBERG, BRADLEY N. DOEBBELING. Univ. of Iowa College of Medicine, Iowa City, IA., and Oregon Health Sciences University, Portland, OR.</p> <p>An apparent outbreak of <i>C. albicans</i> bloodstream infections (BSIs) occurred over a three-week period in a surgical ICU [SICU]. Five patients developed <i>C. albicans</i> BSIs per 417 patient days (PD), versus 6 per 6,232 PD the prior year (incidence density ratio = 12.5, CI₉₅ = 3.8-40.8). The outbreak occurred in an open SICU ward with adjoining beds, where patients were in close proximity and often cared for by the same health care worker (HCW). Five of the six infected patients were insulin-dependent diabetics, each exposed to ward-stock insulin; however, cultures of all 12 insulin bottles in use in the SICU were negative, as were pressure transducers. Hand and throat cultures were obtained prospectively from 30 HCWs over a two-week period after identification of the cluster. <i>C. albicans</i> was isolated from the hands of five (17%) and the throat of one (3%). Karyotyping by contour-clamped homogeneous electric field (CHEF) electrophoresis performed independently at our two centers demonstrated an excellent level of agreement (kappa statistic = 0.84). Karyotyping of 23 <i>C. albicans</i> isolates from patients and 6 from HCWs revealed 15 different patterns. Two patients were infected with the same strain of <i>C. albicans</i>. The last patient of the cluster was infected with a different strain with a karyotype identical to one previously recovered from the hands of a HCW. These data support the concept of limited cross-infection with <i>C. albicans</i> among ICU patients in close proximity and implicate the hands of HCWs as an important mode of transmission. CHEF-karyotyping is a highly reliable and reproducible technique in the investigation of a <i>C. albicans</i> cluster.</p>	<p>M40 Nosocomial Infection and Intubation on a Burn Critical Care Unit. M. KARAJOVIC, R. WURTZ* M. HANUMADASS, E. DACUMOS. Cook County Hospital, Chicago, IL</p> <p>Although many studies have reviewed burn wound infections (BWIs) in burn patients, few have prospectively surveyed other nosocomial infections. Seriously burned patients are clearly at increased risk for infection due to the nature of the burn injury itself, immunocompromising effects of burn injury, prolonged hospital stays, and invasive diagnostic and therapeutic procedures. Over 6 months, we prospectively reviewed all patients admitted to our burn intensive care unit (BICU) for nosocomial infections. We used standard CDC definitions of nosocomial infections (NIs). Because we had previously documented a high incidence of nosocomial pneumonias in these patients, we were particularly interested in determining risk factors for nosocomial pneumonia. Surveillance demonstrated 30 NIs in 20 patients, for a total of 75 NIs per 100 discharges and deaths, or 37 NIs/1000 patient days. Infections included 16 pneumonias, 7 urinary tract infections, 4 bacteremias, and 2 BWIs. Inhalational injury and intubation were associated with pneumonia and burn wound infection. Forty-seven percent of all patients were intubated at some time during their BICU stay, but 76% of those who developed a nosocomial infection were intubated. All patients who developed pneumonia or a BWI were intubated. Forty percent of NIs were attributed to Gram positive COCCI (GPC) and 14% to fungi (<i>Candida albicans</i>), consistent with reports from burn units and other intensive care unit settings of increasing incidence of NIs due to these types of organisms.</p>

<p>M41 Underestimation of surgical wound infection rate in obstetric and gynecology. * Z. MEMISH, MD, D. GRAVEL-TOPPER, BScN., C. OXLEY ART, G.E. GARBER, MD. Ottawa General Hospital, University of Ottawa, Ottawa, Canada.</p> <p>With the increasing volume of same day Surgeries and shortened hospital Stays, it is more likely that a percentage of surgical wound infections occur after hospital discharge. To document the true incidence of post-surgical wound infection surveillance in obstetric and gynecology patients. The study consisted of 2 parts:</p> <ol style="list-style-type: none"> 1. A questionnaire mailed to each surgeon inquiring about clinical evidence of infection. The Infection Control Service continued to do surveillance of wound infection in the usual manner and the results of the 2 methods were compared. 2. A questionnaire to patients undergoing the surgery inquiring about signs and symptoms of wound infection. <p>A total of 469 surgeries were included with a total of 25 (5.212%) infections detected. 14 (58.3%) infections were detected by the usual surveillance method. An additional 10 (41.7%) infections were detected after patient discharge by the physician questionnaire. Only 2/24 infections were detected by the patient questionnaire. Failure to include post-discharge wound Surveillance will result in a substantial underestimation of the true wound infection rate. Physician input and strong support has prompted a regular bi-annual post-discharge wound surveillance.</p>	<p>M42 Surveillance for Infection After Cesarean Section (CS). CINDY YORK* and DAVID L. GEORGE, Baptist Memorial Hospital. Memphis, TN.</p> <p>1107 consecutive women undergoing CS were prospectively followed for development of postoperative endometritis (EM) or wound infection (SWI). 1988 CDC definitions were used. In addition "probable" EM required the presence of ≥ 2 of the following: 1) fever $\geq 38.0^{\circ}\text{C}$ or antibiotic therapy, 2) abdominal pain or uterine tenderness. 3) physician diagnosis of EM. Surveillance methods included 1) medical record review. 2) phone interview 28-35 days after CS, and 3) monthly questionnaires mailed to physicians.</p> <p>Post-CS infections included 85 probable EM, 4 definite EM, 89 incisional SWI, and 2 deep SWI. Sensitivities for detecting EM (definite or probable) were 74% chart review, 31% phone interview, and 30% physician questionnaire. Sensitivities for detecting SWI were 12% chart review, 76% phone interview, and 30% physician questionnaire. All methods were $\geq 99\%$ specific for EM and SWI. Among potential stratifying variables, urgent (vs. elective) CS status was associated with significantly higher EM rates (RR=2.43, $p<.001$, chi square test) and somewhat higher SWI rates (RR=1.41, $10>p>.05$). Variables which did not differ significantly for infected and uninfected patients (either EM or SWI) included duration of surgery, ASA score and wound classification. In conclusion, chart review is ineffective for SWI after CS, and post-discharge phone interview may be helpful. Urgent status may be useful for stratification.</p>
<p>M43 Study of Endometritis in Cesarean Section (c/s) Patients: Efficient/Effective Case Finding C BAKER*, J FLEISCHMANN, C CHENOWETH, C FRIEDMAN. UNIV OF MICHIGAN MEDICAL CENTER, ANN ARBOR, ILL.</p> <p>Endometritis (endo) is a possible complication of delivery among patients undergoing c/s, resulting in increased costs and patient suffering. We compared various case finding (cf) techniques to determine a simple and accurate method for collecting post c/s endo data. We reviewed charts of all patients undergoing c/s (167 total) during 3/1/91 - 7/31/91. This review yielded 10 cases of endo (rate = 6.0/100 cases). These data were compared to cf methods using a) microbiology data, b) infection report forms from nursing and c) computerized reports linking c/s patients with intravenous (iv) antibiotic (abx) usage data and admit/discharge diagnoses. Most cases of endo were detected using the computerized reports because all cases required inpatient iv abx. We also studied various risk factors (rf) which may predispose patients to endo, as a possible means for identifying a high risk population for surveillance. Important rf included immunosuppression, incision type, prematurity, breech presentation and time of surgery. None of the rf assisted in targeting a high risk population. In our institution, cf using a computerized report linking c/s patients with iv abx usage data and admit/discharge diagnoses is the most effective method of detecting post c/s endo and the most efficient use of the infection control department's resources.</p>	<p>M44 Ceftizoxime Versus Cefoxitin in Prophylaxis and Treatment of Surgical Patients. Z. MEMISH*, H. LE, M. TIERNEY, C. OXLEY, G. GARBER. Ottawa General Hospital, Ottawa, Canada</p> <p>In our tertiary care centre, the effect of an automatic substitution of ceftizoxime 1 g Q12 from cefoxitin 2 g Q6 hours was studied in terms of appropriate use, cost and infection rate.</p> <p>An initial cefoxitin audit was performed in 1989 by the pharmacy department along with a 4 month systematic surveillance of clean contaminated wound infection by the infection control service. After the ceftizoxime substitution was started, an audit of its use using the identical criteria was initiated. A second 4 months surveillance of wound infection was also repeated.</p> <p>Ceftizoxime was used in 70 patients, for surgical prophylaxis in 81% and for treatment of infection in 19%. The appropriateness of use was similar in both the cefoxitin and ceftizoxime. Of inappropriate use, prolonged duration of therapy was the principal cause. The cost savings incurred on an annualized basis in 1991 was \$91,701. The change of ceftizoxime from cefoxitin resulted in a similar post-operative infection rate but ceftizoxime use cost significantly less. Additional cost savings can be realized by education to improving drug utilization.</p>
<p>M45 Evaluation of Recommended Infection Control Measures in Preventing Nosocomial Transmission of Multidrug-Resistant Tuberculosis. S.MALONEY*, M. PEARSON, M. GORDON, R. DEL CASTILLO, J. BOYLE, W. JARVIS, Centers for Disease Control, Atlanta, GA and Cabrini Medical Center, NYC, NY.</p> <p>Recently, nosocomial outbreaks of multidrug-resistant tuberculosis (MDR-TB) have been reported at several hospitals. In 1991, we investigated an outbreak of MDR-TB at Cabrini Medical Center (CMC) that occurred during January 1990-March 1991 (epidemic period). Data supported patient-to-patient transmission of MDR-TB at this hospital. Infection control measures were instituted to prevent further transmission, and we conducted a followup investigation to assess the efficacy of these measures. A case was defined as any CMC patient with TB during April 1, 1991-August 11, 1992 (post-epidemic period) and an <i>H. tuberculosis</i> isolate resistant to isoniazid and rifampin. Seventeen patients met the case definition. Of these, 10 were considered post-epidemic case-patients; the other seven had documented exposures to MDR-TB patients at CMC during the epidemic period and were considered additions to the epidemic cluster. The proportion of TB patients with MDR-TB decreased in the post-epidemic compared with the epidemic period (10/51 vs 30/78, odds ratio [OR]=2.6, 35% confidence intervals [CI]=1.1-6.4, $p=0.04$). Infection control measures instituted during the post-epidemic period included earlier isolation of suspected TB patients, negative pressure isolation rooms, more rapid laboratory diagnostics, and restriction of cough-inducing procedures to isolation booths. Our data suggest MDR-TB transmission from patient-to-patient has decreased since the institution of infection control measures recommended in the CDC TB guideline.</p>	<p>M46 Effect of Silver/Copper Ionization on Legionella pneumophila in Potable Hot Water Following an Outbreak of Nosocomial Legionellosis. W.J. RIEBEL,* Lakewood Hospital, Lakewood, Ohio.</p> <p>An outbreak of nosocomial legionellosis in a community hospital that primarily serves elderly patients was traced to the potable hot water system. Silver and copper ionization (Tarn-Pure USA, Burr Ridge, IL) in the recirculating hot water system was chosen as the sole method of environmental control. Although the hospital was initially inadequately equipped, silver ion concentrations exceeding 5 $\mu\text{g/l}$ have been achieved for over 14 months. When levels have been maintained at or above this level, the frequency of isolation of <i>L. pneumophila</i> from 50 ml hot water samples from tanks and sinks has been reduced from 24% to 1% ($P<0.0005$, χ^2). To maintain these silver concentrations, the electrodes have required cleaning at intervals varying from between one and four months. When levels fell below 5 $\mu\text{g/l}$ for four weeks due to inadequate electrode cleaning, water samples again grew <i>L. pneumophila</i>. The only isolation of <i>L. pneumophila</i> with silver concentrations exceeding 5 $\mu\text{g/l}$ has occurred recently, perhaps related to plumbing construction. Control of sporadically occurring clinical cases of <i>L. pneumophila</i> pneumonia has paralleled the environmental control; nosocomial legionellosis has not been detected in 18 months.</p>

<p>M47 Active Role for Hospital Epidemiology in an Outbreak of Meningococcal Disease. *MICHAEL EDMOND, RICK HOLLIS, ALISON HOUSTON and RICHARD WENZEL, University of Iowa College of Medicine, Iowa City, Iowa.</p> <p>Ova a 2-month period, 5 cases of meningococcal disease were reported in young adults from a university community of 60,000 inhabitants. Blood cultures from 4 of the cases grew <i>Neisseria meningitidis</i> (cerebrospinal fluid (CSF) was also positive in one), and in an additional cue the organism grew only in CSF. All isolates were serogroup C. Standard epidemiologic workup by the hospital epidemiology team revealed that cases 1 and 2 were unacquainted college students who had independently attended a football game and social activities at a university (neighboring state) where an outbreak of group C meningococcal disease in students had been reported (9 cases and 3 deaths). Cue 3 was a bartender at a local tavern who had no contact with the previous cases; subsequently, cases 4 and 5 were found to be patrons of the same tavern. Antibiograms of isolates of cases 1 and 2 were similar (rifampin susceptible), but differed from isolates of cases 3, 4 and 5 which had similar patterns (rifampin resistant). Contour-clamped homogeneous electric field electrophoresis of chromosomal DNA restriction enzyme digests (CHEF-RFA) revealed an identical banding pattern for cases 1 and 2, which differed from the pattern seen for isolates from cases 3, 4 and 5. The data suggest the existence of two distinct meningococcal strains responsible for the cluster of cases, and the utility of CHEF-RFA for molecular typing of <i>N. meningitidis</i>. To protect its undergraduates the University of Iowa in consultation with Hospital Epidemiology offered free vaccine to all college students; 18,000 students received quadrivalent vaccine over a 5-day period in December 1992.</p>	<p>M48 Wound Dressings Can Provide Viral Barriers. *CAROLE JOHNSON, DANIEL PRINCE AND PHILIP BOWLER. ConvaTec WHRI, Skillman, NJ, and Deeside, UK, Gibraltar Biol Lab, Inc, NJ.</p> <p>A series of studies were conducted to establish: a) methods by which wound dressings should be tested for their ability to provide an effective viral barrier for both health care workers as well as patients; and, b) comparatively evaluate a series of modern dressings versus standard gauze-type products to determine which would be appropriate for inclusion in an exposure control plan as described in the recent OSHA regulations. METHODS: One method was the American Society of Testing and Materials procedure and used Phi-X 174 as a surrogate for HIV and HBV. Dressings tested were gauze, DuoDERM[®], DuoDERM[®] Extra Thin, and DuoDERM[®] CGF. RESULTS: A complete barrier to Phi-X 174 virus with the 8 hydrocolloid dressings prevented at least 10 plaque forming units per ml from passing through their matrices. CONCLUSION: Modern occlusive dressings were found to be effective viral barriers which could protect both the patient and care giver while current gauze-type dressings were deemed unacceptable for use in areas where exposure control would be a consideration.</p>
<p>M49 Should Routine Syphilis Screening be Reinstated. *SJ SARGENT, PH JENKINS, BR JENNINGS, MM SMITH. Univ. of Tennessee. Memphis, TN.</p> <p>Most hospitals discontinued routine syphilis screening in the 1970's based on the declining incidence of syphilis. Steady increases in syphilis have subsequently occurred since the mid-1980's including Memphis which currently ranks 5th among large cities. In 1992, 1007 consecutive inpatients and 999 emergency room (ER) patients at an inner city hospital were tested for syphilis by RPR and confirmed by MHA-TP. Information on prior history of syphilis was obtained from the local health department. Positive RPR's were found in 83 inpatients. Of those 41 (4.1%) were new cases, 33 (3.3%) had a previous history and 9 (0.9%) were false positives. The population included B=743, W=250, and other=4 with 54% females and 46% males. Among ER patients, 85 reactive RPR's were obtained with 40 (4.0%) new cases, 32 (3.2%) with a past history, and 13 (1.3%) false positives. Demographics included B=784, W=207, and other=8 with 42% females and 58% males. Seroprevalence among new inpatient cases was highest for those age 20-39 and ≥ 70 with significantly more new cases among blacks compared to whites (p=0.016). There were no differences based on sex. With approximately 40 new cases of syphilis detected in each group and based on 23,000 annual hospital admissions with 74,000 annual ER visits at this hospital, a significant number of new cases could be identified by routine screening of all patients, particularly among blacks. This suggests that areas with high rates of syphilis should consider reinstating routine surveillance.</p>	<p>M50 Minimizing Legionella Pneumophila Risk in a Retro-Fitted Autologous Bone Marrow Transplantation Unit. *M.D. BATT*, S. BICCOM, L. WHITE, J. BITRAM. Lutheran General Hospital, Park Ridge, IL.</p> <p>In July, 1991, the decision was made to proceed by year-end with an Autologous Bone Marrow Transplantation (BMT) Program, using the existing Oncology Unit in a 32-year old hospital building. Within tight budgetary and time constraints, 4 beds in the 25-Bed Oncology Unit were to be retro-fitted to minimize the exogenous microbial burden that would be experienced by the BMT patients who are confined to their rooms for an average of 4 weeks while profoundly immune compromised. The Hospital Epidemiology Unit obtained pre-construction air and water samples for baseline cultures. All initial hot water samples from the shower heads and sink hot water fixtures demonstrated 4 plus growth of Legionella Pneumophila Type 1. Existing hospital geography did not offer the option of a separate hot water source. Hyperchlorination, superheating, or ion treatment of the entire hospital water system was considerably less cost effective than an in-wall UV irradiation of the plumbing to these 4 rooms. Following installation of the UV system, follow-up water cultures have shown marked reduction (but not elimination) of growth of Legionella Pneumophila Type 1. Monitoring each BMT patient on admission and discharge from the unit for urinary Legionella Pneumophila Antigen complements our ongoing water surveillance program. To date, no BMT patients have developed Urinary Legionella Antigen.</p>
<p>M51 Handwashing In Intensive Care Units (ICUs): A Prospective Feedback Study. B.N. DOEBBELING,* G.L. STANLEY, & R.P. WENZEL. The Univ. of Iowa Coll. of Medicine, Iowa City, IA.</p> <p>We recently reported the results of an eight month prospective clinical trial of alternative handcleansing agents in reducing nosocomial infections in three ICUs. Initial handwashing training and feedback of compliance rates and hand culture results were performed monthly. We covertly observed handwashing compliance from each ICU's nursing station during randomly selected intervals distributed throughout the day and night among all three nursing shifts. Unique patients were observed for 0.5 hr. periods after random selection of all occupied beds (152 total hrs). The definition of handwashing compliance was strict for each setting: 1) Initial (Prior to direct patient contact), 2) Contaminated (moving from a contaminated to a clean site), 3) Sterile (prior to a sterile procedure), 4) Gloves (after glove removal) and 5) After (after direct contact). Compliance was lowest before initial contact (24%), but significantly higher for the Contaminated (57%), Gloves (53%), After (51%), and Sterile (43%) opportunities (Chi Sq=92.7, 4 d.f., p < 1x10⁻⁸). Rates of overall compliance varied among nurses (46%), radiology technicians (22%), student nurses (19%), nursing assistants (19%) and others. Observed compliance was significantly higher on the night (58%, Clog=49-67) than either the day (41%, Clog=37-44) or evening (35%, Clog=30-39) shifts. Overall compliance (40%) was similar to those previously reported. However, our strict definitions of compliance with multiple observations per HCW and the higher rates observed for most handwashing opportunities suggest that the combination of training and feedback may be effective in improving compliance.</p>	<p>M.52 Risk Factors For Pulmonary Tuberculosis (TB) in the Rural Midwest: Implications for Infection Control. MARY NETTLEMAN*, BRIAN SCOTT, MARLENE SCHMID. Univ. of Iowa College of Medicine, Iowa City IA.</p> <p>Traditional risk factors for TB are based on data from high-prevalence urban settings. To investigate the utility of these risk factors in the rural midwest, we compared 43 patients with pulmonary TB to 43 controls whose expectorated sputum tested negative for TB. Univariate analysis showed that foreign birth, recent contact with TB, weight loss, a positive PPD, and a consistent CXR (cavities, apical or nodular infiltrates) were more common in cases (p<0.05), using multivariate analysis. A consistent CXR was a strong independent predictor of pulmonary TB (OR 26, p<0.05). Although 84% of cases had a consistent CXR, only 1/138 persons tested for TB had positive cultures (prevalence 0.7%). Thus, the positive and negative predictive values for CXR were 3% and 99.9%. Other risk factors and physician judgement also had low positive predictive values. Testing 1, 2, or 3 sputum specimens had a sensitivity of 81%, 88% and 98%. Yet, only 23% of controls had more than two specimens submitted. The cost of testing was \$4800 per case detected. Cases were not isolated until a mean of 5 days after admission. An average of 23 potentially exposed persons was identified per case. Traditional risk factors were not helpful in identifying patients who should be isolated, but an inconsistent CXR identified persons at low risk for pulmonary TB.</p>

<p>M53 Handwashing Agent Use as a Predictor of Nosocomial Infection Rates. ANDREAS VOSS, RICHARD P. WENZEL, BRADLEY N. DOEBBELING. The</p> <p>have documented poor compliance. We previously suggested that improved handwashing compliance might decrease nosocomial infection, by 25-50%. Since direct observation of handwashing compliance is time intensive and costly, a simple method is needed to identify routinely hospital areas with low compliance. We evaluated five different handwashing indices, based on the monthly volume of medicated soap use, patient day (PD), and census, in six different hospital wards from 7/91-6/92. The monthly indices were then compared to the unit specific infections per thousand PD (ITPD) rate (with 3 day latent period) using Pearson's correlation coefficients and multiple regression analysis. Index IV (volume used per day/volume required for adequate handwashing [4 L] / mean patient census) correlated with the monthly ITPD rate in the SICU ($r = -0.603$, $p = 0.038$). Index V (volume used per day/PO) correlated with the ITPD rate in the burn unit ($r = -0.621$, $p = 0.031$). The linear regression model to predict the ITPD rate selected index IV in both ch. SICU ($R^2 = 0.36$, $p = 0.038$) and Burn Unit. ($R^2 = 0.67$, $p = 0.007$). Evaluation of the indices on four hospital wards with lower patient admissions and infrequent ordering of medicated soap did not reach significance: none of the indices predicted infection. We feel that the use of handwashing indices based on volume used should be evaluated prospectively as an approach to predict nosocomial infection, and for targeting hospital areas with low handwashing compliance.</p>	<p>M54 Impact of an Educational Program to Prevent Intravascular devices (IVD) Colonization. F. PARRAS, J. ENA, C. GUERRERO, S. MORENO, MD DIAZ, E. CERCENADO, E. BOUZA. Hospital Gregorio Maranon, Madrid, Spain</p> <p>OBJECTIVE: To describe the epidemiology of IVD colonization and the effect of an educational program for the prevention of IVD colonization/infection.</p> <p>PATIENTS AND METHODS: Two studies performed: A prevalence study covering the entire hospital (samples were taken from all points of insertion, hubs, and infusion fluids. Tips and blood culture were taken when possible or when DIV infection was suspected). And an intervention study covering a random selection of 500 beds. A program of information including the CDC recommendations for control of IVD infections was carried out between the two studies. The results of the intervention study were compared with those previously obtained in the same hospital area in the prevalence study.</p> <p>RESULTS: Of 1,651 in-patients, 460 (27%) had 511 IVD. The prevalence of skin colonization was 32%, hub colonization 17%, and IVD tip colonization 4%. There was only one case of DIV associated sepsis. The proportion of cutaneous colonization was significantly reduced after the educational program (18% vs. 34%, $p = 0.001$). The proportion of hub colonization was unchanged.</p> <p>CONCLUSIONS: A high number of patients with DIV has cutaneous and/or hub colonization. Our educational program (CDC recommendations) was able to reduce the prevalence of cutaneous colonization but not hub colonization. Our results suggest that specific policies to take care of hubs should be included in CDC recommendations.</p>
<p>M55 Skin Decontamination Can Be Improved by the Use of Iodine Tincture Antiseptic (Mediflex, MD). JEFFREY J. TARRAND* and ISSAM RAAD, University of Texas M.D. Anderson Cancer Center, Houston, Texas</p> <p>Contamination of medical devices with normal microbial skin flora is a relevant problem for medical, surgical, infection control, and laboratory medicine practitioners. Even small gains in the efficiency of microbial decontamination could have clinically significant effects. This study compares povidone iodine and tincture of iodine antiseptic agents under controlled clinical conditions. Venipuncture was performed by a supervised phlebotomy team. For the povidone iodine group (P) skin was first cleaned with a 70% isopropanol pad (10 sec), followed by a vigorous 2 min scrub using a 2% povidone/soap swab and finally a 10% povidone antiseptic was applied for 5 min and allowed to dry. The iodine tincture group (I) employed first scrubbing the skin with 70% isopropanol for an additional 5 min. The two test periods were June 1990 to February 1991 for P group and June 1991 to February 1992 for I group. Of 27,939 acceptable blood culture specimens 2,885 (10.3%) were positive in the P group and with 5.68% (1,589/27,939) classified as skin flora. During the I group period 29,238 sets yielded 2,652 positives (9.1%) with 4.43% contaminants. The ratio of contaminants to positives decreased. ($P < 0.001$ chi-square.) Thus even under conditions of rigid technical control, significant improvements in skin antisepsis can be realized when using tincture of iodine.</p>	

<p>L1 The Utilization of Severity Indexes in Intensive Therapy as a Predictor of Nosocomial Infection Risk: TISS versus ASIS. *STARLING, C.E.F.; PINTO, C.A.G.; PINHEIRO, S.M.C.; Nogueiro, MG.; COUJO, B.R.G.M., Felício Rocho Hospital, Belo Horizonte, Minas Gerais, Brazil</p> <p>The objective of this study was to analyze the rates of nosocomial infection in intensive care units and the relations with severity indexes - ASIS (American Severity Index Score) and TISS (Therapeutic Intervention Scoring System) - and with the mean time of internment. Two intensive care units at Hospital Felício Rocho were prospectively followed from February, 1991 on, according to the NNISS-CDC methodology adopted in Brazilian Hospitals, for the monthly evaluation of nosocomial infection rates, and of the risk population. From January, 1992 on, the NI risk population, which was already evaluated by ASIS and AL06 (NNISS-CDC), started being monitored through TISS. NI rates and mean severity values for the patients were monthly calculated, and also the individual indicators of each patient's severity of nosocomial infection, and of death during internment in the ICU. Data concerning 23 months (Feb/91 to Dec/92) and 12 months of individual evaluation of patients interned in the hospital (Jan to Dec/92) was gathered. ASIS (mean) proved to be strongly correlated with the monthly rate of NI (%) of the units ($r=0.70$; $r^2=0.48$), a result that was not observed for TISS ($r=0.19$; $r^2=0.04$; $p=0.0419$). In univariate analysis, it was found a strong association with NI risk for a first TISS evaluation greater than 12 (R.R.=2.8; $p=0.00001$) and for ASIS greater than 2 (R.R.=3.2; $p=0.000001$). In multivariate analysis, no association was found between TISS and nosocomial infection. The multivariate model, which best explains the risk of NI, includes ASIS and the time of internment of the patient. ASIS, proposed by NNISS-CDC and already adapted, proved to be a better predictor of the risk of nosocomial infection than TISS.</p>	<p>L2 The Effect of Influenza Vaccination on Sick Leave Among Hospital Employees. *MICHAEL EDMOND, RICHARD WENZEL, TED YANK and BRADLEY DOEBBELING. The University of Iowa College of Medicine, UI Hospitals and Clinics, Iowa City, Iowa.</p> <p>Influenza vaccination is routinely recommended to health care workers to prevent infections and subsequent transmission to patients. However, one reason that acceptance may be relatively low is due to beliefs about potential side effects. We evaluated a computer database linking hospital employees' sick time to data on influenza vaccine acceptance to determine whether vaccination reduced work time lost due to illness. Sick hours (SH) were analyzed for December 1991, the peak month of culture-confirmed influenza A cases in both the surrounding county and the State of Iowa. 1009 of 3066 (32.9%) non-physician employees received influenza vaccine. Vaccine acceptance (VA) was significantly higher among hospital employees without patient contact than in those with patient contact (39.9% vs 27.6%, $p < 0.000001$). Overall, there was no significant difference in mean SH based on vaccination (6.3 SH for those not vaccinated (NV) vs 5.5 SH for VA, $p = .13$). Sick time was analyzed for workers with and without patient contact. No significant difference in work time lost was observed among workers with patient contact (5.6 SH in VA vs 6.1 SH for NV, $p=0.40$) or without patient contact (5.4 SH for VA vs 6.6 SH for NV, $p=0.20$). These data suggest: 1) vaccine did not reduce work absenteeism among hospital employees for this influenza season even in the midst of a community outbreak, 2) hospital employees with the greatest potential for transmission to patients were least likely to receive vaccine, and 3) there is no evidence that influenza vaccine caused employees to miss work due to vaccine-associated effects.</p>
<p>L3 Product Variance in PPD Positivity Rate. Loretta L. Fauerbach*, Deborah Boeff, Joseph W. Shands, and Richard R. Gutekunst. Shands Hospital at the University of Florida and the University of Florida, Gainesville, FL.</p> <p>Annual PPD testing was instituted for health care providers in July, 1992 after a 5 year hiatus because of the increasing incidence of TB. A positive was read as ≥ 10mm. In 1987, the conversion rate was 0.13% (Raad, et. al). New testing revealed a 9% conversion rate (245 new PPD positive reactions/2,721 employees tested). A clustering of positive PPD reactions using Parke Davis Aplisol was identified in an administrative non-patient care area (16/134 = 12% positivity rate). Investigations to identify active cases or air circulatory problems were negative. An evaluation of the tuberculin testing product was instituted. Parke Davis did not identify any reported problems with Aplisol. In December, 1992, the Connaught PPD product was tested on a previously known positive. The reaction was quantitatively the same, but differed qualitatively. Retesting with the Connaught brand was then instituted. One-hundred and Eight (108) of the PPD pos. employees (69%) retested negative (93 testing at 0 mm and 15 with 1-9 mm). Fifty-one (51) [33%] remained PPD positive. In conclusion, large scale testing at our institution revealed discrepancies in the potency of tuberculin products. Personal communications lead us to believe that other institutions have noticed similar variances in tuberculin potency.</p>	<p>L4 The Impact of HEPA Filtration on Airborne Particulates in Health-Care Facilities. *BYRON S. TEPPER, EDWARD J. BERNACKI and JOHN A. SCHAEFER, The Johns Hopkins Institutions, Baltimore, MD.</p> <p>This study was undertaken to determine the effectiveness of HEPA filtration for clearing the air of particulates generated in a patient room in a health-care facility. A portable HEPA filtration module was designed to provide thorough mixing and recirculation of the air in 2 patient room, to achieve 15 to 25 effective air changes per hour, and not to exceed a sound level of 55 dBA. The rooms were challenged with bis(2-ethylhexyl) sebacate, average particle 0.3 micron, at levels ten times the normal airborne particulate load in the room air supply. Airborne particles were counted with Met One Particle Counters. Data were collected in rooms with 6 fresh air changes per hour, balanced positive to the corridor, and with doors open and closed. The HEPA filter module proved highly effective in accelerating the removal of airborne particulates. Decay curves show a fourfold decrease in time to clear the artificially generated particles to background e.g. 25 minutes reduced to 6 minutes. Without generated particles, the filter system reduced the background particulates by 60 percent. With proper placement of the filter module, there was a corresponding reduction in the escape of particles into the adjacent corridor. In conclusion the risk of acquiring tuberculosis in a health-care environment is a function of the concentration of infectious droplet nuclei. The data in this model system indicate that the recirculation of patient room air through a HEPA filter can rapidly reduce airborne contaminants and, as an adjunct to other infection control techniques, can reduce the risk of exposure of health-care workers to infectious droplet nuclei.</p>

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Bertrand C	11	Cipriani D	M25	Edmond M	L2
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SHEA

Annual Luncheon

TUESDAY, OCTOBER 19, 1993

12:00 – 2:00 PM

**NEW ORLEANS HILTON RIVERSIDE AND TOWERS
NEW ORLEANS, LA**

The Society for Hospital Epidemiology of America will host its Annual Luncheon during the Interscience Conference on Antimicrobial Agents and Chemotherapy (ICAAC) at the New Orleans Hilton.

FEATUREDLUNCHEONSPEAKER

To Be Announced

ALSO FEATURED AT THIS LUNCHEON: AN UPDATE OF SHEA'S ACTMTIES

Non Members Welcome

COST:	SHEA Member (pre-registered by September 18, 1993)	\$30
	Non-Member (pre-registered by September 18, 1993)	\$35
	(Tickets will be mailed to pre-registered guests)	
	After September 18, 1993 or on-site registration	\$40

Registration Form:

PLEASE PRINT OR TYPE NAME(S) _____

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Enclosed is payment to cover advanced registration for each person listed above.

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