Needlestick Injury

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Introduction

The National Audit Office report of April 2003, *A safer place to work – improving the management of health and safety risks in NHS trusts*, found that needlestick and sharps injuries account for 17 per cent of accidents to NHS staff and are the second most common cause of injury, behind moving and handling at 18 per cent.

The major blood-borne pathogens of concern associated with needlestick injury are:

- hepatitis B virus (HBV)
- hepatitis C virus (HCV)
- human immunodeficiency virus (HIV).

However, other infectious agents also have the potential for transmission through needlestick injury. These include:

- human T lymphotrophic retroviruses (HTLV I & II)
- hepatitis D virus (HDV or delta agent, which is activated in the presence of HBV) hepatitis G virus (GB virus or GBV-C)
- cytomegalovirus (CMV)
- Epstein Barr Virus (EBV)
- parvovirus B19
- transfusion-transmitted virus (TTV)
- West Nile Virus (WNV)
- malarial parasites
- prion agents such as those associated with transmissible spongiform encephalopathies (TSE).

In the United Kingdom (UK), the Health Protection Agency (HPA) monitors significant occupational exposures and potential transmission of HIV, HCV and HBV from patients to healthcare workers through a national surveillance scheme. Data are reported in the *Eye of the Needle* report, which is regularly updated and can be accessed at www.hpa.org.uk/infections

When a blood or body fluid exposure incident occurs in the context of an 'exposure-prone procedure', the possibility of transmission of infection from healthcare worker to patient must be considered, as well as from patient to healthcare worker.

'Exposure-prone procedures' are those where there is a risk that injury to the healthcare worker could result in the patient's blood or open body tissue being exposed to the blood of the healthcare worker. In practice these include surgery, midwifery, dentistry and physical contact with trauma patients who may have open fractures or glass-contaminated wounds.

Needlestick or sharps injuries occur when a needle or other sharp instrument accidentally penetrates the skin. This is called a percutaneous injury. If the needle or sharp instrument is contaminated with blood or other body fluid, there is the potential for transmission of infection, and when this occurs in a work context, the term occupational exposure (to blood, body fluid or blood-borne infection) is used.

When blood or other body fluid splashes into the eyes, nose or mouth or onto broken skin, the exposure is said to be mucocutaneous.

The risk of transmission of infection is lower for mucocutaneous exposure than for percutaneous exposures but still significant. Other potential routes of exposure to blood or other body fluids include bites and scratches.

The National Audit Office (NAO) report of April 2003, *A safer place to work* –

improving the management of health and safety risks to staff in NHS trusts, and the subsequent Public Accounts Committee hearing, highlighted the need for the better management of needlestick and sharps incidents in the NHS.

- At least four UK healthcare workers are known to have died following occupationally-acquired HIV infection. By 1999, another healthcare worker was known to have been infected.
- Between 1996 and 2009, the Health Protection Agency received reports of seventeen healthcare workers who had been infected with hepatitis C virus due to occupational exposure.
- Significant stress and psychological trauma can result from needlestick injuries, even where no infection is ultimately acquired, due to long periods of uncertainty regarding the outcome of the injury, as well as changes in lifestyle, working restrictions and, where indicated, extended and debilitating treatments.

Available data suggests that the number of reported occupational exposure incidents increased by 49 per cent between 2002 and 2005, according to the HPA. However, many of these incidents could have been avoided by adopting precautions and by disposing of clinical waste appropriately.[1]

This section gives guidance on what NHS employers should do to reduce the risks of needlestick and sharps injuries to staff.

Reporting incidents

One of the major problems associated with the management of needlestick incidents, identified by the NAO in its report and confirmed by the HSE, is the lack of hard evidence relating to the actual numbers of incidents in trusts. This is due to the under-reporting of exposure incidents, which some studies have identified as being as high as 85 per cent. The NAO identified data collection and record keeping, together with the monitoring of those records, as a key area that requires more work.

Employers have a responsibility to ensure that there are local systems in place for reporting all needlestick injuries. Employees should be encouraged to report exposures promptly, following local reporting arrangements (usually to the trust's occupational health service). This is important for five reasons:

- it ensures appropriate management to reduce the risk of blood-borne virus transmission
- it documents the incident and the circumstances, which is essential for the subsequent investigation of occupational injury or infection
- it provides accurate surveillance, so that collective data analysis can inform measures to reduce the risk of further exposures
- It provides data to monitor and review the effectiveness of measures introduced to reduce the risk of further exposures
- It allows employers to meet their requirements to report RIDDOR dangerous occurrences to the HSE.

Surveillance systems

All cases of occupational exposure to blood or body fluid from patients infected with HIV, hepatitis C virus or hepatitis B virus, and all incidents where post-

[1] *Eye of the Needle* (2006), HPA

exposure prophylaxis (PEP) for HIV has been started (whatever the HIV status of the source), should be reported to the Health Protection Agency national surveillance scheme.

The anonymity of the healthcare worker is maintained through unique identifier codes.

The scheme aims to record:

- the numbers of healthcare workers being exposed to these viruses
- the circumstances contributing to occupational exposures
- the clinical management of those exposures, including HIV exposures and the use of PEP
- the side effects of HIV PEP and outcomes
- evaluate the introduction and effectiveness of safer devices.

Further information about the scheme can be found at www.hpa.org.uk/infections

Trusts interested in devising a format for collecting their data comprehensively might wish to refer to the Safer Needles Network http://www.saferneedles.org.uk/ or to one of the health service unions, who all have experience in this area.

A national study was established on the prevalence and causes of needlestick and sharps injuries, using the EPINet™ surveillance system. This is an international computerised database for recording data about needlestick injuries and body fluid exposure. Further information about this system can be found at www.med.virginia.edu

The legal position

Health and safety legislation

The Health and Safety at Work etc Act 1974 places a legal duty on employers to provide for the health and safety of their employees. NHS trusts have been subject to the full requirements of this legislation since 1991.

These duties were extended under a number of Regulations including;

1) The Management of Health and Safety at Work Regulations 1999, which require employers to assess risks to the health and safety of their employees and arrange for implementation of a comprehensive system of safety management.

2) The Control of Substances Hazardous to Health Regulations 2002 (as amended) specifically include micro-organisms in the definition of substances that are hazardous to health. The law requires employers to make a suitable and sufficient assessment of the risks to the health of workers exposed to such substances, with a view to preventing or adequately controlling the risks. This includes the proper use of protective equipment and regular monitoring of exposure.

3) The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR), requires exposures to hepatitis B or C, or HIV, to be reportable to the HSE as a dangerous occurrence (‘accidental release of a biological agent likely to cause severe human illness’) using form F2508, rather than as an injury (unless the exposure results in three or more days absence from work). Reports can be made online at www.riddor.gov.uk

4) The Safety Representatives and Safety Committee Regulations 1977 require employers to consult with accredited trade union safety representatives on health

and safety issues including the introduction of new technology and information to employees on the risks and dangers arising from their work, measures to reduce or get rid of these risks and what employees should do if exposed to these risks. In the context of needlestick injury, examples of where consultation is required include the development of sharps polices and risk assessments and the introduction of safety engineered devices.

There are additionally three EU Council Directives relevant to the general health and safety of workers (EU Council Directive 89/391/EEC, EU Council Directive 89/655/EEC, EU Council Directive 2000/54/EC.

New EU Directive on protection from sharps injuries in the hospital and healthcare sector

A fourth relevant Directive was published on 1 June 2010. Council Directive 2010/32/EU, on protection from sharps injuries in the hospital and healthcare sector, must be fully implemented in all Member States by 11 May 2013 at the latest.

The Directive can be accessed at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:134:0066:0072:EN:PDF

The Safer Needles Network and the Partnership for Occupational Safety and Health in Healthcare (POSHH) have developed implementation guidelines to provide guidance to NHS organisations on the implementation of the Directive, these can be accessed at www.nhsemployers.org

Following the good practice set out in this chapter will also assist employers in meeting the requirements of the new Directive.

Health Care Legislation

Under the Health Act (2006), the Government published a new and specific Code of Practice for the prevention and control of healthcare-associated infection, which requires NHS bodies to implement policies that encompass “the provision of medical devices incorporating sharps protection mechanisms.”

It places a new statutory duty on NHS healthcare organisations to make arrangements to put the provisions of the Code into practice, backed up by action if there are significant failings in relation to the Code.

Complying with Legislation

By failing to prevent needlestick injuries, trusts can be found to be in breach of regulations, and many have settled such cases, resulting in substantial legal expenses and compensation payments.

In 2004 a legal ruling against the Scottish Ambulance Service, three appeal judges ruled that cost grounds alone cannot be a reason not to purchase safer sharps devices, as this breached European health and safety laws.

In 2010 the Health and Safety Executive prosecuted an NHS trusts after a healthcare worker contracted the Hepatitis C virus after injuring herself on a needle used to take blood from an infected patient. The trust was fined £12, 500 plus £9, 000 costs and likely suffered reputational damage as a result.

Section 1 – Preventing Exposure

Employer responsibilities

Employers are responsible for managing the risks and preventing exposure to biological hazards, or reducing the risks of exposure as far as possible.

With 40,000 reported incidents each year (and at least as many unreported), needlesticks and sharps injuries are a significant issue affecting NHS staff health, safety and welfare. They should be managed as part of a employer's integrated risk management process.

Strategy and policy

The organisation should have a strategic aim or direction to reduce sharps related injuries and commitment should be secured from senior management to put necessary funding and resources into the prevention of sharps injuries.

The organisation should have suitable policies and procedures for managing the risks and preventing exposure to biological hazards.

Employees and Safety Representatives should be consulted and fully involved in all discussions to reduce sharps related injuries.

Local partnership working and good communication between health and safety, infection prevention and control, occupational health, clinical leads and procurement staff and workers representatives is key to the effective prevention and management of sharps injuries.

Assessing the risk

Employers are responsible for assessing risks and preventing exposure to biological hazards, or reducing the risk as far as possible. Below is a five step guide to sharp risk assessments based on the HSE's Five Steps to Risk Assessment.

Step 1 - Identify the Hazards

Organisations should familiarise themselves with the requirements of existing UK legislation, the new directive and implementation guidelines and any supplementary information to support the risk assessment process.

In most hospital and healthcare environments there will be varying degrees of exposure to blood borne viruses (BBVs). The main BBVs of main concern are hepatitis B, hepatitis C, hepatitis D and HIV.

Accidental injury by a sharp implement, such as a hollow bore needle, contaminated with a blood borne virus can lead to the transmission of BBVs.

Sharps injuries are therefore a hazard which can lead to the risk of blood borne viruses. Whilst the risk of infection may be relatively low, the anxiety of having to go through blood tests and possible treatment can cause the worker a great deal of stress.

Step 2 – Decide who might be harmed and how

Legislation covers all workers that are under the managerial authority and supervision of healthcare employer/organisations. This extends not only to these who are directly employed, but also some self employed workers (such as agency/bank nurses), and any workers employed by organizations contracted to provide services for healthcare organizations (e.g. cleaners and other ancillary staff).

There are many types of health care and hospital work which can expose individuals to the risk of sharps injuries these include:

- clinical work - clinical procedures such as phlebotomy, cannulation, vaccination, acupuncture and surgical procedures.
- ancillary services – cleaning, portering, hospital laundry and sterile supplies.
- diagnostic and laboratory work
- Mortuary work.

Groups who carry out the majority of procedures using sharps are those most at risk. These include nurses, Operating Departmental Practitioners (ODPs), phlebotomists, physiotherapists, doctors and laboratory technicians. In addition cleaning staff will have a high exposure risks if sharps are not properly disposed of. Community based, as well as acute staff, may be injured by inappropriate use or non disposal of sharps.

Injury can occur with a wide range of items but those which have a higher risk of injury include needles, IV cannulae, winged steel needles ('butterfly') and phlebotomy needles.

Existing data on sharps injury reports can be used to identify areas who report high numbers of sharps. However, there is often under reporting of sharps injuries within organisations so this may not be a reliable use of data. In reality, whenever a needle or other medical sharp is used on a patient there is a potentially serious occupational safety risk. Universal application of preventative measures, including training, safe working procedures and safety-engineered devices, is therefore necessary.

Step 3 – Evaluate the risks and decide on precautions

Every effort should be made to avoid blood and body fluid exposures occurring, through safe systems of work.

In 2003, the National Institute for Health and Clinical Excellence published guidelines for the *Prevention of Healthcare Associated Infections in Primary and Community Care*. Recommendation SP (Standard Principle) 24 states:

> "*Needle Safety Devices must be used where there are clear indications that they will provide safer systems of working for healthcare personnel*."

The guidelines acknowledge that safety devices not only minimise the risk of operator injury but also reduce 'downstream' injuries following the disposal of sharps, involving housekeeping or portering staff.

The Care Quality Commission (CQC) operates under a new law regulating health and adult social care in England. From 1 October 2010, every health and adult social care service in England is legally responsible for making sure it meets new

essential standards of quality and safety. The CQC will register, and therefore license, care services if they meet essential standards and will monitor them to make sure they continue to do so. It has a wide range of actions it can take if it finds care services are not meeting essential standards, which includes keeping patients and staff safe.

The Care Quality Commission assesses NHS Trusts' performance against the provisions laid out in the *Code of Practice for the Prevention and Control of Health Care Associated Infections*. The Code specifically addresses the need to prevent exposures to blood-borne viruses including prevention of sharps injuries. It states that measures to avoid exposure to blood-borne viruses should include:

- immunisation against hepatitis B
- the wearing of gloves and other protective clothing, the safe handling and disposal of sharps, including the provision of medical devices incorporating sharps protection, and measures to reduce risks during surgical procedures.

The principle of following Standard (Universal) Precautions means never assuming that there is no risk. If every patient is assumed to be potentially infected with a blood-borne infection, the same precautions to prevent exposure should be used for every procedure.

Needles should never be re-sheathed. Re-sheathing needles is a common cause of needlestick injury. The ink mark on an index finger or thumb after inaccurate re-capping of a pen illustrates how easily re-sheathing needlestick injuries occur. Re-capping of needlesticks has been banned in the EU.

Cuts and grazes should be covered with waterproof dressings. Non-intact skin is a potential route of entry for blood-borne transmissible agents through contact with infected body fluids.

Personal protective equipment should be worn when dealing with blood or body fluids.

The easiest way to start step 3 is to compare what you are doing now with good practice. Firstly you should consider whether you can get rid of the hazard altogether and if not how the risks can be control so that harm is unlikely.

The World Health Organisations 'hierarchy of controls' on the prevention of sharps injuries is a way of implementing best practice. The hierarchy below is adapted from the WHO hierarchy and presented in order of priority:

Elimination of hazard – complete removal of a hazard from the work are is the most effective way to control hazards; this approach should be used whenever possible. Examples include:

- removing sharps and needles when possible e.g. substituting jet injectors for needles and syringes or using needlesless intravenous systems.)
- eliminating all unnecessary injections
- eliminating unnecessary sharps such as towel clips.

Engineering controls – These are used to isolate or remove a hazard from a workplace; examples include:

- adequate numbers of easily accessible sharps disposal containers
- use of sharps protection devices for all procedures (devices with needles that retract, sheathe or blunt immediately after use).

Many medical devices incorporating sharps prevention mechanisms (safety engineered devices) are now available. These are designed to significantly reduce or eliminate the risk of needlestick injury. They include safety-shielded

and retractable needles, safety lancets, blunt needles (for example for suturing), needle-free systems, blunt plastic cannulae and shielded cannulae.

There is a large range of diverse products available, so it is essential to select the most appropriate product for a particular clinical procedure. Further information on safety devices currently available under the NHS Supply Chain national framework can be obtained by emailing sharps@supplychain.nhs.uk It is important that devices are evaluated locally by relevant stakeholders.

When considering safety-engineered medical devices the following selection criteria should be applied:

- the device must not compromise patient care
- the device must perform reliably
- the safety mechanism must be an integral part of the safety device, not a separate accessory
- the device must be easy to use and require little change of technique on the part of the health professional
- the activation of the safety mechanism must be convenient and allow the care-giver to maintain appropriate control over the procedure
- the device must not create other safety hazards or sources of blood exposure
- a single-handed or automatic activation is preferable
- the activation of the safety mechanism must manifest itself by means of an audible, tactile or visual sign to the health professional
- the safety mechanisms should not be easily reversible once activated.

There is a growing body of independent evidence from Europe and beyond regarding the effectiveness of these devices.[2] [3]

Independent European academic studies have investigated the issue of cost effectiveness of medical devices incorporating sharps protection mechanisms. These studies explore the overall costs of managing needlestick injuries and assess the cost of purchasing devices incorporating sharps protection mechanisms against the overall financial benefits of reducing injuries. They conclude that investments to prevent needlestick injuries will achieve overall economic savings.

Administrative controls – These are policies such, which aim to limit exposure to the hazard. Examples include:

- health and safety responsibilities of all staff are clear, well coordinated and adequately resourced
- sharps injury prevention committee (may be part of health and safety committee)
- a sharps policy which covers exposure prevention as well as treatment and follow up
- reference to sharps injury prevention in infection control and procurement policies

[2] Cullen BL, Genasi F, Symington I, Bagg J, McCreaddie M, Taylor A, Henry M, Hutchinson SJ, Goldberg D, 'Potential for reported needlestick injury prevention among healthcare workers in NHS Scotland through safety device usage and improvement of guideline adherence: an expert panel assessment' (2006), *Journal of Hospital Infection*, 63: 445-451.2

[3] *Occurrence and prevention of reported occupational needlestick injuries within NHS Scotland, with particular reference to the role of safety devices* (2004), Scottish Centre for Infection and Environmental Health

- removal of all unsafe devices
- safe systems of work particularly in high risk areas such as theatres, obstetrics and emergency care
- environmental factors including good lighting and adequate space to carry out the procedure
- consistent information and training which include safe systems of work, correct use and disposal of sharps, the use of medical devices incorporating sharps protection mechanisms, measures to be taken in the event of a sharps injury, how to use any PPE provided.
- promotion of a no blame culture
- incident reporting procedures and investigations which include feedback to staff/staff groups involved
- vaccination programmes and follow up procedures.

Work Practice Controls – These controls to change the behaviour of workers to reduce exposure to occupational hazards. Examples include:

- no needle recapping or resheathing
- safe construction of sharps containers
- placing sharps containers at eye level and within arms' reach
- disposing of sharps immediately after use in designated sharps containers
- sealing and discarding sharps containers when they are three quarters full
- establishing means for the safe handling and disposal of sharps devices **before** the beginning of a procedure.

Studies in the United States and Europe have shown significant reductions in the numbers of needlestick injuries from improving sharps disposal.

Sharps should never be passed hand to hand and handling should be kept to a minimum.[4] All sharps should be disposed of carefully at the point of use. This means that suitable sharps containers (conforming to British Standard BS 7320) should be portable enough to take to the site of a procedure, and designed specifically to allow needles and sharp instruments to be disposed of easily and safely at the point of use. It is not acceptable, particularly for cost reasons, to reduce the number of sharps bins to such an extent that staff are forced to carry used needles to the sharps bin to dispose of them.

This should also reduce the number of incidents resulting from incorrect disposal or non-disposal of sharps, for example in clinical waste bags, bed linen and laundry, or on floors and other surfaces.

Ideally sharps bins should be designed to prevent overfilling and accidental spillage of contents. They should be easy to close temporarily and permanently, and there should be no risk of puncture of the container. Cardboard sharps bins should not be used. Care is needed to ensure portable sharps bins are not left unattended in areas where non-healthcare workers (especially children) can access them. Syringes/cartridges should be disposed of intact.

In the pressurised work environment of healthcare, staff may be tempted to take short cuts, to save time. This can increase the risk of needlestick injury. It is important that healthcare workers receive continuously updated education and training about safe systems of work with sharps and body fluids. This will ensure that safety becomes embedded into organisational culture and that safe working practices become second nature.

Staff require regular specific training in this key area, not just at induction.

[4] *Safe use and disposal of sharps* (2001), Medical Devices Agency

Personal Protective equipment – These provide barriers and filters between the worker and the hazard. They will prevent exposures to blood splashes but will not prevent needle stick injuries. Examples include:

- Gloves - Although a needle or sharp instrument can easily penetrate a glove, the risk of transmission of infection is significantly reduced. The glove material will remove up to 86 per cent of the blood on the outside of a needle.[5] An inner glove will remove most of blood not removed by the outer glove. Double gloving therefore substantially reduces the risk of blood-borne virus transmission from a sharps injury.

- Eye protection - This is important wherever blood or other body fluids could splash into the eye. Ordinary prescription spectacles offer some, but inadequate, protection, as they are not generally designed for this purpose. Eye protection should therefore be worn routinely not just in operating theatres, delivery suites and endoscopy suites, but also in accident and emergency departments and any other clinical areas where pressure may lead to spurting or splashing of body fluids, such as when unblocking or irrigating lines and tubes.

  Blood may become aerosolised due to surgical drilling techniques, such as those used in orthopaedic surgery, and mucous membrane exposure may not always be recognised.

  There are many designs of safety spectacles now available, many of which will fit over prescription lenses and frames.

Independent studies show that a combination of training, safer working practices and the use of medical devices incorporating sharps protection mechanisms can prevent more than 80 per cent of needlestick and sharps injuries.[6]

Step 4 – Record your findings and implement them

The findings of the risk assessment should be documented and should form part of the action plan to reduce the risks of injury. Such action plans should be time sensitive. The risk assessment can be organisational wide if the organisation is small e.g. a GP practice or ward based for larger health care organisations such as a hospital.

The results of the risk assessment should be shared with all workers identified as being at risk.

Performance indicators can be used to ensure that risk assessments are being implemented e.g. increase in the number of safety devices being purchased.

Step 5 – Monitor performance and review

Steps should be taken to periodically review the effectiveness of the risk assessment and control measures in place. This could be reactive e.g. following

[5] Mast ST, Woolwine JD, Geberding JL. 'Efficacy of gloves in reducing blood volumes transferred during simulated needlestick injury' (1993), *Journal of Infectious Diseases*, 168 (6): 1589-92.

[6] Cullen BL, Genasi F, Symington I, Bagg J, McCreaddie M, Taylor A, Henry M, Hutchinson SJ, Goldberg D, 'Potential for reported needlestick injury prevention among healthcare workers in NHS Scotland through safety device usage and improvement of guideline adherence: an expert panel assessment' (2006), *Journal of Hospital Infection*, 63: 445-451.2

an incident report or proactive e.g. an audit or workplace inspection or looking at performance indicators eg. the number of devices being purchased. It is recommended that a review date is set for a risk assessment.

Risk assessments should also be reviewed if changes take place to work practices or new equipment is introduced.

Section 2 - Managing Exposure

Management of blood and body fluid exposure incidents

First aid treatment

- If the mouth or eyes are involved, they should be washed thoroughly with water.
- If skin is punctured, free bleeding should be gently encouraged and the wound should be washed with soap or chlorhexidine and water, but not scrubbed or sucked.
- If there is any possibility of HIV exposure, urgent advice should be sought about the relative indications for anti-retroviral post-exposure prophylaxis.

Unfortunately, under-reporting of exposure incidents is widespread. Every effort should be made to encourage and facilitate local reporting. The reporting process should be easily accessible, straightforward and confidential. Depending on local arrangements, body fluid exposures in a healthcare setting may be managed by a number of different departments including occupational health, accident and emergency, infection control, infectious diseases, genito-urinary medicine, sexual health, HIV services, microbiology or virology.[7]

Assessment of the risk of blood-borne virus (BBV) transmission

Average estimated seroconversion risks from published studies and reports are:

- 0.3 per cent for percutaneous exposure to HIV-infected blood[8]
- 0.1 per cent for mucocutaneous exposure to HIV-infected blood
- 0.5-1.8 per cent for percutaneous exposure to HCV-infected blood with detectable RNA[9] [10]
- 30 per cent for percutaneous exposure of a non-immune individual to HBeAg positive source.

Factors that may increase the risk, and influence management of the incident are:

- percutaneous injury rather than mucous membrane or broken skin exposure
- injury with a device from a source patient's artery or vein
- blood exposure rather than exposure to blood-stained fluid, diluted blood (for

[7] Doebbeling BN, Vaughn TE, McCoy KD, Beekmann SE, Woolson RF, Ferguson KJ, Torner JC. 'Percutaneous injury, blood exposure, and adherence to standard precautions: are hospital-based health care providers still at risk?' (2003), *Clinical Infectious Diseases*. 37(8):1006-13, and Benitez Rodriguez E, Ruiz Moruno AJ, Cordoba Dona JA, Escolar Pujolar A, Lopez Fernandez FJ. 'Underreporting of percutaneous exposure accidents in a teaching hospital in Spain' (1999) *Clinical Performance & Quality Health Care*. 7(2):88-91. Grime PR, Risi, L, Binns C, Carruthers J, Williams S. Pan Thames Survey of Occupational Exposure to HIV and the Use of Post-Exposure Prophylaxis in 71 NHS Trusts (2001), *Journal of Infection* 42, 27-32

[8] Tokars JI, Marcus R, Culver DH, Schahle CA, McKibben PS, Bonden CI et al.Surveillance of HIV infection and zidovudine use among health care workers after occupational exposure to HIV-infected blood: the CDC Cooperative Needlestick Surveillance Group, (1993). *Ann Intern Med*; 118:913-9

[9] Ramsay ME. Guidance on the investigation and management of occupational exposure to hepatitis C (1999), *Commun Dis Public Health*; 2 258-62

[10] Jagger J. Puro V. De Carli G. 'Occupational transmission of hepatitis C virus' (2002), *JAMA*; 288(12): 1469-71

example in local anaesthetic solution) or other body fluid

- injury from hollow bore rather than solid bore needle
- injury from wide gauge rather than narrow gauge needle
- deep rather than superficial injury[11]
- visible blood on the device
- no protective equipment used (like gloves, double gloves, eye protection)
- first aid measures not implemented (washing, bleeding)
- HCV RNA detectable in source patient on most recent blood test
- high viral load of HIV in source patient[12]
- HBeAg detectable in source patient blood
- exposed person not, or inadequately, immunised against hepatitis B
- source patient co-infected with more than one BBV.

When a body fluid exposure occurs and is reported, the first priority is to assess how likely it is that the incident will result in blood-borne virus transmission, and then take steps to reduce that risk as far as possible. The initial assessment and management has to be based on the information available at the time.

Relevant information to consider

The source patient

1. Known or unknown?
2. If unknown, is there any indication of the origin of the device or body fluid? For example, was the device from a unit or area with patients known to have hepatitis B or C or HIV?
3. If known, is the source patient known to be infected with hepatitis B, hepatitis C or HIV? The validity of negative results varies depending on how long ago the tests were done and current risks factors.
4. If the source patient is not known to carry any of these infections, do they have any risk factors for them?
5. The risk of being infected with HIV is increased in people from areas of high prevalence, particularly sub-Saharan Africa, men who have sex with men (MSM), intravenous drug users, people with HIV-infected mothers or with HIV-infected sexual partners.
6. The risk of being infected with hepatitis C is increased by receipt of unscreened blood or untreated plasma products (in the UK prior to September 1991 and 1985 respectively); sharing of injecting equipment while misusing drugs; sharps injury or mucous membrane splash exposure to blood from patients known to be infected, or at risk of infection with hepatitis C; involvement as a healthcare worker or a patient in invasive medical, surgical, dental or midwifery procedures in parts of the world where infection control

[11] Cardo DM, Culver DH, Ciesielski CA, Srivastava PU, Marcus R et al. 'A case-control study of HIV seroconversion in healthcare workers after percutaneous exposure' (1997). *N Engl J Med*. 337: 1485-1490

[12] Cardo DM, Culver DH, Ciesielski CA, Srivastava PU, Marcus R et al. 'A case-control study of HIV seroconversion in healthcare workers after percutaneous exposure' (1997). *N Engl J Med*. 337: 1485-1490

precautions may have been inadequate; or with populations with a high prevalence of hepatitis C infection (like Egypt).

7. The risk of being infected with hepatitis B is increased in intravenous drug users, men who have sex with men (MSM), and in people with hepatitis B-infected mothers or hepatitis B-infected sexual partners.
8. If the source patient is known to be infected with HCV, is HCV RNA detectable on most recent test?
9. If the source patient is known to be infected with HIV:
   - has there been a recent/current seroconversion illness?
   - are they terminally ill with HIV-related disease? If so viral load may be high.
   - what is the most recently recorded viral load?
   - are they taking anti-retroviral drugs?
   - is there any evidence of viral drug resistance?
10. If the source patient is known to be infected with hepatitis B, are they:
    - HBsAg positive?
    - HBeAg positive?

The exposed person

Hepatitis B immune status:

- unvaccinated?
- one, two, three or more doses of hepatitis B vaccine?
- date of last booster?
- most recent HBsAb result and date?
- HBcAb positive (natural immunity)?

Protocol for management of exposures

In all cases:

1. A blood sample from the exposed person should be sent to a virology or microbiology laboratory for serum to be saved and stored. There is no point in testing this sample for blood-borne viruses at this stage, unless there is reason to believe the exposed person may already be infected. The purpose of this sample is to be able to show that, in the unlikely event of subsequent seroconversion, the member of staff was not infected at the time of the exposure, and therefore the infection was occupationally acquired. As occupational acquisition of blood-borne virus infection is fortunately rare, in the majority of cases this sample is never tested.

2. The exposed person should be given time to talk about their concerns following the incident and discuss the available information about risks from the exposure.

   Counselling of the exposed person should include information about:

   - statistics regarding seroconversion risks
   - risks involved in this particular incident
   - steps to reduce the risk of BBV transmission
   - follow-up procedure and rationale behind it
   - ‘window period’ if the source patient has ongoing risk factors for BBV infection
   - infection control precautions (ie safe sex) and no blood donation during follow-up period, but no additional work restrictions
   - establishing support networks: friends, family and so on
   - allowing time to express anxieties and concerns and to answer questions

- HIV and HCV follow-up tests (and HBV if not immune)
- confidentiality

3. Follow-up to confirm that occupational blood-borne virus transmission has not occurred. See Figure 1 on page 17.

Approaching source patients for blood-borne virus testing

It can be very helpful to test source patients, with their informed consent, for HIV, HBV and HCV, regardless of risk factors, unless very recent results are available. Most source patients consent to testing when the policy is explained.

Pre-test discussion for HIV antibody testing should be considered part of mainstream clinical care, and should therefore not require specialist counselling training or qualification. (*HIV testing for patients attending general medical services: national guidelines. Royal* College of Physicians, March 2005.)

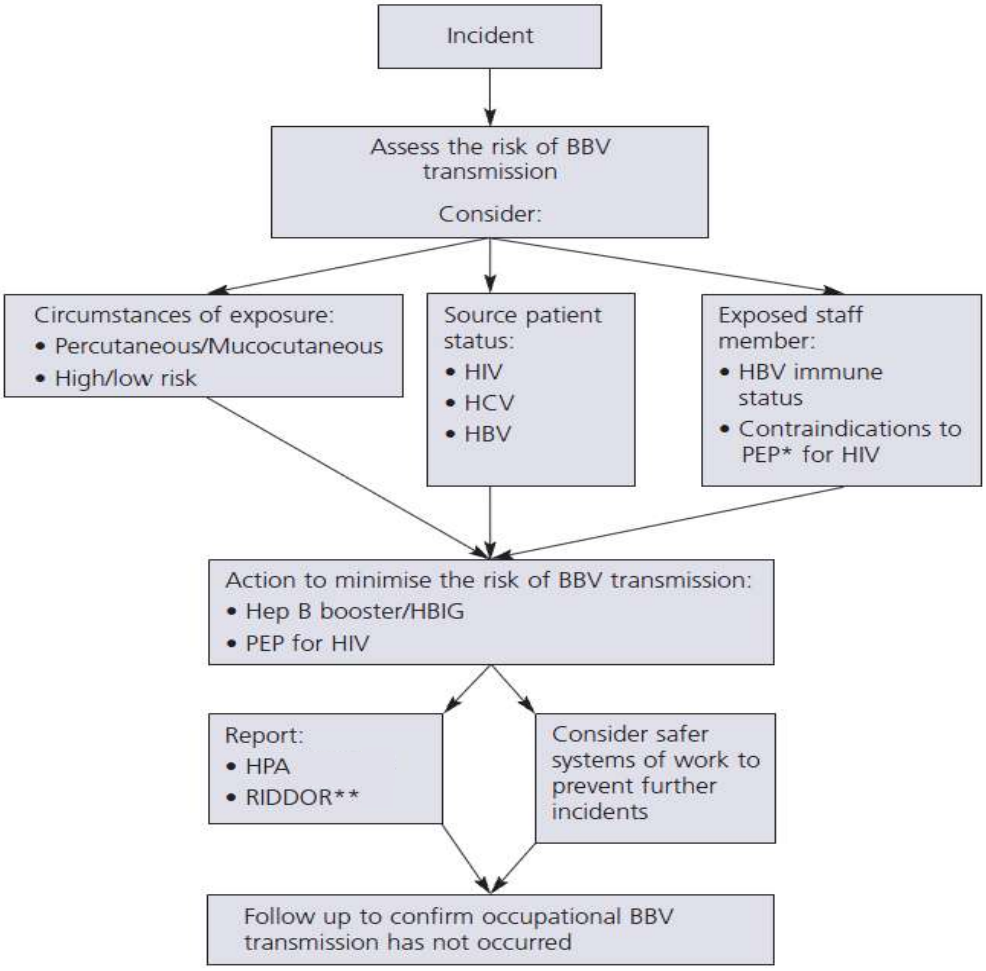
Checklist for pre-test discussion with source patient

1. The pre-test discussion should be carried out with due sensitivity, and not by the exposed member of staff.
2. Explain what has happened and the policy for requesting consent for BBV testing. Check understanding of the tests, which are the same as those done for blood donors. Explain confidentiality. The approach is not made on the basis of perceived risk and patients can decline permission for testing.
3. Details of the exposed person should be kept confidential.
4. Discuss the practical implications of the test and its result (positive or negative), for example sexual relationships, work situations, medical follow-up and life insurance (The Association of British Insurers recommends that companies should only ask about positive test results). Remember the potential stigma associated with HIV in many communities.
5. Discuss possible routes of transmission of HIV, HBV and HCV. If high-risk behaviour occurred within the preceding three months (they don't have to say what) explain the 'window period' (six–ten weeks from infection to the detection of measurable antibodies). Consider organising a follow-up test after the window period.
6. Describe the procedure for having blood taken. Discuss arrangements for communicating the results to the source patient.
7. Informed consent may be obtained verbally or in writing.
8. Request HBsAg, HCV antibody and HIV antibody test on the pathology form.
9. Write 'source patient in needlestick incident' for clinical details.
10. Occasionally a patient is unable to give consent. Consent cannot be given by a third party like a next of kin. It may now be illegal to test without consent, depending on interpretation of the Human Tissue Act 2004.[13]
    If the patient refuses consent, if it would be detrimental for the patient to be approached, or there are any other reasons why the testing is not done, this should be recorded and the exposed person informed.

[13] Human Tissue Act, (2004)

Figure 1

Management of body fluid exposure incidents



* Post Exposure Prophylaxis

** Reporting of Injuries, Diseases and Dangerous Occurrence Regulations 1995 (Health and Safety Executive)

Managing exposures from unknown sources

What should be done about an injury from a used needle of unknown source? The principle for any needlestick injury is to assess the risk of blood-borne virus transmission, and then aim to minimise that risk as far as possible. It's important to keep this principle in mind, as it's easy to get lost in the detail when confronted with a scenario that is often accompanied by a measure of anxiety.

Systematic assessment of the risk from any incident involves consideration of three categories of information: the circumstances of the exposure, the source of the exposure and the exposed individual.

About the circumstances of the exposure, it is important to establish whether exposure has indeed occurred. Was the skin actually breached by the needle? There is no evidence to suggest that blood-borne viruses can be transmitted across intact skin, or from a needle that has not been used. Deep injury from a large, hollow bore needle with visible, fresh blood will carry a higher risk than one from a superficial scratch from an old, blunt, solid or subcutaneous small needle through protective clothing. However, it is important to note that the absence of visible blood on a needle should not create a false sense of security. Minute quantities of blood are all that's needed to transmit deadly viruses. This much blood is frequently present in used hypodermic needles and often the blood is not visible to the naked eye. First aid measures such as washing and bleeding the wound (but not scrubbing or sucking it) will help to minimise the risk.

Some like to consider an estimate of the approximate statistical risk of transmission and are reassured by this, while others find statistics baffling and distressing. Published studies have calculated from reported cases, the average risk of transmission from a source known to be infected. Combining this with the risk of the source being infected (for example the background population prevalence of infection, or the prevalence in intravenous drug users if that seems the likely source of the needle) makes the overall likely risk relatively small. The HPA website is a useful source of up to date epidemiological data.

	UK Population Prevalence*	**Prevalence in UK IVDUs ***	**Average seroconversion risk after percutaneous exposure to known infected source**
HIV	0.08%	London 3% Elsewhere 0.5%	0.3%
HCV	0.4-0.5%	41%	0.5-1.8% (if detectable RNA)
HBV	0.5% HBsAg carriers	22%	30% (non-immune individual exposed to HBeAg positive source)

*Source: HPA

Unless there are clues about the possible origin of the needle (for example, found in the surgery waiting room after a diabetic clinic), a discarded needle may well have been used to inject illicit intravenous drugs. However, blood in the bore of the needle is probably diluted with injection material, and viral load should diminish as it dries. Blood on the outside of the needle is likely to have been wiped by contact with grass, soil, clothing and so on. All this reduces the likely risk of HIV transmission from a needle of unknown source to no more than 1 in 30,000. This does not justify the risks of post-exposure prophylaxis with anti-retrovirals in most cases. Although HIV is often the greatest fear, in fact hepatitis C and hepatitis B are more common and more transmissible. Hepatitis C seroconversion

has been documented following injury from a needle in a hospital waste bag. However, hepatitis C transmission is unlikely in the absence of detectable HCV RNA, and similarly many chronically-infected hepatitis B carriers are also of low infectivity.

If the source patient is infected with HIV [14]

In the case of definite exposures to blood or other high-risk body fluids known or considered to be at high risk of HIV infection, post-exposure prophylaxis (PEP) should be offered as soon as possible, preferably within one hour of the incident.

It may still be worth considering up to 72 hours after the exposure, but the relative benefit of prophylaxis diminishes with time.

The current standard recommended regimen for PEP is a 28-day course of:

- Truvada (Tenofovir disoproxil 245mg/Emtricitabine 200mg) one tablet twice a day
- Kaletra (Lopinavir200mg/Ritonavir50mg) 2 tablets bd

Anti-emetics such as metaclopramide, domperidone, cyclizine, ondansetron, and anti-motility drugs, such as loperamide, are often co-prescribed for the side effects.

Anti-retroviral drugs are not licensed for PEP, so must be prescribed on a 'named patient' basis by a doctor. The regimen may need to be modified if there is evidence that the source patient is infected with a virus that is resistant to any of these drugs. In this case, specialist advice should be sought from the HIV physician treating the source patient.

Anti-retroviral drugs have side effects including: nausea, vomiting, abdominal pain, lethargy, fatigue, diarrhoea, headache, bone-marrow suppression, rashes, liver-function disturbance, pancreatitis, peripheral neuropathy, glucose intolerance (protease inhibitors) and renal calculi.

The exposed person may have relative contraindications to consider, like pregnancy, breast feeding, a history of anaemia, neutropenia, hepatic or renal failure. There are many possible drug interactions to be considered, so check carefully with available information from a specialist pharmacist about any potential interactions with medications the exposed person may be taking.

Exposed persons should be counselled about the side effects and the potential risks and benefits of PEP, so that staff can make an informed choice whether to take PEP or not. Expert advice may be required. In some cases it may be appropriate to approach the source patient for urgent out-of-hours HIV testing if there are relative contraindications to PEP.

If there is doubt and anxiety, it may be reasonable for the exposed person to take the first dose of PEP (unless there are contraindications). This takes away the need for an urgent decision and allows time for further consideration.

In view of the recommendation to start PEP as soon as possible, starter packs containing enough drugs for 5 days (to cover weekends and public holidays) should be made available to avoid delay due to dispensing a prescription. However, the cost-benefit balance will need to be carefully considered. The drugs are expensive and starter packs must be checked regularly to ensure expiry dates are not exceeded.

[14] *HIV Post-Exposure Prophylaxis: Guidance from the UK Chief Medical Officers' Expert Advisory Group on AIDS* (2008), Department of Health.

The exposed person should be followed up weekly while taking PEP for:

- repeat prescriptions for the drugs
- psychological support
- blood samples:
  - biochemistry (urea and electrolytes)
  - liver function tests (including gamma GT and amylase)
  - haematology (full blood count)
- monitoring of side effects.

The exposed person should return for testing (with informed consent) for HIV antibodies at three months after completing post-exposure prophylaxis.

If the exposed person tests positive for HIV antibodies, it will be necessary to test the stored baseline sample and refer them to a specialist in HIV medicine. See Figure 2 on page 21.

Figure 2: Management of HIV Exposures

High Risk Exposure incident:
Needlestick/scratch
Body fluid on **broken** skin
Body fluid on mucous membrane (eye, nose, mouth)

High Risk Body Fluid:
Blood
Amniotic fluid
Human breast milk
CSF, pleural, pericardial peritoneal synovial fluid
Saliva associated with dentistry
Semen/vaginal secretions
Unfixed tissues/organs

Vomit, faeces, urine **only when contaminated with blood**

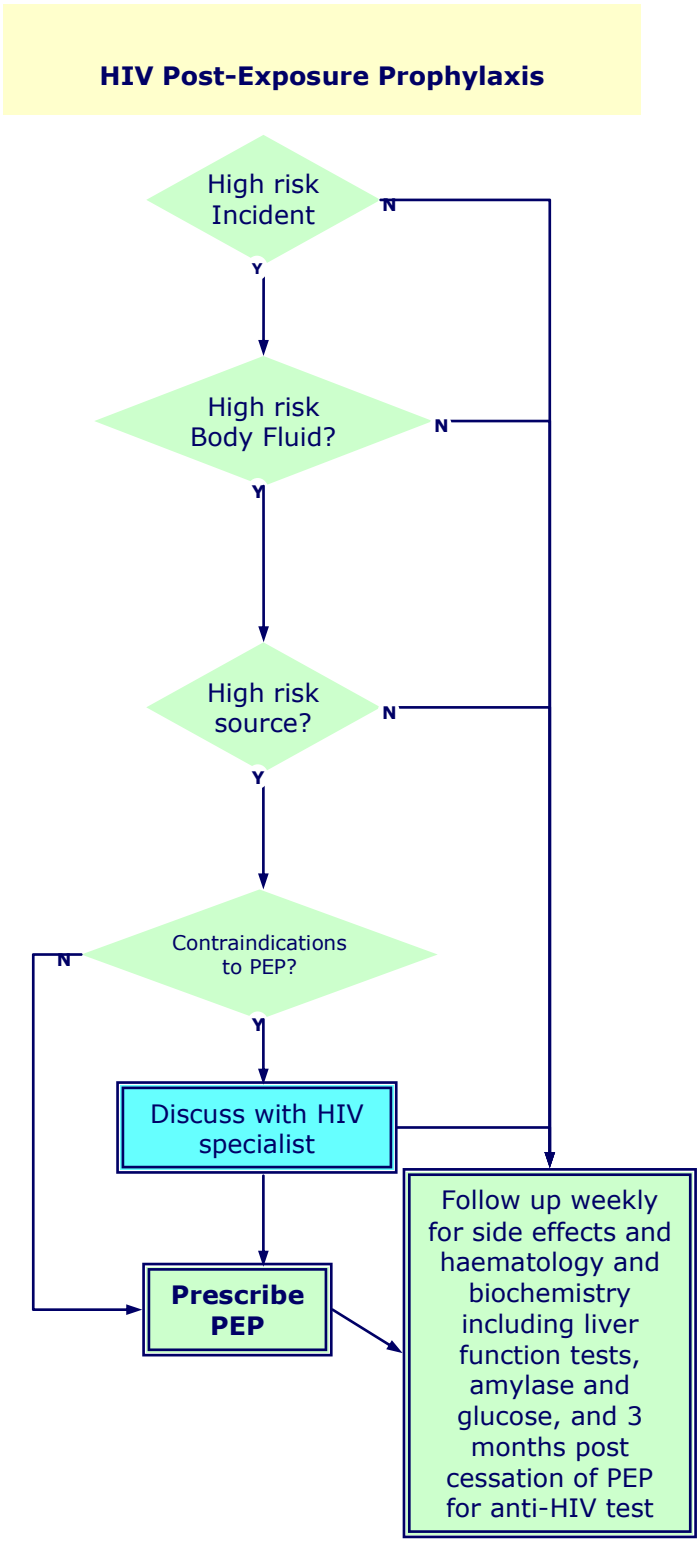
High Risk Source:
Known HIV positive

Consider also those at risk of HIV:
Those from endemic areas (South, East or Central Africa)
Sex between Men
Multiple blood transfusions <Oct 1985
Transfusions abroad
IV Drug user
Unprotected sex with HIV+ or at risk partner

Contraindications to PEP:
Drug interactions:
Amiodarone, ergot derivatives
St John's Wort
rifampicin

Anaemia/neutropenia, hepatic/renal failure
Pregnancy/breast feeding

Starter pack contains:
Truvada (Tenofovir disoproxil 245mg/Emtricitabine 200mg) **one tablet twice a day**
Kaletra (Lopinavir200mg/Ritonavir50mg): **2 tablets bd**
Domperidone for nausea and Loperamide to counteract diarrhoea
All sufficient for 5 days



If the source patient is infected with HCV

There is no prophylaxis available for hepatitis C. Blood should be taken and serum sent for saving and storage. Transmission is unlikely from HCV RNA negative sources.

The exposed person should return for blood tests for:

Table 1: Summary of follow-up blood tests for staff member exposed to HCV:

	HCV Antibodies	HCV RNA (PCR)	Serum save
Baseline			•
6 weeks		•	
3 months	•	•	
6 months	•		

If the source patient is infected with HBV

If the exposed person is not immune to hepatitis B, the patient's HBsAg status should be requested urgently. (See Table 2 on page 24 for management of exposures according to immune status of exposed person and HBV status of source of exposure). Follow-up blood testing will only be necessary if the exposed person was non-immune at the time of the incident. Test for HBsAg at:

- six weeks
- three months
- six months
- and save serum at the time of the incident. See Table 2 on page 24.

If the source patient is unknown or testing cannot be done

These cases are considered on an individual basis. As much detail about the exposure as possible should be obtained.

There will usually be no follow-up other than the initial serum save and check for HBV immunity (if required) for the exposed person, unless there are particular reasons for concern (for example, a patient strongly suspected to be infected with a blood-borne virus).

If the exposed person is very anxious, follow-up testing for HIV, HCV and HBV (if not immune) may help alleviate their anxiety. Hepatitis C PCR testing is not appropriate in these circumstances.

If blood test results are given over the telephone, it will be necessary to first confirm identity and ensure confidentiality is maintained.

Preventing further incidents

Consideration of the circumstances of individual exposures should prompt further investigation of working practice and/or equipment with a view to minimising the risk of future incidents.

More Information

Guidance on managing blood and body-fluid exposure incidents can be found in these publications:

Ramsay, M. E. 1999: 'Guidance on the investigation and management of occupational exposure to hepatitis C, Communicable Disease'. *Public Health*, 2,258-62.

HIV testing for patients attending general medical services: national guidelines (2005), Royal College of Physicians.

HIV Post-Exposure Prophylaxis: Guidance from the UK Chief Medical Officers' Expert Advisory Group on AIDS (2004), Department of Health. (This guidance has been under review and the updated version can be accessed at www.advisorybodies.dh.gov.uk or www.dh.gov.uk)

Immunisation against infectious disease (2006), Department of Health, http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_079917

Table 2: HBV prophylaxis for reported exposure incident [15]

	Significant exposure			Non-significant exposure	
HBV status of person exposed	**HBsAg positive source**	**Unknown source**	**HBsAg negative source**	**Continued risk**	**No further risk**
≤ 1 dose HB vaccine pre-exposure	Accelerated course of HB vaccine* HBIG × 1	Accelerated course of HB vaccine*	Initiate course of HB vaccine	Initiate course of HB vaccine	No HBV prophylaxis. Reassure
≥ 2 doses HB vaccine pre-exposure (anti-HBs not known)	One dose of HB vaccine followed by second dose one month later	One dose of HB vaccine	Finish course of HB vaccine	Finish course of HB vaccine	No HBV prophylaxis. Reassure
Known responder to HB vaccine (anti-HBs > 10mIU/ml)	Consider booster dose of HB vaccine	Consider booster dose of HB vaccine	Consider booster dose of HB vaccine	Consider booster dose of HB vaccine	No HBV prophylaxis. Reassure
Known non-responder to HB vaccine (anti-HBs < 10mIU/ml 2–4 months post-immunisation)	HBIG × 1 Consider booster dose of HB vaccine A second dose of HBIG should be given at one month	HBIG × 1 Consider booster dose of HB vaccine A second dose of HBIG should be given at one month	No HBIG Consider booster dose of HB vaccine	No HBIG Consider booster dose of HB vaccine	No prophylaxis. Reassure

*An accelerated course of vaccine consists of doses spaced at zero, one and two months.
A booster dose may be given at 12 months to those at continuing risk of exposure to HBV.
Source: PHLS Hepatitis Subcommittee (1992).

[15] *Immunisation against infectious disease*, (2011), Department of Health, http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_125113.pdf