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Information on critical issues related to infection control presented during the Eighth Conference on Infectious Diseases

Monday, Dec 8, to Wednesday, Dec 10, 2003

The Eighth Conference on Infectious Diseases was held at the Kimberly-Clark corporate facility in Roswell, Ga, Dec 8-10, 2003. An elegant reception and dinner, sponsored by Kimberly-Clark, was held Monday evening to welcome participants and provide them with an opportunity to network with internationally known speakers to discuss critical infectious disease concerns.

The conference addressed a range of infectious disease issues of interest to perioperative and infection control practitioners. Speakers challenged participants to consider their infection control practices; provided current information on familiar, emerging, and resistant organisms; and discussed infection prevention, disinfection and sterilization issues, and how integrating human factors training can improve infection control.

SEVERE ACUTE RESPIRATORY SYNDROME

John A. Jernigan, MD, MS, chief of the interventions and evaluations section of the Division of Healthcare Quality Promotion at the Centers for Disease Control and Prevention's (CDC's) National Center for Infectious Diseases, Atlanta, explored the recent severe acute respiratory syndrome (SARS) outbreak. He reviewed initial signs of the worldwide outbreak of SARS and lessons learned. To prevent future outbreaks, early recognition is absolutely necessary. This will depend on the ability of the health care community to combine clinical and epidemiological features to make a diagnosis.

Early recognition is important, said Dr Jernigan, because simple infection control measures can reduce transmission. Recognizing and isolating patients with SARS can contribute to reduced transmission rates. The incubation period for SARS is two to 10 days. Early symptoms commonly reported by patients include fever, chills or rigors, headaches, myalgias, and malaise. Fever may resolve before respiratory symptoms appear. Respiratory symptoms often begin three to seven days after the onset of symptoms and peak in the second week, according to Dr Jernigan.

HAND HYGIENE

Elaine L. Larson, RN, PhD, CIC, FAAN, professor of pharmaceutical and therapeutic research at the Columbia University School of Nursing, New York, provided the background evidence on which the CDC hand hygiene guideline is based, including research on skin condition, surgical hand preparation, and general hand washing. Dr Larson also reviewed the hand hygiene guideline, which was released in October 2002, and identified areas of change from the previous recommendation.

Skin hygiene is a critical factor in preventing transmission of infectious organisms. The new guideline promotes the use of alcohol-based products, which have been found to be less damaging to skin and easier to use. This results in higher hand-washing compliance among health care workers. The guideline encourages the use of an

appropriate hand lotion after using an alcohol-based product because the lotion acts as a glue to help prevent skin cells from shedding, thus promoting skin health.

Dr Larson reported one interesting occurrence about the use of alcohol-based products—the occurrence of skin irritation in a small segment of young females. This reaction was resolved after the women did not use an alcohol-based product for a few weeks and then switched to a different alcohol-based product. Dr Larson reported that there was no known reason for this occurrence in this small segment.

ANTIBIOTIC-RESISTANT ORGANISMS

Barry M. Farr, MD, MSc, professor of medicine and epidemiology at the University of Virginia Health System, Charlottesville, Va, provided insight into preventing the spread of antibiotic-resistant organisms. High frequency of antibiotic use in hospitals provides a selective advantage for antibiotic-resistant pathogens, such as methicillin-resistant *Staphylococcus aureus* and vancomycin-resistant enterococci, to survive, proliferate, and spread.

Dr Farr reviewed mechanisms for development of antibiotic resistant organisms that health care providers need to consider, including

- random genetic mutation;
- plasmid swapping during conjugation;
- movement of transposons to plasmids or chromosomes;
- transduction by bacteriophages (ie, acquisition of resistant genes from a recently killed cell and incorporation into a chromosome or plasmid); and
- binary fission (ie, replication).

Possible control measures to prevent the occurrence of resistant organisms include preventing their spread via appropriate hand hygiene, controlling the use of antibiotics, identifying colonized

patients with active surveillance cultures, and using barrier precautions.

Dr Farr detailed initiatives that contributed to the University of Virginia Health System's success in reducing or eliminating outbreaks of infections caused by resistant organisms. The organization succeeded by implementing active surveillance of cultures; strict contact precautions, including using gowns and gloves; meticulous hand hygiene; and isolation of patients found to have positive cultures for resistant organisms.

DESIGNING ERROR-FREE SYSTEMS

Gina Pugliese, RN, MS, vice president of Premier Safety Institute, Oak Brook, Ill, presented the latest information on players who are driving the patient safety movement, how their requirements and activities overlap and conflict, the role of evidence-based practices, and what is working in health care. Pugliese said that consumers want safe and quality health care and expect health care facilities to improve their practices.

One of the major issues health care systems must correct is time wasted because of redundancies and inefficiencies. According to Pugliese, human factors engineering can be used to help health care facilities define the relationships among humans, the tools they use, and the environment in which health care personnel work.

Pugliese clarified that systems must be designed to prevent errors, and procedures must be designed to make errors visible when they occur so they can be caught and corrected rapidly. Systems also must be designed so errors that are not detected and intercepted do not result in adverse consequences. Processes must be simplified, and environmental and staffing issues must be resolved.

A major challenge for health care

Gina Pugliese noted that consumers want safe and quality health care.

Dr William R. Jarvis explored recent health care-associated infection outbreaks.

Dr Michael Leonard spoke on communication and collaboration for patient safety.

Dr Donald E. Fry, offered a variety of observations about surgical site infections.

facilities is to move from "pointing fingers" to a nonpunitive and "just" culture to enhance reporting and learning from errors, said Pugliese. The health care safety initiative will continue to evolve, and there is some indication that, in the future, reimbursement may be tied to an institution's ability to deliver safe, quality patient care.

INFECTION OUTBREAKS

William R. Jarvis, MD, director of the Office of Extramural Research at the CDC's National Center for Infectious Diseases, explored recent health care-associated infection outbreaks and other endemic problems with which all health care professionals need to be familiar. He emphasized the importance of investigating out-

breaks in health care settings and recognizing that an outbreak that occurs in a facility may be an indicator of a nationwide outbreak.

Dr Jarvis said that each year, more than two million patients acquire a health care-associated infection. Often, these infections occur as part of an epidemic or outbreak. Most of these infections occur in small clusters, and many of these clusters are unrecognized; however, they can lead to morbidity and mortality and take time, effort, and resources to resolve.

The combined application of epidemiologic and laboratory methodology can identify the source of an outbreak. When the source is identified, effective prevention strategies and interventions can be implemented. Dr Jarvis listed the goals of any outbreak investigation as identifying the etiologic agent, the reservoir, and the mode of transmission; eliminating the reservoir; terminating transmission; and preventing future outbreaks.

THE HUMAN FACTOR

Michael Leonard, MD, director of patient safety and national physician leader for human factors and patient safety, Colorado Permanente Medical Group, Denver, stressed the effectiveness of communication and collaboration. Differences in physician-to-RN communication include that nurses are trained to use narrative and descriptive communication, and physicians are trained to be problem solvers. Complications that further blur communication styles include gender, the national culture, the pecking order, and previous relationships.

Dr Leonard said that according to the Joint Commission on Accreditation of Healthcare Organizations, communication breakdowns are a primary root cause of more than 60% of the 2,034 sentinel events the Joint Commission has analyzed. The majority of these sentinel

events (ie, 75%) resulted in the death of a patient. Intraoperative and postoperative complications accounted for 12.4%, wrong site surgery for 11.8%, and medication errors for 11.5%.

A human factors approach to solving the problem includes teamwork, effective communication, expert decision making, situational awareness, and a common mental model. A briefing (ie, a conversation between two or more OR team members using concise and pertinent information to promote clear and effective communication) is used before surgery begins. This briefing, or time out, ensures that all team members have a clear idea of what the patient's surgical procedure is and what is needed before the procedure starts, thus, decreasing the possibility of an error.

PREVENTING SURGICAL SITE INFECTIONS

Donald E. Fry, MD, FACS, professor and chair of the Department of Surgery at the University of New Mexico School of Medicine, Albuquerque, NM, shared observations about surgical site infections (SSIs), including that

- all surgical wounds are contaminated by bacteria, but few become infected;
- different surgical procedures have different degrees of contamination and different rates of infection; and
- similar surgical procedures performed by the same surgeon in a different patient population may have different infection rates.

The virulence of bacteria has an effect on the surgical wound. Factors that enhance the possibility of an SSI include hematomas, foreign bodies, dead tissue (eg, from excessive use of electrocautery), and dead space in a wound.

Defenses that help patients resist infection are the efficiency of the inflammatory response, neutrophil function,

Dr Issam Raad reviewed catheter-related infections.

Dr Michelle L. Pearson shared information on smallpox.

and specific immune function. Patients who have an impaired immune system may go into shock, experience hypoxia, be malnourished, have kidney or liver failure, or need a blood transfusion.

According to Dr Fry, antibiotic prophylaxis has a verified benefit in gastrointestinal, oropharyngeal, vascular, open heart, obstetrical, and gynecological procedures. Other procedures that are listed as clean and benefit from antibiotic prophylaxis include orthopedic joint replacements, open reduction of closed fractures, vascular prosthesis, median sternotomy, craniotomy, and breast and hernia procedures. Some strategies to decrease SSIs include reducing contamination in a wound and controlling a patient's temperature and glucose levels during surgery.

Dr William A. Rutala reviewed new disinfection methods.

PREVENTING INTRAVASCULAR CATHETER-RELATED INFECTIONS

Central venous catheter-related bloodstream infections in the intensive care unit result in prolonged stays of 6.5 days, a 25% mortality rate, and an average of \$28,690 in treatment costs, according to Issam Raad, MD, FACP, FIDSA, professor and chair of the Department of Infectious Diseases, Infection Control and Employee Health in the Division of Internal Medicine at

the University of Texas, MD Anderson Cancer Center, Houston, who reviewed catheter-related infections. Sources of these infections are autoinfections, which include patients' own microflora. This can result in hematogenous seeding or an external spread of the infection. Hematogenous seeding results in a fibrin sheath formation on the catheter. This biofilm creates an attachment, then colonization, and finally, growth of pathogens on the catheter surface. The outcomes of the presence of biofilm include a delay in penetration by an antibiotic, altered growth rates of biofilm cells, physiological changes in biofilm cells, and transfer of resistant plasmids (ie, viruses) within the biofilm.

Contaminated disinfectants and a health care worker's hands also can cause catheter-related infections, said Dr Raad. To prevent catheter-related infections, it is important to use an antiseptic hand wash before starting a procedure. Proper disinfection of the site is next. A cap, sterile gown, gloves, mask, and barrier drapes are needed when a catheter is placed. Use of a catheter that is coated with an antimicrobial also is considered a preventive infection control measure, said Dr Raad.

SMALLPOX

The last case of smallpox in the United States occurred in 1949, and worldwide, the last case occurred in Somalia in 1977, according to Michelle L. Pearson, MD, medical epidemiologist in the investigation and prevention branch of the CDC's Hospital Infections Program. During her presentation, Dr Pearson shared that smallpox is caused by the variola virus and that the smallpox vaccination is 95% effective in preventing the disease and provides a three- to five-year immunity that wanes with time. Someone who has been vaccinated against smallpox more than once, however, may have a residual immunity that can persist for more than 30 years.

Today a larger patient population is at risk from smallpox, particularly patients who may have HIV, atopic dermatitis, and organ transplantation. In addition, increased use of invasive devices may alter the skin's integrity. Vaccina trans-

mission from viral shedding of the primary vaccination site can occur from day three to day 21 after vaccination. For individuals being revaccinated, the viral shedding period may be shorter. Transmission via this route, however, is rare. A designated area for checking the patient's smallpox vaccination site should be established in each health care facility. Infectious waste should be disposed of according to state or local regulations for waste disposal.

Contraindications to receiving the smallpox vaccine are HIV, immunosuppressive conditions, allergy to vaccine components, or being younger than one year. Adverse events following smallpox vaccine may include

- mild reactions, such as pain, redness, lymphadenopathy, myalgias and chills, insomnia, headache, nausea, fatigue, and fever of greater than 37.7° C (99.86° F);
- life-threatening reactions, such as eczema vaccinum, progressive vaccinia, and postvaccinal encephalitis; and
- cardiac events, including myopericarditis, myocardial infarctions, angina, and myocardial infection.

DISINFECTION AND STERILIZATION IN HEALTH CARE FACILITIES

William A. Rutala, PhD, MPH, professor for the Division of Infectious Diseases at the University of North Carolina's (UNC's) School of Medicine, Chapel Hill, NC; director of hospital epidemiology in the Occupational Health and Safety Program at the University of North Carolina Health Care System, Chapel Hill, NC; and director of the statewide Infection Control and Epidemiology Program at the UNC School of Medicine, reviewed the field of disinfection and sterilization. Factors influencing efficacy in disinfection and sterilization include the presence of organic and inorganic loads, type and level of microbial contamination, cleaning instruments, concentration of and exposure to the disinfectant or sterilant, and temperature and relative humidity.

Critical items needing disinfection and sterilization include surgical instruments, cardiac catheters, and

implants. Semicritical items include endoscopes, respiratory therapy equipment, anesthesia equipment, endocavitary probes, tonometers, and diaphragm fitting rings.

According to Dr Rutala, newer methods of disinfection use 0.95% glutaraldehyde and 1.64% phenol/phenate, 0.55% ortho-phthalaldehyde, 7.35% hydrogen peroxide, and 0.23% peracetic acid. Using automated endoscope reprocessors after endoscopes have been thoroughly cleaned can reduce staff members' exposure to chemicals and save time. Dr Rutala noted that an important step in the sterilization process is to ensure that all internal surfaces of an item are exposed to high-level disinfectants or sterilants during the process.

Newer methods of sterilization include alternatives to ethylene oxide, such as low temperature hydrogen peroxide gas plasma and peracetic acid. Rutala noted that research on disinfecting and sterilizing instruments used on patients with Creutzfeldt-Jacob disease found that steam sterilization cleaning is effective when using

- sodium hydroxide (NaOH) and steam sterilization (eg, 1N NaOH for 1 hour, 121° C [249.8° F] for 30 minutes);
- 134° C (273.2° F) for 18 minutes in the prevacuum stage; and
- 132° C (169.6° F) for 30 to 60 minutes in the gravity stage.

In addition, low temperature sterilization technology is not effective, but use of chlorine is effective. Dr Rutala noted that recommendations for disinfection and sterilization include

- special prion reprocessing for critical or semicritical devices used for high-risk patients with high-risk tissue samples,
- conventional disinfection and sterilization for critical or semicritical devices used for high-risk patients with low- or no-risk tissue samples,
- conventional disinfection and sterilization for critical or semicritical devices used for low-risk patients

- with high-risk tissue samples, and
- conventional disinfection for noncritical devices used for high-risk patients with high-risk tissue samples.

LOOKING FORWARD

The Eighth Conference on Infectious Diseases offered attendees an opportunity to hear presentations by experts in the field of infectious disease and infection control on diverse topics that many health care facilities are working with already or are just learning about. The information was timely and applicable to a number of health care settings.

AORN, the Association for Professionals in Infection Control and Epidemiology, and Kimberly-Clark have joined together to offer the Ninth Conference on Infectious Diseases, Dec 6-8, 2004, at the Kimberly-Clark corporate facility. Topics presented during the 2004 conference will include technology for preventing nosocomial bacteremia, discussion of recently released pneumonia guidelines, the correlation between hypothermia and infection, the reoccurrence of hepatitis C in patients with liver transplants, preparing your hospital for unexpected infectious diseases, infection control in the ambulatory setting, patient safety, infections in minimally invasive surgery, and vaccines to prevent viral diseases. Attendance is limited to 84 participants. To obtain detailed information on the conference, visit <http://www.aorn.org> or call AORN customer service at (800) 755-2676 x 1. ♦

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