Sharps Injuries and Bloodborne Pathogen Exposures in Home Health Care

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ABSTRACT

Home health care is one of the fastest growing industries in the United States. Approximately 20,000 provider agencies deliver home health care services to 7.6 million individuals with acute illness, long-term health conditions, permanent disability, or terminal illness. The home health care setting poses many challenges that likely increase the risk of sharps injuries. Home health nurses face unique challenges in preventing and reporting sharps injuries in the home. This article examines the nature of and risk factors for sharps injuries in the home health care setting, the scope of the problem, the legislative and regulatory framework relevant to sharps injuries, and the role of occupational health nurses in promoting a culture of safety to prevent sharps injuries and bloodborne pathogen exposures.

Home health care is one of the fastest growing industries in the United States. Approximately 20,000 provider agencies deliver home health care services to 7.6 million individuals with acute illness, long-term health conditions, permanent disability, and terminal illness (National Association for Home Care and Hospice, 2004). The rapid growth is primarily due to the aging population, consumer preference for care in the home, and advances in technology that permit complex care to be delivered in the home setting. Regarding employment in health care by industry segment, the Bureau of Labor Statistics (2006) projects a 69% increase in home health care services between 2004 and 2014, with total employment of home health aides projected to increase 56%. The need for nurses in the home health care sector is predicted to grow at twice the rate for nurses overall between 2000 and 2020 (Mensik, 2007).

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Home health care providers face many serious occupational hazards, including job stress, violence, musculoskeletal injuries, automobile accidents, communicable disease transmission, latex exposure, and sharps injuries, with sharps injuries possibly being the least understood. Relatively little is known about the risk and frequency of sharps injuries or bloodborne pathogen exposures in the home health care setting because significant research and surveillance efforts have been focused primarily on hospitals (Gerberding, 2003; Vos, Gotz, & Richardus, 2006).

This article examines (1) the nature of and risk factors for sharps injury in home health care settings, (2) the scope of the problem, (3) the legislative and regulatory framework relevant to sharps injuries, and (4) the role of occupational health nurses in promoting a culture of safety to prevent sharps injuries and bloodborne pathogen exposures.

SHARPS INJURIES AND BLOODBORNE PATHOGEN EXPOSURES IN HOME HEALTH CARE

Home health care providers are at risk for infection from bloodborne pathogens, primarily as a result of sharps injuries from needles and other sharp devices, as well as mucous membrane and skin exposures to contami-

nated blood and body fluids. The home health care setting presents hazards similar to those of the acute care setting. However, additional risk factors are unique to the home, such as the increased risk of sharps injuries. Several factors make the home health care setting unique and challenging regarding sharps injury reporting and prevention.

Home health care providers have little control over their work environment. Poor lighting, cramped work spaces, awkward work positions, cluttered or unclean environments, distractions from others in the home, unfamiliar surroundings, presence of small children and pets, working alone, and potential for violence are among the variables that can impact the safety of home health care providers (Markkanen et al., 2007). Clinicians visit several patients' homes each day, and each home poses different risks, making the development of an organizational approach to percutaneous injury risk management essential.

Most home health care providers work alone. They conduct patient visits without the assistance of other staff. Workloads can be heavy in home health care, with nurses seeing four to eight patients daily. Unlike the hospital setting, no functional redundancy exists if nurses are injured and need to leave during their workday for postexposure prophylaxis care. Markkanen et al. (2007) found that home health care nurses' concerns regarding who would care for their patients if they sought health care was an important factor in their decisions about reporting and seeking follow-up care. To alleviate these concerns, home health care agencies should develop comprehensive percutaneous injury and bloodborne pathogen exposure control plans that include timely coverage and response capability.

Sharps-handling practices and the lack of uniform methods for disposal of sharps in the home setting contribute significantly to home health care providers' risk of injury. The majority of patient-used devices lack safety features to protect users. Also, patients with chronic illness who require injections or self-monitoring (e.g., insulin-dependent diabetes) may reuse sharp devices (e.g., lancets or syringes) to reduce costs. These devices may be left uncovered until the next use, increasing the risk of sharps injuries for home health care providers. The U.S. Environmental Protection Agency (EPA; 2007) regulations for the proper disposal of used health care devices pertain only to clinician-used devices and not to the devices used by patients. Although some states and municipalities have requirements for patient-used sharps, these regulations are not widespread and vary by locale. For patient-used sharps, the EPA (2006) recommends disposal at free drop-off collection sites or community collection programs. Most municipalities do not offer this method of sharps disposal. Alternately, the EPA recommends the use of mail-back services (i.e., purchasing a sharps collection box with a postage-paid mail-back box). Several drawbacks limit the use of this option: most patients are unaware of the product, it is a costly option (more than $30 per container, not covered by insurance), and it is not readily available at all pharmacies.

The lack of patient education about safe sharps disposal and a dearth of easy, low-cost, safe disposal options put both home health care providers and household members at increased risk of injury posed by improperly disposing of sharp devices (e.g., in detergent bottles; Markkanen et al., 2007). In the next decade, legislation is likely to be enacted for the safe handling and disposal of patient-used sharps. In July 2007, the Medicare Safe Needle Disposal Coverage Act of 2007 (S. 1909) was proposed to amend title XVII of the Social Security Act. This new act proposed coverage under Part D of the Medicare Program for supplies associated with the injection of insulin, home needle removal, decontamination and disposal devices, and the disposal of needles and syringes through a sharps-by-mail or similar program (U.S. Congress, 2007). At this time, the bill has been referred to Senate committee and subsequently referred to the Committee on Finance. Although it is not certain that this particular bill will be enacted, it is likely that this type of legislation will be passed in the near future.

SCOPE OF THE PROBLEM

Frequently cited estimates suggest that, in the United States, between 380,000 and 800,000 hospital-based health care providers sustain sharps injuries from contaminated devices each year. It is also estimated that approximately 58% to 73% of needlestick injuries go unreported, so any data on sharps injuries are likely to significantly underestimate the true number of injuries (Alvarado-Ramy et al., 2003; Dement, Epling, Ostbye, Pompeii, & Hunt, 2004; Perry, Parker, & Jagger, 2003). Furthermore, few estimates include sharps injuries or mucocutaneous exposures outside the hospital setting (Perry et al.).

Timely quantitative data to elucidate the nature of sharps injuries in home health care are not available as a baseline measure for prevention efforts. The few scientific studies that have been completed in the past 10 years are presented in Table 1. These studies demonstrate that most sharps injuries in home health care are reported by nurses. Readers must be mindful that the types and availability of sharps safety devices have changed during the past 5 years, warranting caution in applying older studies when designing interventions.

To address the scarcity of information, the National Institute for Occupational Safety and Health (NIOSH) is currently funding several studies to evaluate sharps injuries and bloodborne pathogen exposures outside the hospital setting. The goal of these current studies is to quantify the incidence of sharps injuries and bloodborne pathogen exposures and characterize the associated risk factors. The findings will provide a baseline for monitoring the incidence and patterns of sharps injuries over time and facilitate the design of appropriate intervention strategies to prevent sharps injuries and bloodborne pathogen exposures in the home health care setting.

Surveillance of Sharps Injuries and Blood Exposures in Health Care Settings

Several surveillance systems are used in the United States to provide insight into the causes of sharps injuries and blood exposures. Three of the more comprehensive surveillance programs are:

Table 1

Studies of Sharps Injuries in Home Health Care Settings

Author	*Description of the Study*	*Key Findings and Recommendations*
Haiduven & Ferrol (2004)	Cross-sectional prevalence study in the San Francisco area; analyzed needlestick and blood exposure reports from three home care agencies (648 registered nurses) between 1993 and 1996; provided no details regarding staffing in other clinician job categories	52 reported exposures, including 4 blood exposures and 48 needlesticks Most injuries occurred after sharps use, indicating the need for safer disposal systems 92% of the injuries were sustained by nurses Due to the challenging work environment, agencies should have a standardized method for collecting needlestick injury data to monitor trends Injuries occurring most frequently: Before, during, or after needle disposal (12 [23%]) Manipulating intravenous lines or access ports (9 [17.3%]) Improper disposal (caused by the patient in 2 cases; 8 [15%]) During or after blood draw (7 [13.5%])
Perry, Parker, & Jagger (2001)	Using Exposure Prevention Information Network data collected from 1993 to 1998, extracted data from home health settings to ascertain frequency and patterns of sharps injuries	87% of reported sharps injuries were sustained by nurses Approximately 31% of the injuries were associated with syringes Phlebotomy needles, lancets, and winged steel needles were each involved in approximately 15% to 17% of the injuries Approximately half of the sharps injuries occurred during disposal Home health care providers in this data set had a higher frequency of reported injuries than their hospital counterparts
Beltrami et al. (2000)	Prospectively collected data from 11 home health care agencies in the United States and Canada with 1,292 eligible to participate; participants provided information about procedures performed and blood contacts using standard questionnaires	Home health care providers are at risk for blood contact but infection control barrier use was low All reported sharps injuries occurred after use of a device but before its disposal

- The National Surveillance System for Health Care Workers (NaSH) at the Centers for Disease Control and Prevention (CDC) collaborates with health care facilities to collect information about occupational exposures and infections among health care workers. NaSH provides standardized methods for recording exposures to bloodborne pathogens and serves as a tool for sharps injury prevention efforts (CDC, 2000).
- The Exposure Prevention Information Network (EPINet) is a surveillance system developed by the International Health Care Worker Safety Center (IHCWSC; 2007) at the University of Virginia to provide standardized methods for recording and tracking sharps injuries and blood and body fluid contacts. Since 1992, EPINet has offered a voluntary data-sharing network for health care facilities using EPINet methods. EPINet data from this shared network are used for benchmarking and research purposes.
- The Massachusetts Sharps Injury Surveillance System requires that all hospitals and their satellite units

Table 2

Percentage of Sharps Injuries by Device

Setting and Source	*Injuries by Types of Hollow-Bore Needles (%)*	*Injuries by Types of Solid Sharps (%)*
Home health care		
Perry, Parker, & Jagger (2001)[a]	All hollow-bore needles (69)	Lancets (17)
	Disposable syringes (31)	
	Phlebotomy needles (16)	
	Winged steel needles (15)	
	Needles on intravenous tubing (4)	
	Intravenous catheters (3)	
Hospitals[b]		
National Surveillance System for Health Care Workers (Centers for Disease Control and Prevention, 2004b)	All hollow-bore needles (59)	All solid sharps (34)
	Hypodermic needles (32)	Suture needles (19)
	Winged steel needles (12)	Scalpels (7)
	Intravenous stylets (8)	Other solid sharps (8)
	Phlebotomy needles (3)	
	Other hollow bore (6)	
Exposure Prevention Information Network (Perry, Parker, & Jagger, 2007)	All hollow-bore needles (60.4)	All solid sharps (⩾ 33)
	Syringes (37.8)	Suture needles (21)
	Winged steel needles (6.3)	Scalpels (7.4)
	Intravenous stylets (3.6)	Glass/ampoules/tubes (1.4)
	Catheter needles (2.6)	Wires (1.3)
	Vacuum tube needles (2.2)	Lancet (0.9)
	Other hollow bore (7.9)	Scissors (0.9)
Massachusetts Sharps Injury Surveillance (Massachusetts Department of Public Health, 2007)	All hollow-bore needles (56)	All solid sharps (30)
	Hypodermic needles (31)	Suture needles (22)
	Winged steel needles (butterfly; 10)	Scalpels (7)
	Intravenous stylets (4.6)	Glass (1)
	Vacuum tube needles (4)	
	Other hollow bore (6.4)	

[a]Percentages were extrapolated from graph and are approximate values. [b]Data primarily from hospitals but may include a small number of home health care agencies.

licensed by the Massachusetts Department of Public Health (MDPH) submit annual reports detailing sharps injuries. This system has been in place since 2001 and includes several home health care agencies that operate under an affiliated hospital's license (MDPH, 2007).

Although the majority of data from the surveillance systems represents sharps injuries in hospitals, the data provide a useful baseline for guiding injury prevention efforts until similar data become available for home health care. These surveillance systems could serve as a model for or even routinely include home health care. Data from the surveillance systems and the literature show patterns of sharps injuries, including occupation, type of device, and how the injury occurred. What is documented clearly is that nurses sustain more sharps injuries than any other occupational group (American Nurses Association, 2007; Babcock & Fraser, 2003; CDC, 2004b; MDPH, 2007; Monge, Mato, Mariano, Fernandez, & Fereres, 2001; Shah, Silverstein, Bonauto, Foley, & Kalat, 2003) in both home health care and hospital settings. Haidu-

ven and Ferrol (2004) found that in home health care, nurses were involved in 92% of the injuries. The larger surveillance systems, primarily hospital based, showed that nurses accounted for 39% to 41% of the injuries, making them the single occupational group sustaining the greatest number of sharps injuries (MDPH; Perry et al., 2007).

Hollow-bore needles are associated with the highest percentage of reported injuries, with syringes the leading device. Home health care providers tend to have proportionally more injuries from winged steel needles (butterfly needles), phlebotomy needles, and lancets than those in the hospital setting (Perry, Parker, & Jagger, 2001). The pattern of injuries is shown in Table 2. Regarding time of injury, data show that the highest percentage of injuries occurs after sharps use (Table 3).

EPINet and MDPH surveillance data reveal that 38.4% and 33% of injuries, respectively, were reported to have occurred using devices with safety features (IHC-WSC, 2007; MDPH, 2007). As noted by the MDPH, these injuries with safety devices "[underscore] the need to evaluate these devices and to train health care workers in their appropriate use" (p. 18). The percentage of injuries occurring with conventional devices (i.e., sharps without an integral safety feature) is surprising, because the use of safety devices is required in most instances. The MDPH reported that hypodermic needles accounted for 23% of injuries caused by devices without an engineered safety feature, even though safety devices are readily available in this product line.

Table 3

Percentage of Sharps Injuries by When Injuries Occurred

When Injuries Occurred	*Percentage*
Home health care	
EPINet[a,b]	
After use	60
Before disposal	33
Putting device in disposal container	15
Disassembling device	10
After initial use and between steps of multistep procedure	2–3
Other, not specified	26
During use	14
Hospitals[c]	
CDC NaSH Surveillance[d]	
After use	57
Before disposal	41
During or after disposal	16
During use of sharp device on patient	39
EPINet[e]	
After use	⩾ 47
Before disposal	22
After initial use and during course of multistep procedure	12.8
During or after disposal (includes improperly disposed devices)	12.9
During (initial) use of the item	41.4
Massachusetts Sharps Injury Surveillance[f]	
After use	49
After use and before disposal of device	34
During or after disposal	15
During use	42

Note. *CDC = Centers for Disease Control and Prevention; EPINet = Exposure Prevention Information Network; NaSH = National Surveillance System for Health Care Workers.*
[a]Percentages were extrapolated from graph and values are approximate. [b]Data from Perry, Parker, & Jagger (2001). [c]Data primarily from hospitals but may include a small number of home health care agencies. [d]Data from CDC (2004b). [e]Data from Perry, Parker, & Jagger (2007). [f]Data from Massachusetts Department of Public Health (2007).

Risk for Occupational Transmission

Although nurses frequently report low perceived risk of disease transmission in the home as a reason for not reporting their injuries (Markkanen et al., 2007), the risk posed by bloodborne pathogens is significant. Sharps injuries have been associated with the transmission of at least 30 pathogens. However, the three bloodborne pathogens of greatest concern are hepatitis B virus (HBV), hepatitis C virus (HCV), and HIV (O'Malley et al., 2007). Risk for occupational transmission of bloodborne pathogens is greatest with the use of hollow-bore devices, which account for the largest group of all injuries reported (57%–59%; CDC, 2004b) and 90% of all HIV seroconversions (CDC, 2004a). Risk of virus transmission after occupational percutaneous exposure is illustrated in Table 4.

HIV Transmission. The CDC (2007a) estimated that 1,039,000 to 1,185,000 individuals were living with HIV/AIDS in the United States at the end of 2003. Approximately 40,000 individuals are newly infected with HIV each year (CDC). To date, no HIV vaccine is commercially available, and the prevalence of HIV in the population routinely puts health care providers at risk for exposure through injuries with contaminated sharps or contact with blood and body fluids.

The risks for occupational transmission of HIV vary with the type and severity of exposure (Bell, 1997; CDC, 2001, 2005). The average risk for HIV transmission has been estimated to be approximately 0.3% after a percutaneous exposure to HIV-infected blood (Bell) and approximately 0.09% after a mucous membrane exposure (CDC, 2001). Although episodes of HIV transmission after nonintact skin exposure have been documented, the

Table 4

Risk of Viral Transmission After Occupational Percutaneous Exposure to Infected Blood

Infectious Agent	*Risk of Seroconversion (%)*
Hepatitis B virus	6–30
Hepatitis C virus	0.5–10 (average = 1.8)
HIV	0.3 (percutaneous injury); 0.09 (mucous membrane exposure)

Note. *Transmission rates vary by type and severity of exposure. Data from Bell (1997), Centers for Disease Control and Prevention (2001, 2003), and O'Malley et al. (2007).*

average risk for transmission by this route has not been precisely quantified but is estimated to be less than the risk for mucous membrane exposures. The risk for transmission after exposure to fluids or tissues other than HIV-infected blood also has not been quantified, but is probably considerably lower than that for blood exposures. The Updated U.S. Public Health Service Guidelines for the Management of Occupational Exposures to HIV and Recommendations for Postexposure Prophylaxis is available at www.cdc.gov/mmwr/PDF/rr/rr5409.pdf.

Epidemiologic and laboratory studies suggest that multiple factors affect the risk for HIV transmission after an occupational exposure (CDC, 2001). In a retrospective case-control study of health care providers who had percutaneous exposure to HIV, increased risk for HIV infection was associated with exposure to a significant quantity of blood from the source person as indicated by (1) a device (e.g., a needle) visibly contaminated with the patient's blood, (2) procedures involving the placement of a needle directly in a vein or artery, or (3) a deep injury. Increased risk was also demonstrated with exposure to blood from a source person with a terminal illness. This is a possible reflection of either the higher titer of HIV in blood late in the course of AIDS or other factors (e.g., the presence of syncytia-inducing strains of HIV; CDC, 2005).

Further support for the observed variation in risk related to blood quantity is provided by research that demonstrated the transfer of more blood by deeper injuries and hollow-bore needles (CDC, 2001). Determination of viral load titer in the source person for use as a surrogate measure of transmission risk has not been clearly established as a useful clinical tool. A low source person viral load (e.g., less than 1,500 RNA copies) or even one that is below detectable limits does not eliminate the possibility of transmission because plasma viral load (e.g., HIV RNA) is only reflective of the cell free virus in peripheral blood. Even in the absence of viremia, latently infected cells can transmit infection (CDC, 2005).

HBV Transmission. In the United States, approximately 1.25 million individuals have chronic HBV infection and are sources of transmission to others (CDC, 2006). The number of new infections per year has declined from an average of 260,000 in the 1980s to approximately 73,000 in 2003 (CDC, 2007b), attributable in part to more widespread use of the HBV vaccine. HBV is now largely preventable with the availability of the vaccine, and home health care providers who have received HBV vaccine are at virtually no risk for infection. For susceptible individuals, the risk from a single needlestick or cut exposure to HBV-infected blood ranges from 6% to 30%. The actual risk depends on the hepatitis B e antigen (HBeAg) status of the source person.

Hepatitis B surface antigen (HBsAg) positive individuals who are HBeAg positive have more virus in their blood and are therefore more likely to transmit HBV than those who are HBeAg negative. Although the risk exists for HBV infection from exposures to mucous membranes or nonintact skin, no risks for HBV infection from intact skin exposures are known (CDC, 2003). In occupational settings, multiple doses of hepatitis B immune globulin initiated within 1 week following percutaneous exposure to HBsAg positive blood provides an estimated 75% protection from HBV infection (CDC, 2001).

HCV Transmission. HCV is a primary cause of serious liver disease in the United States and worldwide. The number of chronic HCV infections in the United States is estimated at 2.7 million (CDC, 2005) and a vaccine against HCV has not been developed. The risk from a single needlestick or cut exposure to HCV-infected blood ranges from 0.5% to 10% (CDC, 2003). In the absence of postexposure prophylaxis for HCV, recommendations for postexposure management are intended to achieve early identification of chronic disease and, if present, referral for evaluation of treatment options (CDC, 2001). Antiviral agents (e.g., interferon) or immune globulin should not be used for postexposure prophylaxis. In the case of acute HCV infection, recent studies have shown that early antiviral treatment can prevent the development of chronic hepatitis (Delwaide et al., 2004; Kamal et al., 2004; Nomura et al., 2004; Wiegand et al., 2006), although debate still exists over when to begin treatment and how long to treat acute HCV (Dienstag, 2005). Exposed health care providers who seroconvert may benefit from antiviral medications to treat HCV, including peginterferon and combination antiviral therapy with interferons and ribavirin. In addition, because HCV so frequently progresses to chronic hepatitis, and only 50% of those with chronic hepatitis respond to therapy at best, identification and treatment of workers with acute hepatitis is vital (Strader, Wright, Thomas, & Seeffs, 2004). Testing for HCV is recommended for all occupational needlestick and bloodborne pathogen exposures (CDC, 2001). For these reasons, following recommended infection control and work practices to prevent sharps injuries is imperative to protect employee health.

LEGISLATIVE AND REGULATORY FRAMEWORK

In the late 1980s, the U.S. Occupational Safety and Health Administration (OSHA) determined that employees face a significant health risk as a result of occupational exposure to blood and other potentially infectious materials that may contain bloodborne pathogens. This prompted the issuance of the Bloodborne Pathogens Standard (29 CFR 1910.1030), effective March 5, 1992, to eliminate or minimize occupational exposure to HBV, HIV, and other bloodborne pathogens. The standard presented guidelines that use a combination of engineering and work practice controls, personal protective clothing and equipment, training, health surveillance, HBV vaccination, signs and labels, and other requirements to minimize the risk of disease transmission (OSHA, 1992).

In 2000, the Needlestick Safety and Prevention Act was signed into law. This law influenced the 2001 revision of the Bloodborne Pathogens Standard in four main areas: (1) specification in greater detail of the engineering controls that must be used to reduce or eliminate exposure; (2) expansion of guidelines on the annual revision and updating of an exposure control plan; (3) solicitation and documentation of nonmanagerial, direct care employee input in the identification, evaluation, and selection of engineering and work practice controls; and (4) the requirement for employers to keep a sharps injury log (OSHA, 2001c).

Key provisions of the Bloodborne Pathogens Standard include:

- Adoption of engineering controls, including safe needle devices (e.g., needleless and shielded needle devices and plastic capillary tubes), and work practice controls that would eliminate or minimize employee exposure to hazards associated with bloodborne pathogens.
- Requirement that employers keep a sharps injury log and record all percutaneous injuries from contaminated sharps.
- Requirement that employers implement an exposure control plan for the worksite with details on employee protection measures. It must also describe how the employer will use a combination of engineering and work practice controls, ensure the use of personal protective clothing and equipment, and provide training, health surveillance, HBV vaccination, and signs and labels. The plan must be updated annually and must (1) reflect changes in technology that eliminate or reduce exposure to bloodborne pathogens [1910.1030(c)(1)(iv)(A)]; (2) document annually consideration and implementation of appropriate, commercially available, effective devices designed to eliminate or minimize occupational exposure [1910.1030(c)(1)(iv)(B)]; and (3) solicit and document input from nonmanagerial employees responsible for direct patient care, who are potentially exposed to injuries from contaminated sharps, in the identification, evaluation, and selection of effective engineering and work practice controls and document the solicitation in the exposure control plan [1910.1030(c)(1)(v)] (OSHA, 2001b).

The original legislation covered employees only in the private sector in both not-for-profit and for-profit settings. Six months later, protection was extended to public sector workers in 23 states with a federal OSHA-approved state occupational health and safety plan, but public hospitals in states without state-run OSHA plans were still exempt at that time. This changed again when the Medicare Modernization Act of 2003 required all public hospitals, as part of their Medicare provider agreement, to comply with the OSHA standard by July 1, 2004. Public hospitals in 28 states, territories, and the District of Columbia were affected by the new law (American Hospital Association, 2004). For home health care employers covered by OSHA, the scope of worker coverage is more limited than in hospitals. Home health care employers are not held accountable for the following site-specific violations: housekeeping requirements such as maintenance of a clean and sanitary worksite and the handling and disposal of regulated waste, ensuring the use of personal protective equipment, ensuring that specific work practices are followed (e.g., handwashing with running water), and ensuring the use of engineering controls (OSHA, 2001a). In addition to federal legislation and regulations, several states have enacted needles safety legislation to add safeguards for health care providers at the state level. Each of these state laws varies in terms of its coverage, scope, and time frame of the development and implementation of the related regulations. Common provisions of these regulations are summarized in the Sidebar.

Common Provisions of State Needle Safety Legislation

1. List safety devices as engineering controls.
2. Develop list of available safety devices (by the state) for use by employers.
3. Develop written exposure plan (by employers), periodic review, and updates.
4. Develop protocols for safety device identification and selection (by employers) and involve frontline workers in the process.
5. Develop sharps injury log and report log information.
6. Develop methods to increase the use of vaccines and personal protective equipment.
7. Waive or exempt safety device use under certain circumstances (including patient and worker safety issues, use of alternative effective strategies, and market unavailability).
8. Place sharps containers in accessible positions.
9. Train workers regarding safety device use.

Note. *Many state laws also contain unique requirements such as cost–benefit analysis, surveillance programs, strict requirements for safety device use, and the use of statewide advisory boards. Data from the Centers for Disease Control and Prevention (2002).*

Joint Commission Standards: Needlestick Prevention and Sharps Safety

Infection control standards that include needlestick prevention:

IC.2.10: Agencies identify risks.

IC.3.10: Agencies establish priorities and set goals to prevent infections.

IC.4.10: Identifying strategies to achieve those goals.

IC.5.10: Evaluation of the effectiveness of infection control.

IC.7.10: Effective management of infection control.

IC.8.10: Recruiting workers to implement the infection control program.

Environment of care and elements of performance standards that stress sharps safety:

EC.1.10: Organizations manage safety risks.

EC.1.10 and EP 5: Organizations use the risks identified to select and implement procedures and controls to achieve the lowest potential for adverse impact on the safety and health of staff.

EC.3.10: Organizations manage hazardous materials and waste risks.

EC.3.10, EP 2, and EP 6: The organization "establishes and implements processes for selecting, handling, storing, transporting, using, and disposing of hazardous materials and waste from receipt or generation through use and/or final disposal, including managing infectious and regulated medical wastes, including sharps."

Note. *Data from Joint Commission Resources (2007).*

In addition to federal regulations enacted to reduce or eliminate hazards from bloodborne pathogens, home health care agencies accredited by the Joint Commission must also comply with applicable infection control, management of environment of care, and elements of performance standards. These include infection control standards with needlestick prevention provisions as well as the environment of care and elements of performance standards addressing needlestick and sharps safety. Relevant standards are contained in the Sidebar.

Costs of Percutaneous Injuries

Not only are the risks, costs, and legal liabilities associated with a blood exposure serious, but percutaneous injuries can have devastating impacts on the lives of those affected. Institutions incur monetary costs, costs of lost opportunities, and the costs of injured workers' physical and emotional tolls. Fortunately, the greatest personal cost, occupational HIV and hepatitis seroconversion, is relatively rare.

OSHA mandates the systematic evaluation and implementation of sharps devices with an integrated safety feature, using input from frontline users and routinely reassessing improved products in the marketplace. Incremental costs of better safety devices are dwarfed by the benefits of avoiding sharps injuries. Although the short-term costs of needlestick injuries may seem low, longer range health care costs or nonmonetary costs can far exceed initial expenditures. Some costs of injuries borne by agencies, individuals, and insurance companies are shown in Tables 5 and 6.

Emotional and Quality of Life Costs to the Individual. It is much harder to assign value to emotional costs, including fear and anxiety related to the possible consequences of an exposure, direct and indirect costs associated with drug toxicities, lost time from work, and societal costs associated with HIV or HCV seroconversions. The psychological trauma may extend beyond the exposed employee to a spouse, a partner, or even children who may experience fear during a period of months that their loved one could seroconvert. Psychological costs are largely unrecognized, and even postexposure prophylaxis guidelines from the CDC provide only a brief reference to helping exposed employees cope with the psychological impact of an occupational exposure (Shalo, 2007).

Hidden Costs to Home Health Care Organizations. The hidden costs of needlestick injuries or bloodborne pathogen exposures to organizations are also difficult to quantify. Gershon, Flanagan, et al. (2000) reported that 83% of health care workers taking postexposure prophylaxis had adverse side effects and that most workers lost work time. Home health care is a service industry in which employees are considered "working capital," as they represent the assets available for conducting the daily operations of the business. The proactive application of resources to occupational safety and health adds to the strength of organizations and serves to attract and retain employees. Injuries offer no similar benefit and only detract from organizations. According to OSHA, "Safe workplaces provide the consistency and reliability needed to build a community and grow a business. Workplaces with active safety and health leadership have fewer injuries, are often rated 'better places to work,' and have more satisfied, more productive employees. These employees return to work more quickly after an injury or illness and produce higher-quality products and services" (OSHA, n.d.).

In economic terms, cost is equal to "what is given up to get it." The hidden costs of sharps injuries are trade-offs: an agency's resources, both financial and human, are applied to addressing injury follow-up rather than to providing home health care services. This use of resources is a lost opportunity for agencies. Preventing injuries is a more productive use of resources.

Legal Liability. Potential liability costs to health care facilities for health care workers injured on the job

Table 5

Costs Associated With Sharps Injury

Time Frame and Exposure Type	*Average Cost*
Short-term injury follow-up	
HIV-infected source patient	$2,456 (range = $907–$4,838)[a]
Unknown or negative source patient	$376 (range = $71–$860)[a]
Hepatitis C virus-infected source patient	$650 (range = $186–$856)[a]
Lifetime	
Chronic hepatitis B (not including liver transplant)	$65,000[b]
Hepatitis B or hepatitis C (includes liver transplant and first year of treatment)	> $300,000[c]
Hepatitis C (not including liver transplant)	$100,000[b]
HIV seroconversion	$618,900 per person[d]

[a]Data from O'Malley et al. (2007). Costs in 2003 U.S. dollars include short-term costs: time spent reporting, managing, and tracking the exposures; salaries (including benefits) for representative staff who sustained or managed exposures; and costs (not charges) for laboratory testing of exposure sources and exposed health care personnel, as well as any postexposure prophylaxis taken by the exposed personnel. [b]Data from C. Everett Koop Institute (2007). [c]Data from Emory Health Care (2006). [d]Data from Schackman et al. (2006).

by sharps are significant. The legal system provides injured workers with three potential avenues of recovery. First, a suit may be brought under the theory of product liability, based on the argument that the instrument causing the injury was unreasonably unsafe and should not have been used in the workplace. Out-of-court settlements and confidentiality agreements significantly reduce the availability of public information about these cases.

The second potential approach to legal action is for the injured worker to file suit against the institution's officers as though failure to provide safe tools was intentional, thereby creating an unsafe work environment. Although cases have been brought and liability found in other industries, officers in the health care field have not been found liable based on this theory. It is possible that this pattern could change in the future, especially if an employer fails to demonstrate a rigorous adherence to the requirements of the Bloodborne Pathogens Standard (OSHA, 2001b).

Finally, the most prevalent legal action in cases of occupational injury is workers' compensation. Employees injured during the course of employment or suffering from work-related mental or emotional disabilities, as well as occupational diseases, are eligible for workers' compensation benefits. The laws in all states provide that workers' compensation is the exclusive remedy for employees injured on the job, thereby precluding an individual employee from filing suit against an employer for an occupational injury. The employer's workers' compensation insurer pays the health care bills and a portion of the lost wages for workers hurt on the job. Like most types of insurance, the employer's premium reflects the number and severity of claims filed (unless the employer is self-insured).

PREVENTION OF PERCUTANEOUS INJURIES AND PROMOTING A CULTURE OF SAFETY

Exposure to bloodborne pathogens is one of the most deadly hazards that home health care providers face on a daily basis, and it is also one for which interventions are well documented. Between 62% and 88% of sharps injuries can be prevented using safe needle devices (Larmouth, 2004). When safe needle devices are combined with health care provider education and work practice controls, injuries can be reduced by more than 90% (Jagger, 1996). However, the presence of patient-provided sharps, often not safe devices, continues to pose potential injury.

The U.S. General Accounting Office (GAO) estimated approximately 69,000 needlesticks in hospitals could be prevented during a 1-year period by using needles with safety features. According to the GAO estimates, this would reduce postexposure treatment costs for injured hospital-based health care workers between $37 and $173 million per year (GAO, 2000). Unfortunately, no data exist to support these types of calculations in home health care. However, extrapolations based on hospital data suggest corresponding savings would result from the use of devices with engineered sharps injury prevention features.

Occupational health nurses can contribute to home health care agencies through sharps injuries prevention efforts and promotion of a safety culture. Although safety devices and carefully developed procedures will reduce injuries, the use of these alone will not eliminate sharps injuries in home health care. It is only through a multidisciplinary approach in a supportive organizational climate that the goal of injury prevention can be achieved and sustained. Poor organizational safety climate (Gershon, Karkashian, et al., 2000), inadequate staffing (Clarke, Sloane, & Aiken, 2002), low morale, and lack

Table 6

Personal Costs Associated With Sharps Injury

Postexposure prophylaxis side effects (n = 65)[a]

- 83% of health care workers taking postexposure prophylaxis had adverse side effects such as nausea, abdominal pain, headache, fatigue, and diarrhea
- Medications were often needed to combat postexposure prophylaxis side effects and most health care workers lost work time

Psychological symptoms related to an exposure incident[a]

- Anxiety (53%)
- Insomnia (18%)
- Depression (13%)
- Loss of appetite (10%)
- Sleepiness (10%)
- Frequent crying (10%)
- Feelings of abandonment by employer in cases where source patients refused testing

Impact on spouses and families of reconsidering whether to stay in one's chosen career, given the risk[a]

- Many spouses were worried, anxious, concerned, or stunned
- Most exposed health care workers altered their sexual practices after exposure and either abstained from sexual activity or practiced "safe sex"
- Separation from spouse due to lack of understanding of health care provider's concerns
- Postponed starting a family

Health care providers experienced increased levels of (n = 64)[b]

- Fear and anxiety (91%)
- Stress symptoms associated with the autonomic nervous system (sweating and tremor; 73%)
- Intrusive thoughts (62%)
- Problems with concentration (57%)
- Negative emotions, such as fear, anger, and sadness (93%)
- Isolation and loneliness (49%)

Nurses who sustained a needlestick injury within the previous 12 months (n = 110)[c]

- As a group they missed 61 days of work for which they cited emotional distress and anxiety as a reason
- Averaged a half lost workday per nurse

[a]Data from Gershon, Flanagan, et al. (2000). [b]Data from Giza (2004). [c]Data from Lee, Botteman, Nicklasson, Cobden, & Pashos (2005).

of administrative support (Hagstrom, 2006) have been identified as work organization factors strongly contributing to injuries. A culture of safety in the work environment can improve employee and patient safety and promote employee satisfaction, retention, and recruitment, critical factors in organizational success in the face of an increasing nursing shortage. Nurses are increasingly seeking a commitment to safety in prospective employers. Fifty-five percent of *Nursing 2004* readers surveyed identified sharps safety records and policies regarding safety devices as significant factors when deciding to accept new jobs (Perry, Robinson, & Jagger, 2004).

Home health care presents unique challenges in sharps injury and bloodborne pathogen exposure prevention. The home health care work force is largely independent, and work schedules and environments are often unpredictable. Other unique risk factors in home health care include the diversity of equipment home health care providers may use, including technology supplied by insurers and patients, and unsafe sharps disposal practices. Equipment supplied by third-party payers varies among patients, and home health care providers may have never worked with particular equipment before. In addition, equipment that is supplied by patients but used by home health care providers may not have safety features to protect users. Finally, although the Bloodborne Pathogens Standard mandates frontline employee input about the range of exposure situations encountered in the work-

Table 7

Product Categories for Common Safety Devices

Device Type and Description	*Advantages*	*Disadvantages*
Retrofitted devices Account for 95% of all devices currently in use; developed to assist institutions rapidly comply with legislation; typically designed by adding a shield, cap, or sheath to a conventional sharps device or 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; retrofitted 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 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 becoming aerosolized during retraction process
Manually retractable devices Provide protection and performance advantages over retrofitted devices	Allows for needle changes; easy to use; lower risk of aerosolization because user controls the mechanism at all times; price similar to that of retrofitted devices; accurate dosing control and reduced hazardous waste volume and disposal cost may also result in savings	

Note. *Data from Daley (2007).*

place and the selection of the most appropriate devices, in some cases, the representatives may be hospital nurses who are unfamiliar with the unique work environment encountered by home health care providers (Table 7). Therefore, the solution to sharps injuries and bloodborne pathogen exposures must be systems based, considering the home as the environment of care and supporting the caring culture and independent nature of home health care.

Hierarchy of Controls

The hierarchy of controls approach to sharps injuries and bloodborne pathogen exposures has been the center of regulatory and legislative activity since the 1991 issuance of the Bloodborne Pathogens Standard. Health care organizations have followed suit and adopted the hierarchy of controls concept to systematically identify hazards and prioritize prevention efforts. This model is based on the premise that removing a hazard from the workplace is more effective than relying on worker behavior or practice to reduce exposure. Table 8 lists control measures, ranked from most to least effective, with selected examples that can be used in home health care settings as part of a comprehensive percutaneous injury and bloodborne pathogen prevention program. Each home health care agency should have a sharps injury prevention program in place to monitor and prevent occupational injuries. To be successful, the sharps injury prevention team (SIPT) needs the support of management. Organizational and management factors are essential to achieving good safety performance (Wilson, DeJoy, Vandenberg, Richardson, & McGrath, 2004). Providing adequate administrative support may be one of the most important steps in building a safer health care system (Clarke et al., 2002). Senior management commitment and support for safety programs are significantly correlated with standard precautions compliance (Lundstrom, Pugliese, Bartley, Cox, & Guither, 2002).

Model for a Sharps Injury Prevention Team

The size and composition of the SIPT will vary depending on the size of the home health care agency and the services it offers. In its essence, the SIPT is a multidisciplinary team focused on eliminating sharps injuries among health care personnel delivering all services offered by the agency. The team leader is an individual with organizational authority and leadership skills, complemented by team members representing all agency services and ensuring the involvement of appropriate resources, expertise, and perspectives. The team leader is ideally the occupational health, employee health, or infection control nurse. Participation of senior-level management is integral to demonstrate the administration's commitment to the program and to ensure availability

Table 8

Sharps Injury Prevention Using the Hierarchy of Controls

Control Measure	*Selected Examples*
Elimination	Remove all unnecessary sharps; eliminate all unnecessary injections; use alternate routes for medication delivery when available (e.g., inhaler, transdermal patches, needleless intravenous and other systems, and jet injectors); review specimen collection systems to identify opportunities to consolidate and eliminate unnecessary punctures
Engineering controls	Employ safety-engineered products that obliterate the sharp feature immediately after completing its useful function, including needle devices that sheath, blunt, or retract the needle immediately after use; select passive devices (i.e., devices requiring no user action to engage a safety feature) over active devices (requiring user activation of safety feature) whenever possible; ideally the safety feature should be passive, easy to use, simple, and active throughout its use[a]
Administrative controls	Provide appropriate allocation of resources to support safety climate, including adequate personal protective equipment, sharps injury prevention program, exposure control plan, removal of all devices that pose risk, comprehensive, interactive, annual training for all employees (provided during working hours at no cost to include safe device use, work practices, and personal protective equipment), and purchasing decisions based on product safety and efficacy with involvement of frontline home health care providers in device evaluation and selection (particularly important when the home health care agency is part of a hospital group purchasing organization); written exposure control plan and immediate access to testing and postexposure prophylaxis according to the most current U.S. Public Health Service guidelines for the management of occupational exposures to HIV and recommendations for postexposure prophylaxis (available at www.cdc.gov/mmwr/preview/mmwrhtml/rr5409a1.htm)
Work practice controls	Replace sharps containers before full; establish a mechanism in each home to handle and dispose of sharps safely before beginning a procedure; no needle re-capping; ask patients about their own sharps disposal practices
Personal protective equipment	Provide quality, readily available gowns, gloves, masks, face shields, and other barriers or filters between the worker and the hazard to be used appropriately

[a]*Data from Fisher (1999).*

of necessary resources. The team must include representatives of clinical services who use sharps devices, as well as staff with expertise in staff development, materials management, and quality and risk management. The multidisciplinary approach is necessary to identify health and safety issues, analyze trends, implement viable interventions, evaluate outcomes, and make recommendations to other organizational units. This may sound daunting and bureaucratic, but the working group often functions in smaller subcommittees with clearly defined responsibilities (CDC, 2004b). Table 9 offers a suggested model for a home health care SIPT.

Occupational health nurses are critical to ensuring that the SIPT is well informed about the principles of hierarchy of controls, product design features, application criteria for device evaluation to ensure consistent

Table 9

Home Health Care Model Sharps Injury Prevention Team Members

Staff Representation	*Contributions*
Occupational health, employee health, or infection control nurses	Current knowledge and expertise in area; understanding of policies and procedures; expertise in assessing, planning, implementing, and evaluating infection control projects; collect injury data and assess environmental factors contributing to injuries; collect detailed information on reported injuries; assist in surveying health care personnel on underreporting; assess environmental and ergonomic factors contributing to sharps injuries and propose solutions
Directors of clinical services	Commitment to support worker safety from leadership; provide resources and authority to meet program goals; approve decision making regarding product choice and policy change
Materials management	Identify products and manufacturers of devices with engineered sharps prevention features; provide cost data for informed decisions
Staff development coordinators	Provide information on current education and training practices; identify training needs and discuss the organizational implications of proposed educational interventions; provide training
Direct care staff (infusion nurse, maternal or child nurse, medical or surgical nurse, hospice nurse, home health aide)	Provide firsthand insight into injury risk factors and the implications of proposed interventions; actively participate in the evaluation of prevention interventions
Quality assurance nurses	Provide institutional perspective and approach to quality improvement; design processes related to the sharps injury prevention program

Note. *Adapted from Centers for Disease Control and Prevention (2004b).*

understanding among device evaluators, and effective selection processes.

The chief aims of the SIPT are the prevention of needlestick and sharps injuries and the assurance of agency compliance with state and federal standards. The SIPT should not serve as an advisory group but rather have a clearly defined line of authority that enables it to:

- Define bloodborne pathogen exposure problems within the agency and develop appropriate strategies to improve needlestick injury reporting procedures.
- Oversee the exposure control plan and postexposure follow-up as required by OSHA, including monitoring the postexposure treatment program.
- Develop an effective surveillance system to monitor needlestick injuries and review the sharps injury log and OSHA 300 log.
- Obtain and disseminate information about new devices as they develop.
- Evaluate, select, and implement safe devices that are appropriate to home health care settings and ensure that frontline home health care providers are involved in product selection.
- Ensure that all home health care providers have thorough training with new safety devices.
- Document the committee's work in meeting minutes and inform and assist those responsible for preparing for Joint Commission site visits to demonstrate compliance with the OSHA standard (American Nurses Association, 2002).

CONCLUSION

This article has reviewed the scope and nature of sharps injury risk factors in home health care. The home health care sector continues to grow, and therefore a comprehensive approach to sharps injury prevention is needed to protect the work force, ultimately attracting and retaining qualified clinicians. In home health care, occupational hazards in general have remained invisible because the home has not been adequately recognized as a workplace (Markkanen et al., 2007).

The highly variable work environments of home health care present unique challenges for implementing sharps injury prevention practices. Nonetheless, a cornerstone for prevention is compliance with the Bloodborne Pathogens Standard and the Needlestick Safety and Prevention Act by ensuring thoughtful selection of safe sharp devices with input from direct care users, review and documentation of practices, and injury recording and tracking. In addition, a team effort is necessary to continually define agency-specific improvement opportunities, develop and execute interventions, and evaluate outcomes.

Although the cost-effectiveness of using safe sharps has been clearly demonstrated, it is the ethical responsibility of health care professionals to use safer health care technologies as the primary injury and exposure prevention measure (Lee, Botteman, Xanthakos, & Nicklasson, 2005). Occupational health nurses should recognize prevention of sharps injuries and bloodborne pathogen exposures not as just a cost-saving matter, but as a health

IN SUMMARY

Sharps Injuries and Bloodborne Pathogen Exposures in Home Health Care

Chalupka, S. M., Markkanen, P., Galligan, C., & Quinn, M.

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1. Home health care providers face serious occupational hazards, including job stress, violence, musculoskeletal injuries, automobile accidents, communicable disease transmission, latex exposure, and sharps injuries.

2. Relatively little is known about the risk and frequency of sharps injuries or bloodborne pathogen exposures in home health care because most research and surveillance efforts have focused primarily on hospitals.

3. Home health care presents unique challenges in sharps injury and bloodborne pathogen exposure prevention.

4. Occupational health nurses have a key leadership role in preventing and reducing sharps injuries and bloodborne pathogen exposures through promotion of a safety culture in home health care.

and human rights issue affecting clinicians and patients. Occupational health nurses have a key leadership role in preventing and reducing bloodborne pathogen exposures as well as promoting an organizational safety culture.

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