

# Bio-medical waste



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## Impact of needlestick injuries on healthcare workers

It was a routine day for Kailash, until he put his hand to clear the plastic liner of a dustbin. He felt a sudden sting and jerked his hand back to see blood dripping from his finger. How had the needle found its way into a dustbin which was not meant for the purpose? Nobody knew. But everybody knew what Kailash might contract from the needle stick injury – Hepatitis B, HIV or Hepatitis C, were only a few deadly possibilities.

Occupational Safety and Health Administration (OSHA), USA, estimates that 8 million workers in the healthcare industry and related occupations worldwide are at risk of occupational exposure to blood borne pathogens. According to the Centre for Disease Control and Prevention (CDC), Department of Health and Human Services, USA, in

March 2000, it was estimated that 0.6 to 0.8 million needlestick injuries and other percutaneous injuries occur annually among healthcare workers.

Studies show that nurses sustain the majority of these injuries and that as many as one-third of all sharps injuries are related to the disposal process. Many research papers have tried to figure out the situations and use of any particular equipment, which makes people more prone to needlestick injury.

The circumstances leading to a needlestick injury depend partly on the type and design of the device used. For example, needle devices that must be taken apart or manipulated after use (phlebotomy needles/vacuum tube assemblies) are an obvious hazard and have been associated with increased injury rates.<sup>1</sup>



### AT A GLANCE

- ❖ A report on injection practices in India, submitted to the Ministry of Health in February, shows that two-thirds of the injections administered are unsafe.
- ❖ In March 2000, it was estimated that 0.6 to 0.8 million needle stick injuries and other percutaneous injuries occur annually among health care workers.
- ❖ Needle devices that must be taken apart or manipulated after use (for example, phlebotomy needle/vacuum tube assemblies) are an obvious hazard and have been associated with increased injury rates

<sup>1</sup>Jagger et al, 1988

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In addition to risks related to device characteristics, needlestick injuries have been related to certain work practices such as:

- ◆ Recapping,
- ◆ Transferring of sharps between hands,
- ◆ Failing to properly dispose of sharps in puncture proof containers.

The risk of an individual getting infected with a blood borne pathogen after a needlestick injury from a source depends on various factors and the probability of getting the virus is called seroconversion.

Seroconversion means the percentage of healthcare workers developing the infection after being exposed to body fluids from a proven infective source. These rates have been documented by carrying out a follow-up of healthcare workers with occupational exposure to blood from a patient positive for a particular blood borne pathogen. For instance, in the case of exposure to a HIV positive patient, the healthcare worker would be tested for HIV antibodies at the time of exposure (baseline testing) and at periodic intervals for around 12 months.<sup>2</sup>

#### **Potential risk factors for sero-conversion following percutaneous injury:**

1. Interval between needle use and exposure
2. Depth or severity of exposure: Deeper injuries lead to more blood transfer, thus increasing the

#### **Risks from needlestick injuries**

##### **HIV**

The centre for Disease control has documented 32 cases of occupationally transmitted cases of HIV in healthcare workers, including 12 nurses. These are reported cases; many cases go unreported due to fear of discrimination or loss of confidentiality.

##### **HBV**

Is more readily transmitted, 8,700 healthcare workers each year contract Hep B on the job. More than 200 die.

##### **HCV**

Is a growing threat to nurses. Infection with HCV appears to carry a great potential for chronic liver diseases. Antibody tests have been developed to detect the virus but the number of healthcare workers that are infected remains unknown. No vaccine is currently available.

probability of infection transmission.

3. Quantity of blood injected: Directly related to virus particles passed to the person. At least 0.1ml of blood is thought to be required to cause infection in case of HIV, whereas for HBV – which is much sturdier than HIV, and the circulating titer is also high – it is estimated that 0.00004 ml of blood may be enough to cause an infection as a result of needle stick injury.<sup>3</sup>
4. Bore of needle: Studies have suggested that more blood is transferred by deeper injuries and by hollow bore phlebotomy needles, especially those of larger gauges than with solid suture needles.
5. Source patient: Patient's clinical status or stage of disease and the drug therapy he/she is receiving would affect the virus titer in blood thus influencing seroconversion.
6. Clinical status
7. Titer of circulating virus: Titer of freely circulating virus in the blood greatly influences the seroconversion rate. For example, the quantity of infectious virus in plasma or serum of HIV infected individuals is estimated to be 10-15 infectious particles (ip)/ ml with the highest levels of 10<sup>4</sup>ip/ml in patients with AIDS. A small amount of freely circulating virus in the blood could explain the low risk of infection following a needlestick injury compared to that of HBV, which is present in infected individuals at 10<sup>9</sup>ip/ml. In other body fluids like tears, saliva and ear secretions the virus titer is one tenth or one hundredth of the titer in blood.<sup>4</sup>
8. Use of antiviral drugs/ vaccination: Use of antiviral drugs like zidovudine after exposure to HIV and inoculation of vaccination following a HBV exposure have proved helpful in preventing seroconversion in most of the cases. Research evidence seems to suggest that the use of Anti-HIV drugs like zidovudine in combination with other anti-HIV drugs if given soon after the injury can reduce the rate of transmission. It is recommended that PEP should commence within 24-36 hours of injury, and preferably within a few hours of exposure.<sup>5</sup>
9. Healthcare worker: The immune response, adoption of universal precautions and post prophylaxis affect the susceptibility of the healthcare worker.
10. Use of barriers: Use of personal protective equipment like gloves, etc, may help reduce seroconversion. Studies have shown that a single pair of surgical gloves appears to decrease the volume of blood injected by solid suture needle by 70% or more in almost every simulation and another pair of gloves may reduce it by another 50% or more.

Thus good sharps management within the hos-

<sup>2</sup> Blood borne occupational disease of healthcare workers December 1999, *PRIA*, ACILS

<sup>3</sup> Pat, *Reducing the incidence of needlestick injuries*, Professional Nurse, January 1997 Vol. 12 No. 4

<sup>4</sup> AIDS, Hepatitis B and the healthcare worker; Dr. TS Jayalakshmi, Dr. GP Dureja, *AIIMS*

<sup>5</sup> HIV post-exposure prophylaxis: guidance from the UK chief medical officers' expert advisory group on aids, Department of Health, July 2000

pital can help in ensuring safety of the workers.

### Post prophylaxis measure following an injury

Healthcare personnel should be educated about the risk, and prevention, of blood borne infections. Hospitals should establish exposure-control plans, reporting formats for documenting any needlestick injury and also include post-exposure follow-up. Access to clinicians who can provide post-exposure care should be available at all working hours, or linkages with other facilities should be created for timely administration.

It is essential to educate healthcare workers to report occupational exposures immediately after they occur, particularly because Hepatitis B vaccine and HIV PEP are most likely to be effective if administered soon after the exposure.

### Evaluation of the exposure

The exposure should be evaluated for the potential to transmit HBV, HCV and HIV based on the type of body substance involved and the route and severity of the exposure. Exposures to these fluids or tissue through a percutaneous injury (that is, needle stick or other penetrating sharps-related event) or through contact with mucous membrane are situations that pose a risk for bloodborne virus transmission and require further evaluation. For HCV and HIV, exposure to a blood filled hollow needle or visibly bloody device suggests a higher risk exposure than exposure to a needle that was most likely used for giving an injection. In addition, any direct contact (in the absence of personal protective equipment) with concentrated virus in a research laboratory or production facility is considered an exposure that requires clinical evaluation.

### Needlestick Bill

The U.S senate unanimously approved new workplace regulations that will dramatically lower the number of potentially lethal needlesticks. The Bill is called the Needlestick Safety and Prevention Act. The legislation will require health care facilities nationwide to provide their employees with syringes and blood drawing devices incorporating safety features that retract, blunt or cover the needles after they are used.

Salient features of the Act are:

- ◆ Requires employers to solicit input from non-managerial health care workers when identifying, evaluating and selecting safety-engineered sharp devices, and to document this process in their exposure control plan.
- ◆ Requires management to evaluate and introduce safety-engineered sharp devices and needleless systems in order to reduce employees' occupational exposure to HIV, hepatitis C and other

### Suggested action following a needlestick injury

- ◆ Encourage bleeding at the site of injury. If percutaneous exposure occurs, bleeding should be encouraged by pressing around the site of the injury (but taking care not to press immediately on the injury site). It is best to do this under a running water tap.
- ◆ Wash wound with soap and hot water and dry hands.
- ◆ Apply povidine-iodine to the wound.
- ◆ Cover with an occlusive dressing (preferably water proof).
- ◆ Report incident immediately to the person concerned/ waste management committee.
- ◆ Complete an accident form.
- ◆ Identify source of needle contamination if possible.

bloodborne diseases.

- ◆ Requires that workplace exposure control plans document whether or not the management considered using safer medical devices as a way of addressing occupational exposure to bloodborne diseases. Plans must be reviewed and updated, atleast annually.
- ◆ Requires each health care facility to maintain a sharps injury log with detailed information on needlestick/sharps injuries (including type and brand of device involved in the incident, department where exposure occurred and an explanation of how it occurred).

Thus, as sharps have been linked with transmission of blood borne pathogens, stress should be laid on gradually eliminating the risk of needle stick injuries to the staff.

The reporting of accidents at work should be made mandatory. Biomedical waste rules mention this clause but are silent on the details. Some countries have made this reporting integral to the hospital's working. In UK, for instance, all employers are legally obliged by the Health and Safety at Work Act 1974 to ensure that their employees are trained properly and are proficient in safe working practices. Staff must be aware of acts or omissions likely to cause an accident. Employers are also obliged by the Control of Substances Hazardous to Health Regulations 1994 to review every procedure that involves contact with potentially dangerous substances, including bacteria and viruses in patients' blood and body fluids. Employees should know the hazards associated with a needlestick injury as it influences the incidence of such injuries. The re-

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porting of accidents is integral to the 1974 Act.

It is advantageous for the injured person to make a prompt record of any work related accident so that an accurate account of events is available if details are needed at a later stage.<sup>6</sup>

Responsibility for reporting the injury to the concerned authorities rests with the employer, as is the case with our rules too.

### Accident reporting format

Healthcare institutions should ensure that needlestick injuries are reported. The hospitals can adopt the following reporting format in case of injuries.

- ◆ Report the injury to the nursing supervisor or the identified person.
- ◆ Fill in the details of the injured person:
  - a. Name
  - b. Occupation
  - c. Date of birth and sex
- ◆ Fill in details of the incident:
  - a. Type of incident
  - b. Cause of injury
  - c. Category of person injured
  - d. Location of injury
- ◆ Fill in the following details about the incident:
  - a. Date and time of accident
  - b. Where did the accident happen
  - c. Nature of injury
  - d. Description of what happened
  - e. First aid treatment given
- ◆ Document action taken to prevent re-occurrence

This documentation would help the healthcare institution in identifying situations that lead to a needlestick injury, and therefore, allow them to take remedial action.

### Controlling this menace

- ◆ Avoid the use of needles where safe and effective alternatives are available.
- ◆ Help your employer select and evaluate devices with safety features that reduce the risk of needlestick injury.
- ◆ Use devices with safety features provided by your employer.
- ◆ Avoid recapping needles.
- ◆ Plan for safe handling and disposal of needles before using them.
- ◆ Promptly dispose of used needles in appropriate sharps disposal containers.
- ◆ Report all needlestick and sharps-related injuries promptly to ensure that you receive appropriate follow-up care.
- ◆ Tell your employer about any needlestick hazards you observe.
- ◆ Participate in training related to infection prevention.
- ◆ Get a Hepatitis B vaccination.

- ◆ Establish a post-injury protocol that protects the interest of workers.
- ◆ Through surveys and interviews, attempts should be made to establish the causes for under-reporting.
- ◆ An evaluation of procedures to determine ways to reduce the numbers of injections administered should be done.
- ◆ Training of all personnel on proper use and handling of needles and sharps is a must.

A report, on injection practices in India, submitted to the Ministry of Health in February shows that two-thirds of the injections are unsafe. In other words the country may be looking at 20,00,000 new Hepatitis B cases, 4,00,000 new Hepatitis C cases and 30,000 new HIV-positive cases, in a year. Unsafe disposal is one of the criterion which makes the injection dangerous not just for the healthcare worker, but also for the community at large.

Any needle or syringe leaving the hospital without disinfection and mutilation can be picked up by ragpickers, washed, repacked and sold as a new syringe. In this entire process it can transmit disease to a host of people who come in contact with it.

Realising the enormous disease transmission potential of these sharps, there was a need felt to control this menace at the global level. Safe Injection Global Network (SIGN) was formed, which is a coalition of several public and private partners, including WHO, UNICEF, UNAIDS, NGOs, governments, and health workers. It was formed in Geneva in October 1999 with a view of uniting the strengths and skills of several partners to work together on the issue of injection safety, of which safe disposal is an important component.

Thus the big onus of protecting itself and several others is on the healthcare sector. Training the staff and developing good sharps management plans are some basic steps, which can go a long way in ensuring safety from sharps.

Initial training can provide an impetus to a needlestick prevention program. However, training must be reinforced with other activities to make the program long-lasting and effective.

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<sup>6</sup> Sellick, J.A. et al, *Influence of an educational programme and mechanical opening needle disposal boxes on occupational needlestick injuries*. *Infect. Control & Hosp Epidemiol* 1991; 12: 12, 725-731

