

Preventing Needlestick Injuries among Healthcare Workers:

A WHO-ICN Collaboration

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Effective measures to prevent infections from occupational exposure of healthcare workers to blood include immunization against HBV, eliminating unnecessary injections, implementing Universal Precautions, eliminating needle recapping and disposing of the sharp into a sharps container immediately after use, use of safer devices such as needles that sheath or retract after use, provision and use of personal protective equipment, and training workers in the risks and prevention of transmission. Post-exposure prophylaxis with antiretroviral medications can reduce the risk of HIV transmission by 80%. In 2003, the World Health Organization and the International Council of Nurses launched a pilot project in three countries to protect healthcare workers from needlestick injuries. The results of the pilot will be disseminated worldwide, along with best policies and practices for prevention. *Key words:* needlestick; prevention.

INT J OCCUP ENVIRON HEALTH 2004;10:451-456

Karen Daley, a registered nurse with 23 years of experience, had just completed accessing the vein of a patient in the emergency room of a large teaching hospital and was placing the used intravenous catheter into the sharps container according to protocol when she felt a prick in her finger from a needle extruding from the sharps container that had been caught in its drop-down lid. Nine months later, she learned that she had been infected not only with the human immunodeficiency virus (HIV) but also with hepatitis C.¹ In Karen's case, the source patient was unknown.

Hepatitis C (HCV) and HIV, the virus that causes AIDS, are two of the most serious of the 20 blood-borne pathogens that healthcare workers are exposed to in their daily work caring for the world's health. Hepatitis

B virus (HBV) is the most common bloodborne infection and the only one of the three serious viral infections for which an immunization exists. Other infections transmittable through needlesticks include syphilis, malaria, and herpes.^{2,3}

The healthcare workforce, 35 million people worldwide, represents 12% of the working population.⁴ The occupational health of this significant group has long been neglected both organizationally and by governments.⁵ The misconception exists that the healthcare industry is "clean" and without hazard, when in fact the chemical and blood-borne exposures encountered can be career- and life-ending.

Hazard Categories in the Healthcare Workplace

Biological hazards exist throughout all healthcare settings and include airborne and bloodborne pathogens such as the agents that cause tuberculosis, severe acute respiratory syndrome (SARS), hepatitis, and HIV infection/AIDS.

Healthcare workers (HCWs) are also subject to exposures to hazardous chemicals such as disinfectants and sterilizing agents that cause dermatitis and occupational asthma, carcinogens such as hazardous drugs that are also reproductive toxins, ergonomic hazards from the lifting and manual handling of patients, overexertion, short staffing, shift rotation, and physical hazards such as noise and radiation.

In addition to the traditional aforementioned categories of occupational hazards, HCWs experience the stress of being directly responsible for the care of very sick and dying patients, which, coupled with increasing workloads, can seriously threaten their health and well-being.

Global Burden of Disease from Occupationally Acquired Infections

Healthcare workers incur 2 million needlestick injuries (NSIs) per year that result in infections with hepatitis B and C and HIV. The World Health Organization estimates the global burden of disease from occupational exposure to be 40% of the hepatitis B and C infections and 2.5% of the HIV infections among HCWs as attrib-

Received from the International Council of Nurses and the American Nurses Association, Geneva, Switzerland (SQW), and the World Health Organization, Occupational Health Program, Geneva, Switzerland (GE). Supported in part by the United States National Institute for Occupational Safety and Health (NIOSH).

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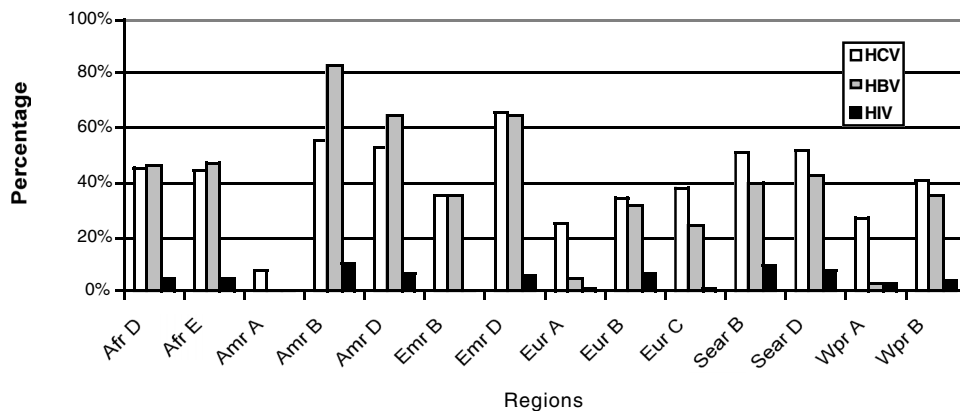


Figure 1—Attributable fractions of HCV, HBV, and HIV infections in healthcare workers 20–65 years of age due to injuries with contaminated sharps. See the List of Member States by WHO Region and normally (illegible) for an explanation of subregion.

utable to exposures at work (Figure 1).⁶ While 90% of the occupational exposures occur in the developing world, 90% of the reports of occupational infection occur in the United States and Europe.⁷ As of June 2001, 57 confirmed and 137 suspected cases of occupational HIV transmission in the United States had been reported by the CDC.³ But estimates of up to 35 new cases of HIV and at least 1,000 cases of serious infection are transmitted annually to HCWs.⁸

The projected 2 million NSIs is probably a low estimate because of the lack of surveillance systems and underreporting of injuries. Research has shown 40–75% underreporting of these injuries.⁹

Data from injection safety surveys conducted by the WHO and others show on average: four NSIs per worker per year in the African, Eastern Mediterranean, and Asian populations.¹⁰ Seventy percent of the world's HIV population lives in Sub-Saharan Africa, but only 4% of worldwide occupational cases of HIV infection are reported from this region.¹¹ In Vietnam, 38% of physicians and 66% of nurses reported sustaining a sharp-stick injury in the previous nine months.¹² In Tanzania, birth attendants were reported to be using plastic bags to deliver babies because of the lack of gloves.

In South Africa, 91% of junior doctors reported sustaining a needlestick injury in the previous 12 months, and 55% of these injuries came from source patients who were HIV-positive.¹³

Globally, NSIs are the most common source of occupational exposures to blood and the primary cause of blood-borne infections of HCWs.¹⁴

The two most common causes of NSIs are two-handed recapping and the unsafe collection and disposal of sharps waste.¹⁵

The WHO estimate of the global burden of disease from occupational exposures to contaminated sharps to HCWs is based on the number of HCWs at risk of exposure, the annual number of sharps injuries, and the prevalence of blood-borne disease in the worldwide population.¹⁷ The prevalences of HBV and HCV worldwide vary by region, ranging from 0.5 to 10% for hepatitis B and from 1 to 4% for hepatitis C. Prevalences of

HIV infection range from 0 (Europe and North American) to 0.3% in Latin America and the Caribbean, to 4% in Sub-Saharan Africa. According to the 2003 report of UNAIDS, 40 million people in the world are now living with AIDS. In general, hospitalized patients show higher prevalences of all three viral diseases than the general population, with median ratios of hospital samples to the general population of 1.9 for HBV, 3.4 for HCV, and 5.9 for HIV infection.¹⁶

Determinants of NSIs

Determinants of NSIs^{15,16} include:

- Overuse of injections and unnecessary sharps
- Lack of supplies: disposable syringes, safer needle devices, and sharps-disposal containers
- Lack of access to and failure to use sharps containers immediately after injection
- Inadequate or short staffing
- Recapping of needles after use
- Lack of engineering controls such as safer needle devices
- Passing instruments from hand to hand in the operating suite
- Lack of awareness of hazard and lack of training

Determinants of Transmission of Infection

The risks of transmission of infection from an infected patient to the HCW following a NSI are¹⁵:

Hepatitis B	3–10%
Hepatitis C	3%
HIV	0.3%

Factors that increased risks of transmission of HIV include a deep wound, visible blood on the device, a hollow-bore blood-filled needle, use of the device to access an artery or vein, and high-viral-load status of the patient.^{17,18} Taken together, these factors can increase the risk of transmission of HIV from a contaminated sharp to 5%. In developing countries, the

risk of occupational transmission is increased by the excessive handling of contaminated syringes.

Post-exposure prophylactic medication has been demonstrated to reduce the risk of transmission of HIV following NSI by 80%.¹⁹

The risk of occupational transmission has been extrapolated by the WHO to convey the risk of an unsafe injection.²⁰

EFFICACY OF CONTROL MEASURES

An effective exposure control program should have a responsible person assigned to head the program and a committee (such as an infection-control or health and safety committee) that includes representatives from front-line patient care providers to evaluate the hazards, compile the injury data, and make recommendations for prevention. The committee and staff responsible for exposure control should regularly review and analyze data from the exposure experience of the institution, incorporating an analysis of near-misses to determine the need for change. The committee should assure appropriate follow-up and post-exposure prophylaxis as determined by the nature of the injury and source patient.^{14,21}

CONTROL MEASURES

The most effective means of preventing the on transmission of blood-borne pathogens is to prevent exposure to NSIs. Primary prevention of NSIs is achieved through the elimination of unnecessary injections and elimination of unnecessary needles. The implementation of education, Universal Precautions, elimination of needle recapping, and use of sharps containers for safe disposal have reduced NSIs by 80%, with additional reductions possible through the use of safer needle devices.^{22,23} Control measures to prevent NSI following the traditional hierarchy of controls from most effective to least effective include^{24,25}:

- *Elimination of hazard*—substitute injections by administering medications through another route, such as tablet, inhaler, or transdermal patches, for example. Remove sharps and needles and eliminate all unnecessary injections. Jet injectors may substitute for syringes and needles. Other examples include the elimination of unnecessary sharps such as towel clips and using needleless intravenous (IV) systems.
- *Engineering controls*—such as needles that retract, sheathe, or blunt immediately after use. (These devices, after a decade of technologic advances, are widely available in North America and Europe and required by law in the United States.)
- *Administrative controls*—policies and training programs aimed to limit exposure to the hazard. Exam-



Worker in Pretoria Academic Hospital in South Africa dons protective apron.

ples include Universal Precautions (see below), allocation of resources demonstrating a commitment to HCW safety, a needlestick prevention committee, an exposure control plan, and consistent training.

- *Work practice controls*—examples include no re-capping, placing sharps containers at eye level and at arms' reach, checking sharps containers on a schedule and emptying them before they're full, and establishing the means for safe handling and disposing of sharps devices before beginning a procedure.
- *Personal protective equipment (PPE)*—barriers and filters between the worker and the hazard. Examples include eye goggles, face shields, gloves, masks, and gowns.

Universal Precautions

The concept of universal precautions came into being in 1985ⁱ as the AIDS epidemic worldwide raised awareness about the occupational hazard of exposure to blood-borne pathogens. Universal Precautions is an administrative control measure that calls for the implementation of practices and equipment to protect the HCW whenever the potential exists for exposure to blood. Every patient is considered to be infected with a blood-borne pathogen regardless of the known sero-status.^{2,26-28}

Testing of patients for HIV on admission to a health-care setting is widespread in some countries, and regardless of the ethical implications of not obtaining informed consent, a negative test provides a false sense of security to healthcare workers. Seroconversion to



Lab worker giving an injection to a child in Muhimbili National Hospital in Dar es Salaam, Tanzania.

HIV or HCV positive can be delayed up to nine months following infection, so a negative test does not necessarily mean that the individual is not infected. In addition, medical treatment of emergency patients and provision of first aid do not provide any opportunity for testing prior to treatment.

POST-EXPOSURE MEASURES

Follow-up

Every HCW who sustains a NSI should have access to post-exposure prophylaxis (PEP), as appropriate, within hours of the injury, along with counseling, confidential testing, and follow-up. Failure to report NSIs may compromise appropriate post-exposure management, including PEP for HIV and hepatitis B virus, and assessment of occupational hazards and preventive interventions. The absence of PEP, lack of knowledge of the efficacy of PEP for prevention, an attitude that HCWs are careless or to blame for their own injuries, and lack of follow-up and workers' compensation are all reasons HCWs do not report injuries. Health care institutions and HCWs should assess reasons for underreporting and eliminate barriers to reporting to encourage an effective exposure-control program.^{7,19}

Prophylaxis

When any HCW sustains a needlestick injury or other potential exposure to a blood-borne pathogen, the site should be washed with soap and water; mucous membranes should be flushed with water.

Evaluation of the injury for the appropriate use of PEP should be initiated immediately. The decision to initiate PEP is based upon the nature of the NSI, severity of exposure, and source patient sero-status and medication regimen if known. Testing of source patients requires informed consent in most institutions. Ethical issues must be considered prior to testing of source patients or workers. Guidelines for PEP can be found on the CDC Web site, and a 24-hour emergency post-exposure hotline is maintained by the CDC (box).

Immune globulin and antiviral agents are not recommended for PEP of hepatitis C.

A common reason for neglecting to implement disposable syringes, sharps containers, and PEP is cost. While cost-effectiveness data regarding HCW health and safety in general and NSI in particular are generally lacking, the WHO Safe Injection Global Network demonstrated the cost effectiveness of safe injections for the patients and community.²⁹ The state of California projected a savings of more than \$200 million from prevention of occupational HIV and hepatitis transmission following the implementation of a revised standard to protect workers from blood-borne pathogens by using safer needle devices.³⁰

Unnecessary injections pose unnecessary risks to the patient and the worker and increase the cost of health care. The marginal savings realized through the reduction of unnecessary injections can offset the cost of sharps containers (also known as safety boxes), especially if locally produced in developing countries.

The costs avoided will then include the costs of infection, disease, death, and workers' compensation, and most of all the human cost of suffering for workers' families.

MIGRATION

The morbidity and mortality of HCWs related to occupational exposures has an impact on the workforce, and as a result on access to good health care. A global shortage of nurses has emerged due in part to poor working conditions, including exposures to deadly infectious agents, carcinogenic chemicals, and hazardous drugs, and ergonomic hazards (lifting patients). Low salaries and difficult working conditions lead to the migration of skilled workers from developing countries to Europe and the United States, increasing the burden/workload of the remaining staff and contributing further to illness, injury, dissatisfaction, and the desire to migrate. This becomes a vicious circle. The migration of nurses from their home coun-

tries to others, especially the loss of the skilled health-care workforce from the developing world to the developed world, has created a crisis in the workforce.^{31,32}

Needlestick injury is the top health and safety concern of nurses worldwide, after stress.³³ According to an on-line survey conducted by the American Nurses Association, 88% of nurses consider occupational hazards when deciding whether to continue their employment and/or whether to choose new employment settings.³⁴

IMPLICATIONS FOR POLICY

From the first reported transmission from an occupational exposure in 1984, of HIV to a HCW, universal precautions, standards, and legislation have been enacted, such as the U.S. Bloodborne Pathogens Standard in 1992, and in 2000, after a decade of advances in technology, the 2000 Needlestick Safety and Prevention Act, which required the use of safer needle devices to prevent NSI.^{21,35} Essential occupational health and safety measures include:

- Proper training of workers
- Provision of equipment and clothing for personal protection
- Establishment of an effective occupational health program that includes immunization, PEP, and medical surveillance

The implementation and enforcement through legislative or regulatory policy of universal precautions and other control measures will enhance prevention. Recognition by HCWs and by regulatory authorities of the risks of exposure to blood-borne pathogens is crucial. While the primary cause of transmission of HIV is sexual transmission and not occupational exposure, the evidence that 40% of hepatitis is caused by occupational exposure is enough to warrant comprehensive programs and policies to protect HCWs.

Karen Daley was instrumental in helping HCWs understand and personalize their own risks of infection and in lobbying for passage of the U.S. Needlestick Safety and Prevention Act, which was eventually, after the passage of 17 state laws, passed by a unanimous vote in the U.S. Congress. This law requires the use of engineering controls, also known as safer needle devices, to prevent exposure and the involvement of front-line HCWs in the evaluation and selection of control measures, including devices. Legislation to require safer needle devices has been introduced in the United Kingdom and is being considered in the European Union.

WHO AND ICN JOINT PROJECT TO PROTECT HCWs FROM NSI

In September 2003, the WHO and the International Council of Nurses began a pilot project in three coun-



President of the Hanoi district nurses association demonstrating a sharps container to the project leaders at the National Institute for Occupational and Environmental Health in Vietnam.

tries, South Africa, Tanzania, and Vietnam, to prevent HIV and hepatitis infection from occupational exposures to blood-borne pathogens. Recognizing the need for integration between disciplines, the WHO and the ICN joined together with the national nurses' associations, occupational health professionals, and ministries of health to assess and address policy gaps, implement universal (or standard) precautions, educate workers and health systems managers, develop surveillance systems, immunize against hepatitis B, and implement appropriate post-exposure follow-up including prophylactic medication.

The goal of the project is to reduce NSIs and transmission of hepatitis viruses and HIV to HCWs. Secondary process measures are to increase reporting of NSIs, improve follow-up of injured workers, including PEP, and utilize the data regarding exposures for prevention.

Updated U.S. Public Health Service Guidelines for the Management of Occupational Exposures to HBV, HCV, and HIV and Recommendations for Postexposure Prophylaxis. Vol 50, No RR11; 1 06/29/2001. <<http://www.cdc.gov/mmwr/PDF/RR/RR5011.pdf>>

The WHO Injection Safety Tool Kit assembled by the Safe Injection Global Network (SIGN, see <www.injectionsafety.org>) will be utilized for initial assessment and as a programmatic resource. After one year, an evaluation of the pilot project will determine effectiveness of and need for wider dissemination of the tools and strategies beyond the pilot hospitals.

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