Management of sharps injuries in the healthcare setting

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Sharps injuries are common in the healthcare setting. Between 2004 and 2013 a total of 4830 healthcare associated occupational exposures to body fluid were reported in the UK, 71% of these for percutaneous injuries.¹ As the reporting system is likely to have recorded only cases with an important exposure, the actual burden of sharps injuries is likely to be much higher. Healthcare workers need to be familiar with immediate management both for themselves if they become injured and for assisting injured colleagues. Many healthcare workers do not know how to manage a sharps injury,² particularly if this occurs out of hours. This review presents a summary of the immediate management of sharps injuries and outlines the risk assessment and management strategies to prevent the transmission of HIV, hepatitis B virus, and hepatitis C virus.

What is a sharps injury?

A sharps injury occurs when a sharp object such as a needle, a scalpel, bone fragments, or teeth penetrate(s) the skin. A splash of body fluid to mucous membrane or non-intact skin is another form of exposure to body fluids that could have a similar consequence.

Where do sharps injuries occur?

Healthcare related sharps injuries are not confined to hospitals, with 3-7% occurring outside.¹ The most commonly reported injuries are associated with venepuncture. Injuries to nurses and healthcare assistants accounted for 42% of all reports, whereas doctors and dental professions accounted for 41% and 5%, respectively.² Worryingly, ancillary healthcare workers without direct patient contact were also injured by inappropriate disposal of sharps.

What are the risks associated with sharps injuries?

Apart from the trauma of the injury itself, a major concern with sharps injuries is the risk of infection. In Western countries the three most common blood borne infections usually associated with transmission through sharps injuries are HIV, hepatitis B virus, and hepatitis C virus. Rarely, other infections such as malaria,¹ human T cell leukaemia viruses (types I and II),³ and haemorrhagic fever viruses, such as Ebola virus,⁴ may be implicated. The risks of transmission of hepatitis B virus (when positive for HB e antigen), hepatitis C virus, and HIV through sharps injuries are often quoted as 1:3, 1:30, and 1:300, respectively.⁵ ⁶ Mucosal exposure to body fluid carries a much lower risk (<1:1000 for HIV).⁷

The actual risk of transmission during an incident depends on several factors, such as the type of injury, the viral load of the source patient, the immune status of the recipient, and risk reduction strategies implemented in the healthcare setting. Since 1997 there has only been one documented case in the UK of HIV seroconversion in a healthcare worker after an occupational exposure.⁸ Despite hepatitis B virus being highly infectious, no transmission by sharps injuries has been reported in the UK in the past 10 years. This probably relates to the high percentage of healthcare workers who are immunised against hepatitis B virus. Hepatitis C virus is most commonly associated with sharps injuries, with the virus involved in 50% of all reported cases. Since 1997 a total of 21 hepatitis C virus seroconversions in healthcare workers have been reported in the UK.¹ As these infections have a relatively long incubation period, of as much as 3-6 months, the psychological impact and associated anxiety of potential infection during the follow-up period should not be underestimated.⁹

What should be done immediately after a sharps injury?

First aid should be performed on-site immediately after a sharps injury (box 1).

How is a risk assessment performed?

Prompt reporting of injuries is necessary so that a risk assessment can be carried out urgently by an appropriately trained individual (other than the exposed worker) who is familiar with the local management pathway. The arrangement for the provision of post-exposure advice varies between
The bottom line

- First aid should be undertaken as soon as possible and a risk assessment needs to be carried out urgently by an appropriately trained individual.
- If post-exposure prophylaxis is deemed necessary this should begin as soon as possible without waiting for the test results of the source patient.
- Post-exposure prophylaxis using antiretroviral drugs within the hour after injury can considerably reduce the risk of HIV transmission.
- Hepatitis B vaccine is highly effective in the prevention of hepatitis B; all healthcare workers should be immunised against the virus.
- Despite the lack of post-exposure prophylaxis to hepatitis C, such exposure should be followed up vigorously as treatment has a high success rate.

Sources and selection criteria

We searched PubMed and the Cochrane Library for articles published over the past 20 years using the terms “sharps injury”, “needle stick injury”, and “body fluid exposure” and hand selected the most relevant and appropriate articles. To search for relevant UK national guidelines we also accessed the UK Department of Health and Public Health England (formerly Health Protection Agency) websites. We consulted guidelines from the World Health Organization, Centers for Disease Control and Prevention, British HIV Association, and British Society for Sexual Health and HIV.

Box 1 Immediate first aid after exposure to body fluid (based on UK guidelines)

- Gently encourage bleeding in the puncture site
- Wash the injured area with soap and water
- Do not scrub the site or use antiseptic agents
- Cover the wound with an impermeable dressing after cleansing
- In the case of mucosal exposure, wash the exposed area copiously with water or normal saline
- If contact lenses are worn, wash the eyes with water or normal saline both before and after removing the lenses.

What blood tests are required for source patients and recipients?

If the risk assessment indicates that a clinically important exposure to body fluid has occurred, the status of the source patient’s blood borne viruses should be established. In some cases it may be possible to ascertain this from the source patient’s medical records. If the blood borne virus status is not known, appropriate arrangements should be made, with the consent of the source patient, either to test an existing blood sample or to take a fresh sample for testing. Box 5 lists the recommended tests. Immediate management and prophylaxis should be offered based on the initial risk assessment and should not be delayed while waiting the results of blood tests.

A baseline serum sample should be taken from the recipient and stored for potential retrospective testing. If the hepatitis B virus immunity status of the recipient is not already known, the baseline sample can be tested for antih Hepatitis B surface antibody to guide further immunisation against Hepatitis B virus. Further blood borne virus testing of the recipient at this stage is unnecessary, as this only reflects the status of the recipient at the time of testing and not whether transmission has occurred.

What consent is required?

In addition to obtaining the source patient’s consent for blood borne virus testing, consent should also be sought for disclosure of the test results to the occupational health service and the injured healthcare worker. If the source patient is deemed not to have capacity to consent, the tests cannot be performed, as this is for the benefit of a third party and not in the patient’s own best interests. Next of kin cannot give consent on behalf of a patient, unless the patient is deceased, or a child, in which case the parents or guardians may give consent. The recipient of the sharps injury should not approach the source patient for consent as this may influence the source patient’s decision and could invalidate the consent. If the incident happened during a procedure where sedation or anaesthesia was given, the source patient should be given sufficient time to recover capacity. If there are practical obstacles to obtaining consent promptly, the decision for starting post-exposure prophylaxis should be based on the information available at the time.

When should post-exposure prophylaxis for HIV be started?

The evidence for efficacy of post-exposure prophylaxis in preventing transmission of HIV is limited. Transmission of simian immunodeficiency virus in macaques was shown to be...
Box 2 Risk assessment based on injury type (adapted from UK guidelines and case-control studies)

**High risk exposures**
- Deep percutaneous injury
- Freshly used sharps
- Visible blood on sharps
- Needle used on source’s blood vessels

**Low risk exposures**
- Superficial injury, exposure through broken skin, mucosal exposure
- Old discarded sharps
- No visible blood on sharps
- Needle not used on blood vessels—for example, suturing, subcutaneous injection needles

**Exposures with no or minimal risk**
- Skin not breached
- Contact of body fluid with intact skin
- Contact with saliva (non-dental), urine, vomit, or faeces that is not visibly blood stained
- Needle not used on a patient before injury

Box 3 Body fluids and risk for transmission of blood borne viruses (in alphabetical order, based on UK guidelines)

**High risk body fluids**
- Amniotic fluid
- Blood
- Cerebrospinal fluid
- Exudative or other tissue fluid from burns or skin lesions
- Human breast milk
- Pericardial fluid
- Peritoneal fluid
- Pleural fluid
- Saliva in association with dentistry (likely to be contaminated with blood, even when not visibly so)
- Semen
- Synovial fluid
- Unfixed human tissues and organs
- Vaginal secretions

**Low risk body fluids (unless visibly blood stained)**
- Saliva (non-dentistry associated)
- Stool
- Urine
- Vomit

Box 4 Risk assessment of source patient (based on UK guidelines and case-control studies)

**High risk source**
- Known to be infected with one or more blood borne viruses (viral load and treatment status unknown)
- Known to have a detectable viral load for one or more blood borne viruses
- Unknown viral load but known to have advanced or untreated blood borne virus infection
- Blood borne virus status unknown but had known risk factors

**Low risk source**
- Ongoing risk factors for blood borne viruses and recent blood test results were negative for all three blood borne viruses
- Infected with a blood borne virus but known to have a fully suppressed viral load
- Unknown viral load but receiving long term antiviral treatment for blood borne virus with good adherence and known to be stable
- Blood borne virus status unknown but had no known risk factors for such viruses

**Source with no or minimal risk**
- A recent blood test result was negative for all three blood borne viruses

*Examples of risk factors: intravenous drug use, men who have sex with men, commercial sex workers, origin from high prevalence areas for HIV, hepatitis B virus, or hepatitis C virus.
†Can be arranged from source patient after consent if no recent results for blood borne viruses are available. However, management should not be delayed while waiting for results.
Box 5 Recommended investigations in source patient after consent (based on expert opinion)

- Combined HIV antigen and antibody (fourth generation HIV immunoassay)
- Hepatitis B surface antigen
- Hepatitis C antibody
- Other additional investigations could be added if a specific transmissible infectious condition is suspected—for example, malaria, human T cell leukaemia virus

*Testing for hepatitis C virus RNA or antigen should also be considered if source patient is at high risk for hepatitis C virus. This is because hepatitis C virus antibody may be negative during acute infection and may remain negative for more than 12 months in immunocompromised patients.*

What can be done about exposure to hepatitis C virus?

A case-control study found that the risk of hepatitis C virus transmission after percutaneous exposure increased with deep injuries and procedures involving hollow bore needles placed in a source patient’s blood vessel. Hepatitis C virus has also been found to have prolonged survival in syringes with a high residual void volume. The risk of hepatitis C virus transmission increases significantly if the source has a high viral load, whereas those with an undetectable viral load are unlikely to be infectious.

Currently no vaccine or post-exposure prophylaxis is effective in the prevention of hepatitis C virus transmission. However, treatment of acute hepatitis C infection is known to be highly effective. Early detection of hepatitis C virus transmission and referral to an appropriate specialist for assessment and treatment is therefore essential.

How is care accessed in different healthcare settings?

Local policy should clearly identify which department to contact during and out of normal working hours. The emergency department is usually the location for immediate access to advice, medicines, and vaccines, although in some hospitals additional post-exposure prophylaxis packs are stored in strategic locations such as operating theatres or delivery suites. In the community setting or in dental practices, the initial management of the injury has to be started on-site, immediately after the incident. A system to enable injured healthcare workers to access urgent expert advice should be locally agreed. As this occurs in an outpatient setting, it is important that source patients should be assessed before discharge and consent obtained for any potential blood tests. Hepatitis B virus vaccines are widely available in general practice, but access to HIV post-exposure prophylaxis would require a visit to the local emergency department. Because of the need to start these drugs early, attendance at an emergency department should not be delayed if this is deemed necessary after risk assessment.
How should injured healthcare workers be followed up?

After important exposure to body fluid, recipients should be followed up for at least 12 weeks. Table 4 summarises the testing required and timing of follow-up. Healthcare workers who have sustained a high risk injury and receive post-exposure prophylaxis should not be considered infectious and should be reassured that it is safe for them to return to clinical work, including performing procedures that are prone to exposure. 18

They should, however, be advised to use barrier contraception and to avoid blood or tissue donations, pregnancy, and breast feeding, especially during the first six to 12 weeks after exposure. 18

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References


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Additional educational resources

Resources for healthcare professionals

- Health and Safety Executive. Sharps injuries—what you need to do (www.hse.gov.uk/healthservices/needlesticks/actions.htm)—provides a perspective from the regulatory aspect of sharps injury
- NHS Choices. What should I do if I injure myself with a used needle? (www.nhs.uk/chq/Pages/2557.aspx?CategoryID=72)—provides a concise and practical approach to needlestick injury; also useful for non-healthcare workers
- Royal College of Nursing. Needlestick and sharps injuries (www.rcn.org.uk/support/the_working_environment/health_and_safety/needlestick_and_sharps_injuries)—has a link to the Royal College of Nursing guidance on sharps safety
- Patient.co.uk. Needlestick injury (www.patient.co.uk/doctor/needlestick-injury)—provides good tips on how to prevent sharps injury
- Health Education England. e-learning for Healthcare (http://www.e-lfh.org.uk/—several e-learning modules under Pathology (PATH)/e-Path 07-Virology provide useful information on prevention and management of sharps injury: 07_052 Sharps Injuries; 07_060 HBV; 07_104 HIV prevention
- Medscape (http://emedicine.medscape.com/article/782611-overview)—a comprehensive overview of the American approach to management of exposure to body fluids
- HIV-druginteraction.org (www.hiv-druginteractions.org)—maintained by the University of Liverpool, which provides a clinically useful, up to date and evidence based drug-drug interaction resource, freely available to healthcare workers, patients, and researchers.

Tables

Table 1 | Recommendation for HIV post-exposure prophylaxis based on HIV status of source patient and nature of incident (based on UK guidelines’)

<table>
<thead>
<tr>
<th>Incident risk and nature of exposure</th>
<th>Status of source patient*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No or low risk for HIV</td>
</tr>
<tr>
<td><strong>Minimal risk incident or low risk exposure</strong></td>
<td></td>
</tr>
<tr>
<td>Post-exposure prophylaxis</td>
<td>Not recommended</td>
</tr>
<tr>
<td>Follow-up</td>
<td>Not required</td>
</tr>
<tr>
<td><strong>Low risk incident and high risk exposure</strong></td>
<td></td>
</tr>
<tr>
<td>Post-exposure prophylaxis</td>
<td>Not recommended</td>
</tr>
<tr>
<td>Follow-up</td>
<td>Not required</td>
</tr>
<tr>
<td><strong>High risk incident and high risk exposure</strong></td>
<td></td>
</tr>
<tr>
<td>Post-exposure prophylaxis</td>
<td>Not recommended</td>
</tr>
<tr>
<td>Follow-up</td>
<td>Not required</td>
</tr>
</tbody>
</table>

*Where it is not possible to identify the source patient, a risk assessment should be conducted, including circumstances of exposure and epidemiological likelihood of HIV being present. Use of post-exposure prophylaxis is unlikely to be justified in most such exposures.
†Could be offered after a thorough discussion of risk.
<table>
<thead>
<tr>
<th>Source of guidelines and recommendations</th>
<th>Potential side effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UK and USA</strong></td>
<td></td>
</tr>
<tr>
<td>Truvada (245 mg tenofovir disoproxil fumarate and 200 mg emtricitabine) one tablet daily</td>
<td>Rare, but important side effects include acute renal failure and proximal renal tubulopathy (Fanconi’s syndrome)</td>
</tr>
<tr>
<td>Raltegravir 400 mg twice daily</td>
<td>Rare, include insomnia, diarrhoea, and nausea and vomiting</td>
</tr>
<tr>
<td><strong>World Health Organization</strong></td>
<td></td>
</tr>
<tr>
<td>2 nucleoside reverse transcriptase inhibitors: tenofovir+lamivudine or emtricitabine</td>
<td>Rare, but important side effects of tenofovir include acute renal failure and proximal renal tubulopathy (Fanconi’s syndrome)</td>
</tr>
<tr>
<td>Kaletra (200 mg lopinavir and 50 mg ritonavir) or other ritonavir boosted protease inhibitor</td>
<td>Rare, but include rash, diarrhoea, nausea and vomiting, and abnormal liver function test results</td>
</tr>
<tr>
<td>Hepatitis B immunity status</td>
<td>≤1 dose of vaccine or uncertain vaccination history</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>High risk exposure, source patient positive for hepatitis B surface antigen</td>
<td>Accelerated vaccine* course + 1 dose of hepatitis B immunoglobulin†</td>
</tr>
<tr>
<td>High risk exposure, hepatitis B surface antigen status of source patient unknown</td>
<td>Accelerated vaccine* course</td>
</tr>
<tr>
<td>Source patient negative for hepatitis B surface antigen or low risk exposure (regardless of hepatitis B surface antigen status)</td>
<td>Initiate vaccine course</td>
</tr>
<tr>
<td>Source patient negative for hepatitis B surface antigen or low risk exposure (regardless of hepatitis B surface antigen status)</td>
<td>Initiate vaccine course</td>
</tr>
</tbody>
</table>

* Doses spaced at 0, 1, and 2 months with booster dose at 12 months.
† Hepatitis B immunoglobulin 500 units intramuscularly per dose.
Table 4 Suggested follow-up schedules after high risk sharps injuries (based on UK guidelines\(^7\) for HIV and expert opinions for hepatitis B virus and hepatitis C virus)

<table>
<thead>
<tr>
<th>Blood borne virus risk in source patient</th>
<th>Within first 12 weeks</th>
<th>Week 12*</th>
<th>Week 24</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV</td>
<td>If post-exposure prophylaxis is started, review within seven days to monitor any side effects. Carry out tests for full blood count, urea and electrolytes, liver function, and bone profile, and carry out urine analysis</td>
<td>Test for combined HIV antigen and antibody (fourth generation HIV immunoassay)</td>
<td>Not routinely recommended</td>
</tr>
<tr>
<td>Hepatitis B virus</td>
<td>Attendance for hepatitis B vaccination with or without second dose of hepatitis B immunoglobulin according to recommended schedule</td>
<td>Test for hepatitis B surface antigen and hepatitis B surface antibody</td>
<td>Not routinely recommended unless hepatitis B immunoglobulin was given</td>
</tr>
<tr>
<td>Hepatitis C virus</td>
<td>Test for hepatitis C virus RNA at week 6</td>
<td>Test for hepatitis C virus antibody and hepatitis C virus RNA</td>
<td>Not routinely recommended unless risk of hepatitis C virus transmission is high</td>
</tr>
</tbody>
</table>

*If HIV post-exposure prophylaxis has been started, week 12 is calculated from end of post-exposure prophylaxis.