Volume 30 Number 2

aacn ViewPoint

The Voice of Ambulatory Care Nursing

MARCH/APRIL 2008

CNE Continuing Nursing Education

Needlestick and Sharps Injury Prevention: Are We Reaching Our Goals?

Stephanie Chalupka
Pia K. Markkanen
Catherine J. Galligan
Margaret M. Quinn

The "Needlestick Safety & Prevention Act" became law in November 2000. This law directed the Occupational Safety and Health Administration (OSHA) to revise the bloodborne pathogen standard, making requirements for using current technology and methods in the prevention of sharps injuries more explicit. Seven years after this law became effective, health care providers, nurses in particular, continue to be injured, many workplace risks are still not being addressed, and important opportunities for prevention are missed.

Magnitude of the Problem

It is unclear how many health care providers sustain sharps injuries from contaminated devices in the Unites States each year. Frequently cited estimates suggest that in the United States, between 380,000 and 800,000 hospital-based health care providers sustain sharps injuries annually. It is further estimated that approximately 58% to 73% of needlestick injuries are actually unreported, suggesting that current data on sharps injuries are a significant underestimation of the true number of injuries (Alvarado-Ramy et al., 2003; Dement, Epling, Ostbye, Pompeii, & Hunt, 2004; Perry, Parker, & Jagger, 2003). Importantly, most estimates of sharps injuries and mucocutaneous exposures are for the hospital setting, providing an incomplete picture of the risk in ambulatory care settings.

Epidemiology of Needlestick And Sharps Injuries

Three comprehensive surveillance databases comprise the authors' understanding of the epidemiologic patterns of injury: the University of Virginia International Health Care Worker Safety Center's Exposure Prevention

continued on page 12

Contact hour instructions, objectives, and accreditation information may be found on page 16.

The Official Publication of the American Academy of Ambulatory Care Nursing

Table 1.
Sharps Injury by Device

Surveillance Data Base	Hollow-bore Needle Injuries (%)	Solid Sharp Injuries (%)
EPINet Exposure Prevention Information Network (Perry, Parker, & Jagger, 2007)	**All hollow-bore needles (60.4)** Syringes (37.8) Winged-steel needles (6.3) Intravenous stylets (3.6) Catheter needles (2.6) Vacuum tube needles (2.2) Other hollow-bore (7.9)	**All solid sharps (33)** Suture needles (21) Scalpels (7.4) Glass/ampoules/tubes (1.4) Wires (1.3) Lancet (0.9) Scissors (0.9)
Massachusetts Sharps Injury Surveillance (MADPH, 2007)	**All hollow-bore needles (56)** Hypodermic needles (31) Winged-steel needles (butterfly) (10) Intravenous stylets (4.6) Vacuum tube needles (4) Other hollow-bore (6.4)	**All solid sharps (30)** Suture needles (22) Scalpels (7) Glass (1)
National Surveillance System for Health Care Workers (NaSH) (CDC, 2004b)	**All hollow-bore needles (59)** Hypodermic needles (32) Winged-steel needles (12) Intravenous stylets (8) Phlebotomy needles (3) Other hollow-bore (6)	**All solid sharps (34)** Suture needles (19) Scalpels (7) Other solid sharps (8)

Needlestick and Sharps

continued from page 1

Information Network (EPINet), the Centers for Disease Control and Prevention's National Surveillance System for Health Care Workers (NaSH), and the Massachusetts Sharps Injury Surveillance System (MSISS).

Providers at Highest Risk

Surveillance data from NaSH, EPINet, and MSISS indicate that nurses sustain the highest number of percutaneous injuries (NaSH – 44%, EPINet – 40.6%, MSISS – 39%). Nurses are the predominant occupational group injured by needles and other sharps, in part, because they are the largest segment of the workforce at most hospitals. Physicians, particularly physicians in training, are also an important high-risk group. Physicians (attending/intern/resident/fellows) are the second most frequently injured workers according to surveillance data (NaSH – 28%, EPINet – 23.7%) (Centers for Disease Control and Prevention [CDC], 2004b) and MSISS – 34% (Massachusetts Department of Public Health [MADPH], 2007). Physicians and medical students may be seriously under-represented in this surveillance data because about half of all sharps injuries and nursing sharps injuries are not reported in this group.

A recent study of 699 surgical trainees working at 17 medical centers assessed the frequency and response to needlestick injuries. The average number of needlestick injuries per resident was 3.8, with a gradual increase to a total of 7.7 injuries per resident by the completion of the training program. During the final year of surgical training, 99% of all residents had sustained a needlestick injury. For 53% of respondents, the injury involved a high-risk patient. Approximately half of all injuries were never reported (Makary et al., 2007). Table 1 lists sharps injuries by device for all health care personnel.

Risk for Occupational Transmission

While transmission of at least 30 bloodborne pathogens have been associated with sharps injuries, three of them – hepatitis B virus (HBV), hepatitis C virus (HCV), and HIV – present the greatest concerns (O'Malley et al., 2007). The risk of transmission of bloodborne infection varies according to type and severity of exposure. The risk of viral transmission after occupational percutaneous exposure to infected blood is estimated to be as follows:

- HBV: 6% to 30%.
- HCV: 0.5% to 10% (average is 1.8%).
- HIV: 0.3% for percutaneous injury, 0.09% for mucous membrane exposure (Bell, 1997; CDC, 2001, 2003; O'Malley et al., 2007).

There are several factors that can significantly increase the risk of HIV infection to a 5% risk. These include a visibly bloody device, high viral status of source patient, and device being used to access a vein or artery (Wilburn, 2004). The most significant risk for occupational transmission of bloodborne pathogens is associated with the use of hollow-bore devices. These account for the largest group of all injuries reported (57% to 59%) (CDC, 2004b) and 90% of all HIV seroconversions (CDC, 2004a).

Even if these pathogens are not transmitted, a needlestick or sharps injury's emotional cost to the injured health care provider and his or her family can be devastating. In addition, the employer is faced with post-exposure evaluation, follow-up, and treatment costs. Short-term costs alone, which include time spent to report, manage, and track an exposure; salary for the injured nurse; actual costs (not charges) for laboratory testing of source patient and exposed nurse; and post-exposure prophylaxis are estimated to be $2,456 (range = $907 to $4,838) (O'Malley et al., 2007).

In the case of a seroconversion, the costs to the injured nurse, health care organizations, and insurers are far greater. In addition to monetary costs, the employer also can potentially face legal action by the injured nurse in states where there is no required workers' compensation coverage. The nurse may file suit against the institution's officers based on the theory that there was an intentional failure to provide safe tools, thereby creating an unsafe work environment. Alternately, the injured nurse may choose workers' compensation that would preclude an individual employee from filing suit against an employer for an occupational injury.

Table 2.
Product Categories for Common Safety Devices

Device Type	Advantages	Disadvantages
Retrofitted Devices Account for 95% of all devices in use currently; developed to assist institutions to rapidly comply with legislation; typically designed by adding a shield, cap, or sheath to a conventional sharps device or to the needle itself.	Low cost.	Activation of the safety mechanism often requires the user to place a hand in close proximity to the used needle to move the sheath forward or place a cap over the sharp; can potentially expose the user to injury; retro-fitted add-on pieces are awkward and may interfere with safely activating the safety mechanism.
Automatically Retractable Devices Feature a built-in mechanism to permanently disable the needle after use; when plunger is depressed, needle automatically retracts into the barrel, obliterating the sharp and rendering it safe.	Simple to use; passive mechanism (not requiring the user to activate the safety feature).	Fixed needle configuration precludes needle changes; generally more expensive than other devices; incorrect use can result in medication and body fluids may be aerosolized during retraction process.
Manually Retractable Devices Provide protection and performance advantages over retro-fitted devices.	Allow for needle changes; easy to use; lower risk of aerosolization because user controls the mechanism at all times. Price similar to that of retro-fitted devices; accurate dosing control; and reduced hazardous waste volume and disposal cost may also result in savings.	

Note: Data from Daley (2007)

Regulatory Framework for Prevention

Safety devices are widely considered to be a key defense against needlestick and sharps injuries. However, despite OSHA's Bloodborne Pathogen (BBP) Standard and its requirements for thoughtful evaluation, selection, and use of sharps devices with integral safety features, needlestick and sharps injuries continue to occur. Much responsibility lies with employers who fail to comply with OSHA's BBP Standard. However, another line of defense against injury can be nurses who understand their rights under the BBP Standard and participate in obtaining the protection to which they are entitled.

In 2000, the Needlestick Safety and Prevention Act (H.R. 5178) required the 1991 BBP Standard (29 CFR 1910.1030) to be revised to considerably strengthen the requirements related to the use of safety-engineered sharp devices. The revised OSHA standard became effective in April 2001. The key provisions of the law are:

- Health care facilities are required to document that they have evaluated and implemented needleless systems and safety-engineered sharp devices in order to reduce employees' occupational exposure to HIV, HBV, HCV, and other bloodborne diseases in their exposure control plan.
- Exposure control plans must be reviewed and updated *at least annually* to reflect changes in sharps safety technology that eliminate or reduce exposure to bloodborne pathogens.
- Health care employers are required to maintain a detailed sharps injury log containing specific information on percutaneous injuries. The log must include type and brand of device involved in exposure incident, department where exposure occurred, and an explanation of how it occurred.
- Employer requirement to solicit input from non-managerial (such as frontline) health care workers in the identification, evaluation, and selection of safety-engineered sharp devices. This process must be documented in the exposure control plan.
- An expanded definition of "engineering controls" to include devices with engineered sharps injury protection (OSHA, 2001).

It should be noted that some states have additional state level legislation offering additional protections to clinicians in the workplace. Nurses should be familiar with the needlestick safety and prevention legislation protections afforded to them by their own states.

Protection under this law was originally limited to employees in the private sector in both for-profit and not-for-profit environments. Protection was subsequently extended to public sector workers in 23 states with a federal OSHA-approved state occupational health and safety plan. However, in states without state-run OSHA plans, public hospitals remained exempt. It was not until 2003 with the passage of the Medicare Modernization Act that all public hospitals were required to comply with the OSHA standard by July 1, 2004, as part of their Medicare provider agreement.

Needlestick and Sharps Injury Prevention

Exposure to bloodborne pathogens is one of the most dangerous hazards ambulatory care providers face; fortunately, it is also one for which preventive interventions are very well documented. The preventive approach adopted by many health care organiza-

tions is an industrial hygiene model that uses the hierarchy of controls as outlined in the BBP Standard (29 CFR 1910.1030) (effective March 5, 1992). This model helps to prioritize preventive interventions.

When this hierarchy is applied to sharps injury prevention, the first priority is given to elimination and reduction of the use of needles and other sharps wherever possible. The use of oral and inhalation routes, transdermal patches, and jetsprays can eliminate the hazard of needles used in injectables. The second priority level, engineering controls, isolates or eliminates hazards through designs or applications of safeguards to prevent exposure (for example, needles retract or sheath immediately after use). Passive devices that require no user action to activate the safety feature are optimal.

The third level of prevention is the consistent implementation of administrative controls that are management-directed work practices aimed to reduce exposure to the hazard or risk of injury. This level can also include the provision of adequate resources to support a safety climate and adequate employee training, while purchasing decisions are based on product safety and efficacy (with involvement of front-line health care providers in device selection and evaluation).

Work practice controls at the fourth level may include using instruments (rather than fingers) to grasp needles, retract tissue, and load/unload needles and scalpels; giving verbal announcements when passing sharps; avoiding hand-to-hand passage of sharp instruments by using a basin or *neutral zone;* using alternative cutting methods (such as blunt electrocautery and laser devices when appropriate); and using round-tipped scalpel blades instead of sharp-tipped blades. Lowest priority is given to personal protective equipment, including face shields, gowns, and gloves, because they are the least effective in protecting the health care provider against needlestick and sharps injuries.

As described above, the 2001 revision of the BBP Standard requires that employers must solicit and document the input of non-managerial, direct care employee input in the identification, evaluation, and selection of engineering and work practice controls. With respect to engineering controls, the use of safe needle devices can prevent between 62% and 88% of needlestick injuries (Larmouth, 2004). Table 2 provides information about device types, and Figure 1 identifies desirable characteristics of safety devices.

Karen Daley, a nurse who experienced an occupational needlestick injury and contracted HIV and HCV, is an advocate for the national Needlestick Safety and Prevention Act. She urges nurses to seize the opportunity afforded by the federal legislation to participate in evaluating and selecting devices to be used in their own practice settings (Daley, 2007). The first step in this process is the designation of a product evaluation and selection committee. Health care organizations should designate a team to guide processes for the selection, evaluation, and implementation of engineered sharps injury prevention devices. Many institutions already have product evaluation committees that may be used for this purpose; others may want to assign this responsibility to a subcommittee of the prevention planning team.

Figure 1.

Desirable Characteristics of Safety Devices

- Passive, easy to use, simple, and active throughout use.
- Effectively used by either left or right-hand-dominant clinicians.
- Permit the clinician's hands to remain behind the needle at all times.
- Have an integral safety feature, not an accessory retrofit.
- Easy to ascertain whether the safety feature has been activated.
- Once it is permanently engaged, it cannot be defeated.
- Is effective, and safe in the provision of patient care.

Source: Fisher, 1992; Safety Institute, Premier, Inc., 2007.

Figure 2.

Additional Resources

American Nurses Association
http://www.needlestick.org

CDC Workbook for Designing, Implementing, and Evaluating a Sharps Injury Prevention Program
http://www.cdc.gov/sharpssafety

International Healthcare Worker Safety Center
http://www.healthsystem.virginia.edu/internet/epinet

MA Sharps Injury Surveillance System, Occupational Health Surveillance Program, Massachusetts Department of Public Health
www.mass.gov/dph/ohsp

NIOSH Safer Medical Device Implementation in Health Care Facilities
http://www.cdc.gov/niosh/topics/bbp/safer

Premier Safety Institute
http:www.premierinc.com/quality-safety/tools-services/safety/topics/needlestick

Training for the Development of Innovative Control Technologies
www.tdict.org

University of Massachusetts Lowell Sustainable Hospitals Program
http://www.sustainablehospitals.org

Ambulatory Care Nursing Implications

It is essential that *clinical staff* participate in the evaluation of safety devices. They are the end-users who best understand the implications of product changes. They know the conventional and unconventional ways that different devices are used in clinical care. They also can identify expectations for device performance that will affect product selection. It is particularly important that

when ambulatory care settings are hospital-based that ambulatory care is represented. While ambulatory care settings may, in some cases, be hospital-based, the needs of clinicians in ambulatory practice settings may not be fully understood by the hospital committee. Comprehensive guidance on the evaluation of safety devices, including safety feature evaluation tools, is available from many sources, such as the Sustainable Hospitals Project, the Training for Development of Innovative Control Technologies Program (TDICT), and the Premier Safety Institute (see Figure 2).

Conclusion

When health care provider education and work practice controls are combined with safe needle devices, injuries can be reduced by more than 90% (Jagger, 1996). The very essence of nursing is the obligation to provide safe, patient-centered care with health protection for the nurse, which is frequently a secondary concern. In actuality, unsafe work environments have a profound effect on patient safety. *Keeping Patients Safe: Transforming the Work Environment of Nurses,* a report by the Institute of Medicine (IOM) (2004), describes the inexorable link between staffing, fatigue, and patient-related errors. Nurses must be proactive in preventing needlestick injuries in the ambulatory care setting, openly acknowledging if they do not have access to safety devices, and actively participating in the selection and evaluation of both new and existing safety devices. Ambulatory care settings must seek to cultivate a culture of safety in which both patients and nurses are protected.

Stephanie Chalupka, EdD, APRN, BC, CNS, FAAOHN, *is a Professor and Director, RN to BS Program, Department of Nursing, School of Health and Environment, University of Massachusetts, Lowell, MA; and a Visiting Scientist in Occupational and Environmental Health, Harvard School of Public Health, Boston, MA.*

Pia K. Markkanen, ScD, *is a Research Professor, Department of Work Environment, University of Massachusetts, Lowell, MA.*

Catherine J. Galligan, MS, *is a Project Manager, Sustainable Hospitals Program, University of Massachusetts, Lowell, MA.*

Margaret M. Quinn, ScD, CIH, *is a Professor, Department of Work Environment, and Director, Sustainable Hospitals Program, School of Health and Environment, University of Massachusetts, Lowell, MA.*

Authors' Note: *The authors' research in sharps injury prevention is funded by the National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention (grant no. 1RO1 OH008229).*

References

Alvarado-Ramy, F., Beltrami, E.M., Short, L.J., Srivastava, P.U., Henry, K., Mendelson, M., et al. (2003). A comprehensive approach to percutaneous injury prevention during phlebotomy: Results of a multicenter study, 1993-1995. *Infection Control and Hospital Epidemiology, 24*(2), 97-104.

Bell, D.M. (1997). Occupational risk of human immunodeficiency virus infection in health-care workers: An overview. *American Journal of Medicine, 102*(5B), 9-15.

Centers for Disease Control and Prevention (CDC). (2001). Updated U.S. Public Health Service guidelines for the management of occupational exposure to HBV, HCV, and HIV and recommendations for post-exposure prophylaxis. *Morbidity and Mortality Weekly Report, 50*(RR-11), 1-42.

Centers for Disease Control and Prevention (CDC). (2003). *Exposure to blood: What health care personnel need to know.* Retrieved September 12, 2007, from www.cdc.gov/ncidod/dhqp/pdf/bbp/Exp_to_Blood.pdf

Centers for Disease Control and Prevention (CDC). (2004a). *Incidence of acute hepatitis B: United States, 1990-2002.* Retrieved January 1, 2008, from www.cdc.gov/mmwr/preview/mmwrhtml/mm5251a3.htm

Centers for Disease Control and Prevention (CDC). (2004b). *Workbook for designing, implementing, and evaluating a sharps injury prevention program.* Retrieved January 1, 2008, from www.cdc.gov/sharpssafety

Chalupka, S. (2008) Sharps injuries and bloodborne pathogen exposures in home health care. *AAOHN Journal, 56*(1), 15-29.

Daley, K.A. (2007). Needlestick injuries: How to improve safety in your workplace. *American Nurse Today, 2*(7), 25-26.

Dement, J.M., Epling, C., Ostbye, T., Pompeii, L.A., & Hunt, D.L. (2004). Blood and body fluid exposure risks among health care workers: Results from the Duke Health and Safety Surveillance System. *American Journal of Industrial Medicine, 46*(6), 637-648.

Fisher, J. (1999, August 2). *Users of protected sharps systems.* Presented at the General Hospital and Personal Use Devices Panel Open Session, Rockville, MD.

Institute of Medicine (IOM). (2004). *Keeping patients safe: Transforming the work environment of nurses.* Washington, DC: National Academy Press.

Jagger, J. (1996). Reducing occupational exposure to blood-borne pathogens: Where do we stand a decade later? *Infection Control and Hospital Epidemiology, 17*(9), 573-575.

Larmouth, J. (2004). SNHMC improves worker safety: Transition to safety-engineered products reduces sharps injuries. *Healthcare Purchasing News, 28*(6), 66-69.

Massachusetts Department of Public Health (MADPH). (2007) *Sharps injuries among hospital workers in Massachusetts, 2004: Findings from the Massachusetts Sharps Injury Surveillance System.* Retrieved January 1, 2008, from www.mass.gov/Eeohhs2/docs/dph/occupational_health/injuries_hospital_2004.pdf

Makary, M.A., Al-Attar, A. Holzmueller, C.C., Sexton, J.B., Syin, D., Gilson, M.M., et al. (2007). Needlestick injuries among surgeons in training. *New England Journal of Medicine, 356*(26), 2693-2699.

O'Malley, E., Scott, R.D., Gayle, J., Dekutoski, J., Foltzer, M., Lundstrom, T.S., et al. (2007). Costs of management of occupational exposures to blood and body fluids. *Infection Control and Hospital Epidemiology,28*(7), 774-782.

Occupational Safety and Health Administration (OSHA). (2001). *Regulations (Standards – 29 CFR): Bloodborne pathogens – 1910.1030.* Retrieved January 1, 2008, from www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10051

Perry, J., Parker, G., & Jagger, J. (2003). EPINet report: 2001 percutaneous injury rates. *Advances in Exposure Prevention, 6*(3), 32-36.

Safety Institute, Premier, Inc. (2007). *Prevent needlestick injuries: You owe it to yourself and your family.* Retrieved January 1, 2008, from www.premierinc.com/needlestick

Wilburn, S. (2004) Needlestick and sharps injury prevention, *On-Line Journal of Issues in Nursing, 1*(3), Retrieved January 1, 2008, from http://www.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/TableofContents/Volume92004/Number3September30/InjuryPrevention.aspx

Additional Reading

Catanzarite,V., Byrd, K., Namara, M., & Bombard, A. (2007). Preventing needlestick injuries in obstetrics and gynecology: How can we improve the use of blunt tip needles in practice? *Obstetrics & Gynecology, 110*(6), 1399-1403.

Perry, J., Parker, G., & Jagger, J. (2007, August). EPINet report: 2004 percutaneous injury rates. *International Healthcare Worker Safety.* Retrieved January 1, 2008, from www.healthsystem.virginia.edu/internet/epinet/ EPINet-2004-rates.pdf.