Nursing Practice

Review

Needlestick injury

Needlestick injuries (NSIs) are one of the most frequent occupational hazards faced by nurses, phlebotomists, doctors and other healthcare workers, as well as those working in cleaning and waste disposal. Such injuries are particularly dangerous in view of their potential for transmitting life-threatening bloodborne pathogens, including hepatitis B (HBV), hepatitis C (HCV) and HIV (European Parliament, 2010). Many of these incidents, for various reasons, never get reported.

HBV transmission requires only 1/10,000ml of infected plasma (Wittman et al, 2009), and many times this amount is present within the barrel or on the sides of medical sharps, even in devices not used expressly to draw blood or gain vascular access.

A surprising number of NSIs occur after use, during disposal. HBV is stable in dried blood for at least seven days and HCV for at least 16 hours (Centers for Disease Prevention and Control, 1995). Not all healthcare workers are vaccinated against HBV; the European range is 30–90% depending on the country and branch of medicine (Vos et al, 2006).

Legislation to protect healthcare workers

Much work has been done since the millennium by healthcare worker associations to highlight the danger of NSIs. These injuries have been described by the European Parliament as “one of the most serious health and safety threats in European workplaces... estimated to cause one million injuries each year” (European Commission for Employment, Social Affairs and Inclusion, 2010).

The 2010 EU directive on sharps injury prevention (Council of the EU, 2010) will become law in all EU countries by May 2013, and oblige healthcare organisations to take measures to prevent NSIs to their staff. One measure is the use of safety-engineered medical devices (SEMDs); these are needles, phlebotomy devices and intravenous catheters that incorporate shielding or retraction of the needle.

Bloodborne viruses can stay infectious after blood has dried
Behind (year on year) for disposable syringes. There is a lack of perception of the danger of injection-related NSIs, as hospital administrators and staff seem to believe that needles that have been inside veins are riskier than injection devices.

It is a common view that devices that have been in veins are more likely to transmit bloodborne pathogens than those that have gone into other tissues, such as muscle or fat. However, while exposure to blood is a risk factor, there are factors with even higher risks.

Table 1 shows the odds ratio of HIV seroconversion as a function of certain factors (Centers for Disease Control and Prevention, 1995). An odds ratio of 1 implies that the event is equally likely in both groups, and an odds ratio of 16 means that a deep injury is 16 times more likely to transmit HIV than a non-deep injury. The depth of the injury is the most important risk factor. Table 1 shows that sustaining a deep injury carries around three times the risk for transmitting HIV than the presence of visible blood on the needle, the needle having been inside a vessel or the HIV positive patient later dying.

Another study showed similar results regarding HCV conversion (Yazdanpanah et al, 2005). Hypodermic needles have the greatest potential for delivering deep injuries. This is because, for both IV catheters and safety-engineered phlebotomy, the needle is inserted at a shallow angle with

### Table 1: Factors Affecting Risk of HIV Transmission

<table>
<thead>
<tr>
<th>Factor for HIV transmission</th>
<th>Odds ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep injury</td>
<td>16:1</td>
</tr>
<tr>
<td>Visible blood on device</td>
<td>5:2</td>
</tr>
<tr>
<td>Needle having been directly in a vein or artery</td>
<td>5:1</td>
</tr>
<tr>
<td>Terminal illness in source patient</td>
<td>6:4</td>
</tr>
</tbody>
</table>

*Source: CDC (1995) *All significant at p<0.01

### Table 2: Ratios of Percutaneous Injuries Among IV Catheters, Hypodermic Needles and Blood-Contaminated Hypodermic Needles

<table>
<thead>
<tr>
<th>Country (year)</th>
<th>All devices</th>
<th>IV catheters</th>
<th>Hypodermic needles</th>
<th>Blood-contaminated hypodermic needles</th>
</tr>
</thead>
<tbody>
<tr>
<td>US (1995)</td>
<td>3,003</td>
<td>6%</td>
<td>33%</td>
<td>5%</td>
</tr>
<tr>
<td>Italy (1994)</td>
<td>2,915</td>
<td>5%</td>
<td>30%</td>
<td>6%</td>
</tr>
<tr>
<td>Italy (1997-99)</td>
<td>6,872</td>
<td>10%</td>
<td>44%</td>
<td>12%</td>
</tr>
<tr>
<td>Total/weighted average</td>
<td>12,790</td>
<td>8%</td>
<td>38%</td>
<td>9%</td>
</tr>
</tbody>
</table>

*Source: PHASE (2001; 2003)*

Although there is a definite risk, it is a common misconception that most NSIs occur with devices that have been in a vein. The device most commonly associated with NSI is an injecting needle. These needles are used frequently to give medications (such as insulin or antibiotics), to aspirate fluids (such as from abscesses) or to reconstitute drugs (for example, chemotherapy agents).

Many studies and surveys have placed the common injecting syringe at the top of the frequency table of NSI. In the UK, for example, syringe needles cause more than 25% of NSIs (Watterson, 2005). An overview of epidemiological data from several countries indicates that injection procedures contribute on average to 21% of NSIs (Valls et al, 2007; Bi et al, 2006; Cullen et al, 2006; Watterson, 2005; Perry et al, 2004; PHASE study group, 2001; 2003) Injection procedures are therefore an important cause of exposure of healthcare workers to biological and chemical hazards.

### Risks posed by injections

Global conversion to safety-engineered IV catheters and safety-engineered phlebotomy sets has been faster than conversion to safety-engineered injection devices (Jagger et al, 2008), even though the last cause more NSIs.

In the US, where the use of safety devices has been mandatory since 2000, the percentage conversion has lagged behind (year on year) for disposable syringes. There is a lack of perception of the danger of injection-related NSIs, as hospital administrators and staff seem to believe that needles that have been inside veins are riskier than injection devices.

Another study showed similar results regarding HCV conversion (Yazdanpanah et al, 2005). Hypodermic needles have the greatest potential for delivering deep injuries. This is because, for both IV catheters and safety-engineered phlebotomy, the needle is inserted at a shallow angle with

Safety-engineered medical devices
NSI costs can be substantial when treatment, lost working time and staff turnover are taken into account. A number of organisations have introduced full or partial safety-device policies on the basis of a measured business case. However, this is not the only driving force for safety device conversion. The threat of potentially damaging legal cases, costly compensation claims and adverse publicity, all of which divert attention away from core objectives of delivering high-quality healthcare, may sometimes be the trigger.

There is an established perceived risk of NSI with devices that have been in a vein, whether to draw blood or to infuse medication, so many healthcare organisations are focusing on these devices when taking steps to reduce NSIs.
Healthcare budgets

When considering converting to safety-engineered medical devices, many purchasing departments take into account only the additional percentage in costs, whereas the use of a safety device is an investment for the institution as a whole.

In a recent study in Belgium, health economist David Larmuseau has shown that a conversion to safety-engineered devices saves nearly half a million euros per year (Larmuseau, 2007).

Healthcare organisations that have converted recognise that adopting safety-engineered medical devices is fundamental to a safer working environment, to eliminate the cost of treatment and staff absence, and to avoid damaging and expensive legal action.

Conclusion

In contrast to common belief, the risk of NSIs from injecting needles is greater than other activities, such as blood drawing and cannulation.

Now that the EU directive is being implemented, conversion to safety-engineered devices is swiftly becoming a more urgent consideration, as healthcare organisations will be obliged to take preventive and protective measures in all situations where there is a significant risk of sharps injury and infection.

Hospitals and other healthcare organisations will need to build strategies so they comply with the directive, and not to wait for the May 2013 deadline. These strategies should definitely include measures to protect healthcare workers when carrying out medical injections.

References


