

1.

### **The Impact of Multifocused Interventions on Sharps Injury Rates at an Acute Care Hospital •**

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[Infection Control and Hospital Epidemiology](#). Volume 20, Issue 12, Page 806–811, Dec 1999

**OBJECTIVE.** To determine the impact of a multifocused interventional program on sharps injury rates. **DESIGN:** Sharps injury data were collected prospectively over a 9-year period (1990–1998). Pre- and post-interventional rates were compared after the implementation of sharps injury prevention interventions, which consisted of administrative, work-practice, and engineering controls (ie, the introduction of an **anti-needlestick** intravenous catheter and a new sharps disposal system).

**SETTING.** Sharps injury data were collected from healthcare workers employed by a mid-sized, acute-care community hospital.

**RESULTS.** Pre-interventional annual sharps injury incidence rates decreased significantly from 82 sharps injuries/1,000 worked full-time-equivalent employees (WFTE) to 24 sharps injuries/1,000 WFTE employees post-intervention ( $P < .0001$ ), representing a 70% decline in incidence rate overall. Over the course of the study, the incidence rate for sharps injuries related to intravenous lines declined by 93%, hollow-bore **needlesticks** decreased by 75%, and non-hollow-bore injuries decreased by 25%.

**CONCLUSION.** The implementation of a multifocused interventional program led to a significant and sustained decrease in the overall rate of sharps injuries in hospital-based healthcare workers.

2.

### **Evaluating Sharps Safety Devices: Meeting OSHA's Intent •**

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[Infection Control and Hospital Epidemiology](#). Volume 22, Issue 7, Page 456–458, Jul 2001

**ABSTRACT**

The Occupational Safety and Health Administration (OSHA) revised the Bloodborne Pathogen Standard and, on July 17, 2001, began enforcing the use of appropriate and effective sharps devices with engineered sharps-injury protection. OSHA requires employers to maintain a sharps-injury log that records, among other items, the type and brand of contaminated sharps device involved in each injury. Federal OSHA does not require **needlestick** injury rates to be calculated by brand or type of device. A sufficient sample size to show a valid comparison of safety devices, based on injury rates, is rarely feasible in a single facility outside of a formal research trial. Thus, calculations of injury rates should not be used by employers for product evaluations to compare the effectiveness of safety devices. This article provides examples of sample-size requirements for statistically valid comparisons, ranging from 100,000 to 4.5 million of each device, depending on study design, and expected reductions in **needlestick** injury rates.

**3. Occupational Exposure to Blood or Body Fluids as a Result of Needlestick Injuries and Other Sharp Device Injuries Among Medical Residents in Japan •**

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[Infection Control and Hospital Epidemiology](#). Volume 28, Issue 4, Page 507–509, Apr 2007

**4. Workers' Compensation Claims for Needlestick Injuries Among Healthcare Workers in Washington State, 1996–2000 •**

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[Infection Control and Hospital Epidemiology](#). Volume 26, Issue 9, Page 775–781, Sep 2005

**OBJECTIVES.** To characterize accepted workers' compensation claims for **needlestick** injuries filed by healthcare workers (HCWs) in non-hospital compared with hospital settings in Washington State.

**DESIGN.** Descriptive study of all accepted workers' compensation claims filed between 1996 and 2000 for **needlestick** injuries.

**PARTICIPANTS.** All Washington State HCWs eligible to file a state fund workers' compensation claim and those who filed a workers' compensation claim for a **needlestick** injury.

**RESULTS.** There were 3,303 accepted state fund HCW **needlestick** injury claims. The incidence of **needlestick** injury claims per 10,000 full-time-equivalent HCWs in hospitals was 158.6; in dental offices, 104.7; in physicians' offices, 87.0; and in skilled nursing facilities, 80.8. The most common mechanisms of **needlestick** injury by work location were as follows: for hospitals, suturing and other surgical procedures (16.7%), administering an injection (12.7%), and drawing blood (10%); for dentists' offices, recapping (21.3%) and cleaning trays and instruments (18.2%); for physicians' offices, disposal (22.2%) and administering an injection (10.2%); and for skilled nursing facilities, disposal (23.7%) and administering an injection (14.9%). Nurses accounted for the largest (29%) proportion of HCWs involved, followed by dental assistants (17%) and laboratory technicians and phlebotomists (12%) in non-hospital settings. Rates of **needlestick** injury claims increased for non-hospital settings by 7.5% annually (95% confidence interval [CI<sub>95</sub>], 4.89% to 10.22%;  $P < .0001$ ). Rates decreased for hospital settings by 5.8% annually, but the decline was not statistically significant (CI<sub>95</sub>, -12.50% to 1.34%;  $P < .1088$ ). HCWs were exposed to hepatitis B, hepatitis C, and human immunodeficiency viruses in non-hospital settings.

**CONCLUSION.** There was a difference in the incidence rate and mechanisms of **needlestick** injuries on review of workers' compensation claim records for HCWs in non-hospital and hospital settings.

## 5. Costs and Benefits of Measures to Prevent Needlestick Injuries in a University Hospital •

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[Infection Control and Hospital Epidemiology](#). Volume 20, Issue 9, Page 614–617, Sep 1999

**OBJECTIVE.** To document the costs and the benefits (both in terms of costs averted and of injuries averted) of education sessions and replacement of phlebotomy devices to ensure that needle recapping did not take place.

**DESIGN.** The percentage of recapped needles and the rate of **needlestick** injuries were evaluated in 1990 and 1997, from a survey of transparent rigid containers in the wards and at the bedside and from a prospective register of all injuries in the workplace. Costs were computed from the viewpoint of the hospital. Positive costs were those of education and purchase of safer phlebotomy devices; negative costs were the prophylactic treatments and followup averted by the reduction in injuries.

**SETTING.** A 1,050-bed tertiary-care university hospital in the Paris region.

**RESULTS.** Between the two periods, the proportion of needles seen in the containers that had been recapped was reduced from 10% to 2%. In 1990, 127 **needlestick** (12.7/100,000 needles) and 52 recapping injuries were reported versus 62 (6.4/100,000 needles) and 22 in 1996 and 1997. When the rates were related to the actual number of patients, the reduction was 76 injuries per year. The total cost of information and preventive measures was \$325,927 per year. The cost-effectiveness was \$4,000 per injury prevented.

**CONCLUSION.** Although preventive measures taken to ensure reduction of **needlestick** injuries appear to have been effective (75% reduction in recapping and 50% reduction in injuries), the cost of the safety program was high.

## 6.

### **Use of Safety Devices and the Prevention of Percutaneous Injuries Among Healthcare Workers •**

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**Objective.** To study the effectiveness of safety devices intended to prevent percutaneous injuries.

**Design.** Quasi-experimental trial with before-and-after intervention evaluation.

**Setting.** A 350-bed general hospital that has had an ongoing educational program for the prevention of percutaneous injuries since January 2002.

**Methods.** In October 2005, we implemented a program for the use of engineered devices to prevent percutaneous injury in the emergency department and half of the hospital wards during the following procedures: intravascular catheterization, vacuum phlebotomy, blood-gas sampling, finger-stick blood sampling, and intramuscular and subcutaneous injections. The nurses in the wards that participated in the intervention received a 3-hour course on occupationally acquired bloodborne infections, and they had a 2-hour "hands-on" training session with the devices. We studied the percutaneous injury rate and the direct cost during the preintervention period (October 2004 through March 2005) and the intervention period (October 2005 through March 2006).

**Results.** We observed a 93% reduction in the relative risk of percutaneous injuries in areas where safety devices were used (14 vs 1 percutaneous injury). Specifically, rates decreased from 18.3 injuries (95% confidence interval [CI], 5.9–43.2 injuries) to 0 injuries per 100,000 patients in the emergency department ( $P = .002$ ) and from 44.0 injuries (95% CI, 20.1–83.6 injuries) to 5.2 injuries (95% CI, 0.1–28.8 injuries) per 100,000 patient-days in hospital wards ( $P = .007$ ). In the control wards of the hospital (ie, those where the intervention was not implemented), rates remained stable. The direct cost increase was €0.558 (US\$0.753) per patient in the emergency department and €0.636 (US\$0.858) per patient-day in the hospital wards.

**Conclusion.** Proper use of engineered devices to prevent percutaneous injury is a highly effective measure to prevent these injuries among healthcare workers. However, education and training are the keys to achieving the greatest preventative effect.

## 7.

### **Effect of Implementing Safety-Engineered Devices on Percutaneous Injury Epidemiology •**

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[Infection Control and Hospital Epidemiology](#). Volume 25, Issue 7, Page 536–542, Jul 2004

**OBJECTIVE.** To assess the effect of implementing safetyengineered devices on percutaneous injury epidemiology, specifically on percutaneous injuries associated with a higher risk of bloodborne pathogen exposure.

**DESIGN.** Before and after intervention trial comparing 3-year preintervention (1998–2000) and 1-year postintervention (2001–2002) periods. Percutaneous injury data have been entered prospectively into CDC NaSH software since 1998.

**SETTING.** A 427-bed, tertiary-care hospital in Manhattan.

**PARTICIPANTS.** All employees who reported percutaneous injuries during the study period.

**INTERVENTION.** A “safer-needle system,” composed of a variety of safety-engineered devices to allow for needlesafe IV delivery, blood collection, IV insertion, and intramuscular and subcutaneous injection, was implemented in February 2001.

**RESULTS.** The mean annual incidence of percutaneous injuries decreased from 34.08 per 1,000 full-time-equivalent employees preintervention to 14.25 postintervention ( $P < .001$ ). Reductions in the average monthly number of percutaneous injuries resulting from both low-risk ( $P < .01$ ) and high-risk ( $P$  was not significant) activities were observed. Nurses experienced the greatest decrease (74.5%,  $P < .001$ ), followed by ancillary staff (61.5%,  $P = .03$ ). Significant rate reductions were observed for the following activities: manipulating patients or sharps (83.5%,  $P < .001$ ), collisions or contact with sharps (73.0%,  $P = .01$ ), disposal-related injuries (21.41%,  $P = .001$ ), and catheter insertions (88.2%,  $P < .001$ ). Injury rates involving hollow-bore needles also decreased (70.6%,  $P < .001$ ).

**CONCLUSIONS.** The implementation of safetyengineered devices reduced percutaneous injury rates across occupations, activities, times of injury, and devices. Moreover, intervention impact was observed when stratified by risk for bloodborne pathogen transmission.

## 8.

### **Sharp-Device Injuries to Hospital Staff Nurses in 4 Countries •**

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**Objective.** To compare sharp-device injury rates among hospital staff nurses in 4 Western countries.

**Design.** Cross-sectional survey.

**Setting.** Acute-care hospital nurses in the United States (Pennsylvania), Canada (Alberta, British Columbia, and Ontario), the United Kingdom (England and Scotland), and Germany.

**Participants.** A total of 34,318 acute-care hospital staff nurses in 1998-1999.

**Results.** Survey-based rates of retrospectively-reported **needlestick** injuries in the previous year for medical-surgical unit nurses ranged from 146 injuries per 1,000 full-time equivalent positions (FTEs) in the US sample to 488 injuries per 1,000 FTEs in Germany. In the United States and Canada, very high rates of sharp-device injury among nurses working in the operating room and/or perioperative care were observed (255 and 569 injuries per 1,000 FTEs per year, respectively). Reported use of safety-engineered sharp devices was considerably lower in Germany and Canada than it was in the United States. Some variation in injury rates was seen across nursing specialties among North American nurses, mostly in line with the frequency of risky procedures in the nurses' work.

**Conclusions.** Studies conducted in the United States over the past 15 years suggest that the rates of sharp-device injuries to front-line nurses have fallen over the past decade, probably at least in part because of increased awareness and adoption of safer technologies, suggesting that regulatory strategies have improved nurse safety. The much higher injury rate in Germany may be due to slow adoption of safety devices. Wider diffusion of safer technologies, as well as introduction and stronger enforcement of occupational safety and health regulations, are likely to decrease sharp-device injury rates in various countries even further.

## 9.

### **Evaluation of a Safety Resheathable Winged Steel Needle for Prevention of Percutaneous Injuries Associated With Intravascular Access Procedures Among Healthcare Workers •**

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[Infection Control and Hospital Epidemiology](#). Volume 24, Issue 2, Page 105–112, Feb 2003

**OBJECTIVE.** To compare the percutaneous injury rate associated with a standard versus a safety resheathable winged steel (butterfly) needle.

**DESIGN.** Before–after trial of winged steel needle injuries during a 33-month period (19-month baseline, 3-month training, and 11-month study intervention), followed by a 31-month poststudy period.

**SETTING.** A 1,190-bed acute care referral hospital with inpatient and outpatient services in New York City.

**PARTICIPANTS.** All healthcare workers performing intravascular access procedures with winged steel needles.

**INTERVENTION.** Safety resheathable winged steel needle.

**RESULTS.** The injury rate associated with winged steel needles declined from 13.41 to 6.41 per 100,000 (relative risk [RR], 0.48; 95% confidence interval [CI95], 0.31 to 0.73) following implementation of the safety device. Injuries occurring during or after disposal were reduced most substantially (RR, 0.15; CI95, 0.06 to 0.43). Safety winged steel needle injuries occurred most often before activation of the safety mechanism was appropriate (39%); 32% were due to the user choosing not to activate the device, 21% occurred during activation, and 4% were due to improper activation. Preference for the safety winged steel needle over the standard device was 63%. The safety feature was activated in 83% of the samples examined during audits of disposal containers. Following completion of the study, the safety winged steel needle injury rate (7.29 per 100,000) did not differ significantly from the winged steel needle injury rate during the study period.

**CONCLUSION.** Implementation of a safety resheathable winged steel needle substantially reduced injuries among healthcare workers performing vascular access procedures. The residual risk of injury associated with this device can be reduced further with increased compliance with proper activation procedures.

**10.**

**Lessons Regarding Percutaneous Injuries Among Healthcare Providers •**

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[Infection Control and Hospital Epidemiology](#). Volume 24, Issue 2, Page 82–85, Feb 2003

**EXCERPT**

This issue of *Infection Control and Hospital Epidemiology* contains four important articles on the epidemiology and prevention of sharps or percutaneous injuries among healthcare workers. These articles as a group convincingly demonstrate the importance of a multidimensional occupational safety program within hospitals, including surveillance and data analysis, administrative and engineering control measures, consistent use of protective equipment, and safer personal work practices.

**11.**

**Sharp-Device Injuries and Perceived Risk of Infection With Bloodborne Pathogens Among Healthcare Workers in Rural Kenya •**

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[Infection Control and Hospital Epidemiology](#). Volume 28, Issue 6, Page 761–763, Jun 2007

**12.**

**Effect of the Introduction of an Engineered Sharps Injury Prevention Device on the Percutaneous Injury Rate in Healthcare Workers •**

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**Objective.** To evaluate the effect of introducing an engineered device for preventing injuries from sharp instruments (engineered sharps injury prevention device [ESIPD]) on the percutaneous injury rate in healthcare workers (HCWs).

**Methods.** We undertook a controlled, interventional, before–after study during a period of 3 years (from January 1998 through December 2000) at a major medical center. The study population was HCWs with potential exposure to bloodborne pathogens. HCWs who sustain a **needlestick** injury are required by hospital policy to report the exposure. A confidential log of these injuries is maintained that includes information on the date and time of the incident, the type and brand of sharp device involved, and whether an ESIPD was used.

**Intervention.** Introduction of an intravenous (IV) catheter stylet with a safety–engineered feature (a retractable protection shield), which was placed in clinics and hospital wards in lieu of other IV catheter devices that did not have safety features. No protective devices were present on suture needles during any of the periods. The incidence of percutaneous **needlestick** injury by IV catheter and suture needles was evaluated for 18 months before and 18 months after the intervention.

**Results.** After the intervention, the incidence of percutaneous injuries resulting from IV catheters decreased significantly ( $P < .01$ ), whereas the incidence of injuries resulting from suture needle injuries increased significantly ( $P < .008$ ).

**Conclusion.** ESIPDs lead to a reduction in percutaneous injuries in HCWs, helping to decrease HCWs' risk of exposure to bloodborne pathogens.

### 13.

#### **Healthcare Epidemiology: Efficacy of Safety-Engineered Device Implementation in the Prevention of Percutaneous Injuries: A Review of Published Studies**

SeJean Tuma and Kent A. Sepkowitz

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[Clinical Infectious Diseases](#). Volume 42, Issue 8, Page 1159–1170, Apr 2006

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Nearly 6 years have passed since the **Needlestick** Safety and Prevention Act of 2000 was signed into law. We reviewed studies published since 1995 that evaluated the effect of safety-engineered device implementation on rates of percutaneous injury (PI) among health care workers. Criteria for inclusion of studies in the review were as follows: the intervention used to reduce PIs was a needleless system or a device with engineered sharps-injury protection, the outcome measurements included a PI rate, the intervention was evaluated in a defined population with clear comparison groups in clinical settings, and outcomes and denominators used for rate calculations were objectively measured using consistent methodology. All 17 studies reported substantial decreases in device-associated or overall PI rates after device implementation (range of reduction, 22%–100%). The majority of studies ( $n = 12$ ) were uncontrolled before & after trials with limited ability to control for confounding variables. In addition, implementation of safety-engineered devices was often accompanied by other interventions, and direct measurement of outcomes was not performed. Nevertheless, safety-engineered devices are an important component in PI prevention.

#### 14.

##### **Analysis of Sharp-Edged Medical Object Injuries at a Medical Center in Taiwan •**

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[Infection Control and Hospital Epidemiology](#). Volume 21, Issue 10, Page 656–658, Oct 2000

##### **ABSTRACT**

A total of 733 incidents by sharp-edged objects occurred among healthcare workers between 1995 and 1998. Injuries occurred most frequently among interns. The workplace location with the highest incidence of injury was the patient ward, and the object that most frequently inflicted injury was a needle. The most frequent work practice was recapping of syringes. One healthcare worker demonstrated seroconversion for hepatitis C.

#### 15.

##### **Safety-Engineered Device Implementation: Does It Introduce Bias in Percutaneous Injury Reporting? •**

SeJean Sohn, MPH; Janet Eagan, RN, MPH; Kent A. Sepkowitz, MD

[Infection Control and Hospital Epidemiology](#). Volume 25, Issue 7, Page 543–547, Jul 2004

**OBJECTIVE.** To examine whether implementation of safety-engineered devices in 2001 had an effect on rates of percutaneous injury (PI) reported by HCWs.

**DESIGN.** Before and after intervention trial comparing 3-year preintervention (1998–2001) and 2-year postintervention (2001–2002) periods. PI data from anonymous, self-administered surveys were prospectively entered into CDC NaSH software.

**SETTING.** A 427-bed, tertiary-care hospital in Manhattan.

**PARTICIPANTS.** HCWs who attended state-mandated training sessions and completed the survey (1,132 preintervention; 821 postintervention).

**INTERVENTION.** Implementation of a “safer-needle system” composed of various safety-engineered devices for needlesafe IV delivery–insertion, blood collection, and intramuscular–subcutaneous injection.

**RESULTS.** Preintervention, the overall annual rate of PIs self-reported on the survey was 36.5 per 100 respondents, compared with 13.9 per 100 respondents postintervention ( $P < .01$ ). The annual rate of formally reported PIs decreased from 8.3 to 3.1 per 100 respondents ( $P < .01$ ). Report rates varied by occupational group ( $P \leq .02$ ). The overall rate did not change between study periods (22.7% to 22.3%), although reporting improved among nurses (23.6% to 44.4%,  $P = .03$ ) and worsened among building services staff (90.5% to 50%,  $P = .03$ ). HCWs with greater numbers of PIs self-reported on the survey were less likely to formally report injuries ( $P < .01$ ). The two most common reasons for nonreport (ie, thought injury was low risk or believed patient was low risk for blood-borne disease) did not vary from preintervention to postintervention.

**CONCLUSIONS.** Safety-engineered device implementation decreased rates of PIs formally reported and self-reported on the survey. However, this intervention, with concomitant intensive education, had varying effects on reporting behavior by occupation and a minimal effect on overall reporting rates.

## 16.

### Role of Safety-Engineered Devices in Preventing Needlestick Injuries in 32 French Hospitals •

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**Objectives.** To evaluate safety-engineered devices (SEDs) with respect to their effectiveness in preventing **needlestick** injuries (NSIs) in healthcare settings and their importance among other preventive measures.

**Design.** Multicenter prospective survey with a 1-year follow-up period during which all incident NSIs and their circumstances were reported. Data were prospectively collected during a 12-month period from April 1999 through March 2000. The procedures for which the risk of NSI was high were also reported 1 week per quarter to estimate procedure-specific NSI rates. Device types were documented. Because SEDs were not in use when a similar survey was conducted in 1990, their impact was also evaluated by comparing findings from the recent and previous surveys.

**Setting.** A total of 102 medical units from 32 hospitals in France.

**Participants.** A total of 1,506 nurses in medical or intensive care units.

**Results.** A total of 110 NSIs occurring during at-risk procedures performed by nurses were documented. According to data from the 2000 survey, use of SEDs during phlebotomy procedures was associated with a 74% lower risk ( $P < .01$ ). The mean NSI rate for all relevant nursing procedures was estimated to be 4.72 cases per 100,000 procedures, for a 75% decrease since 1990 ( $P < .01$ ); however, the decrease in NSI rates varied considerably according to procedure type. Between 1990 and 2000, decreases in the NSI rates for each procedure were strongly correlated with increases in the frequency of SED use ( $r = 0.88$ ;  $P < .02$ ).

**Conclusion.** In this French hospital network, the use of SEDs was associated with a significantly lower NSI rate and was probably the most important preventive factor.

17.

## **Costs of Management of Occupational Exposures to Blood and Body Fluids •**

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**Objective.** To determine the cost of management of occupational exposures to blood and body fluids.

**Design.** A convenience sample of 4 healthcare facilities provided information on the cost of management of occupational exposures that varied in type, severity, and exposure source infection status. Detailed information was collected on time spent reporting, managing, and following up the exposures; salaries (including benefits) for representative staff who sustained and who managed exposures; and costs (not charges) for laboratory testing of exposure sources and exposed healthcare personnel, as well as any postexposure prophylaxis taken by the exposed personnel. Resources used were stratified by the phase of exposure management: exposure reporting, initial management, and follow-up. Data for 31 exposure scenarios were analyzed. Costs were given in 2003 US dollars.

**Setting.** The 4 facilities providing data were a 600-bed public hospital, a 244-bed Veterans Affairs medical center, a 437-bed rural tertiary care hospital, and a 3,500-bed healthcare system.

**Results.** The overall range of costs to manage reported exposures was \$71–\$4,838. Mean total costs varied greatly by the infection status of the source patient. The overall mean cost for exposures to human immunodeficiency virus (HIV)-infected source patients ( $n = 15$ ), including those coinfecting with hepatitis B or C virus) was \$2,456 (range, \$907–\$4,838), whereas the overall mean cost for exposures to source patients with unknown or negative infection status ( $n = 8$ ) was \$376 (range, \$71–\$860). Lastly, the overall mean cost of

management of reported exposures for source patients infected with hepatitis C virus ( $n = 4$ ) was \$650 (range, \$186–\$856).

**Conclusions.** Management of occupational exposures to blood and body fluids is costly; the best way to avoid these costs is by prevention of exposures.

## 18.

### **Increased Rate of Catheter-Related Bloodstream Infection Associated With Use of a Needleless Mechanical Valve Device at a Long-Term Acute Care Hospital •**

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**Objective.** To determine whether introduction of a needleless mechanical valve device (NMVD) at a long-term acute care hospital was associated with an increased frequency of catheter-related bloodstream infection (BSI).

**Design.** For patients with a central venous catheter in place, the catheter-related BSI rate during the 24-month period before introduction of the NMVD, a period in which a needleless split-septum device (NSSD) was being used (hereafter, the NSSD period), was compared with the catheter-related BSI rate during the 24-month period after introduction of the NMVD (hereafter, the NMVD period). The microbiological characteristics of catheter-related BSIs during each period were also compared. Comparisons and calculations of relative risks (RRs) with 95% confidence intervals (CIs) were performed using  $\chi^2$  analysis.

**Results.** Eighty-six catheter-related BSIs (3.86 infections per 1,000 catheter-days) occurred during the study period. The rate of catheter-related BSI during the NMVD period was significantly higher than that during the NSSD period (5.95 vs 1.79 infections per 1,000 catheter-days; RR, 3.32 [95% CI, 2.88–3.83];  $P < .001$ ). A significantly greater percentage of catheter-related BSIs during the NMVD period were caused by gram-negative organisms, compared with the percentage recorded during the NSSD period (39.5% vs 8%;  $P = .007$ ).

Among catheter-related BSIs due to gram-positive organisms, the percentage caused by enterococci was significantly greater during the NMVD period, compared with the NSSD period (54.8% vs 13.6%;  $P = .004$ ). The catheter-related BSI rate remained high during the NMVD period despite several educational sessions regarding proper use of the NMVD.

**Conclusions.** An increased catheter-related BSI rate was temporally associated with use of a NMVD at the study hospital, despite several educational sessions regarding proper NMVD use. The current design of the NMVD may be unsafe for use in certain patient populations.

## 19.

### **Risk of Sharp Device–Related Blood and Body Fluid Exposure in Operating Rooms •**

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**Objective.** The risk of percutaneous blood and body fluid (BBF) exposures in operating rooms was analyzed with regard to various properties of surgical procedures.

**Design.** Retrospective cohort study.

**Setting.** A single university hospital.

**Methods.** All surgical procedures performed during the period 2001–2002 ( $n = 60,583$ ) were included in the analysis. Administrative data were linked to allow examination of 389 BBF exposures. Stratified exposure rates were calculated; Poisson regression was used to analyze risk factors. Risk of percutaneous BBF exposure was examined separately for events involving suture needles and events involving other device types.

**Results.** Operating room personnel reported 6.4 BBF exposures per 1,000 surgical procedures (2.6 exposures per 1,000 surgical hours). Exposure rates increased with an increase in estimated blood loss (17.5 exposures per 1,000 procedures with 501–1,000 cc blood loss and 22.5 exposures per 1,000 procedures with >1,000 cc blood loss), increased number of personnel ever working in the surgical field (20.5 exposures per 1,000 procedures with 15 or more personnel ever in the field), and increased surgical procedure duration (13.7

exposures per 1,000 procedures that lasted 4–6 hours, 24.0 exposures per 1,000 procedures that lasted 6 hours or more). Associations were generally stronger for suture needle–related exposures.

**Conclusions.** Our results support the need for prevention programs that are targeted to mitigate the risks for BBF exposure posed by high blood loss during surgery (eg, use of blunt suture needles and a neutral zone for passing surgical equipment) and prolonged duration of surgery (eg, double gloving to defend against the risk of glove perforation associated with long surgery). Further investigation is needed to understand the risks posed by lengthy surgical procedures.

## 20.

### **Safer Generation of Spring-Loaded Fingerstick Lancets •**

J. Jagger

[Infection Control and Hospital Epidemiology](#). Volume 23, Issue 6, Page 298–299, Jun 2002

## 21.

### **Ensuring Injection Safety during Measles Immunization Campaigns: More than Auto-Disable Syringes and Safety Boxes**

Bradley S. Hersh, Richard M. Carr, Julia Fitzner, Tracey S. Goodman, Gillian F. Mayers, Hans Everts, Eric Laurent, Gordon A. Larsen, and Julian B. Bilous

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Measles immunization campaigns are effective elements of a comprehensive strategy for preventing measles cases and deaths. However, if immunizations are not properly administered or if immunization waste products are not safely managed, there is the potential to transmit bloodborne pathogens (e.g., human immunodeficiency virus and hepatitis B and hepatitis C). A safe injection can be defined as one that results in no harm to the recipient, the vaccinator, and the surrounding community. Proper equipment, such as the exclusive use of auto-disable syringes and safety boxes, is necessary, but these alone are not sufficient to ensure injection safety in immunization campaigns. Equally important are careful planning and managerial activities that include policy and strategy development, financing, budgeting, logistics, training, supervision, and monitoring. The key elements that must be in place to ensure injection safety in measles immunization campaigns are outlined.

22.

**Medical Students' Exposure to Bloodborne Pathogens in the Operating Room: 15 Years Later •**

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We compared the rates of exposure to blood in the operating room among third-year medical students during 2005–2006 with the rates reported in a study completed at the same institution during 1990–1991. The number of medical students exposed to blood decreased from 66 (68%) of 97 students during 1990–1991 to 8 (11%) of 75 students during 2005–2006 ( $P < .001$ ).