

Standard Infection Control Precautions Literature Review: Occupational Exposure

**Management of Occupational
Exposure to Blood Borne Viruses
Version 4.0**

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Key Information

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Document information

- Description:** This literature review examines the available professional literature on management of occupational exposures to blood borne viruses in health and care settings.
- Purpose:** To inform the Standard Infection Control Precaution (SICP) section on occupational exposure management (including sharps) in the National Infection Prevention and Control Manual in order to facilitate the prevention and control of healthcare associated infections in all health and care settings in Scotland.
- Target Audience:** All health and care staff involved in the prevention and control of infection in Scotland.
- Update/review schedule:** Updated as new evidence emerges with changes made to recommendations as required.
- Review will be formally updated every 3 years with next review in 2024
- Cross reference:** National Infection Prevention and Control Manual
- Update level:** Practice – No significant change.
- Research – Further high quality research required on occupational exposure to BBVs in health and care settings. Further research also required on occupational exposure events not relating to BBVs.

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Version History

This literature review will be updated in real time if any significant changes are found in the professional literature or from national guidance/policy.

Version	Date	Summary of changes
4.0	March 2022	<p>What is the definition of an “occupational exposure”?</p> <p>Addition of new objective.</p> <p>This objective was split from the definition of a “significant occupational exposure” to allow clarity between the two definitions.</p> <p>What occupational health screening and protection should be offered to healthcare workers?</p> <p>Addition of new recommendation.</p> <p>‘Risk assessment of job roles should be undertaken to identify areas where occupational exposure may occur. There should also be policies and procedures in place to update these risk assessments when necessary.</p> <p>Employers are required to eliminate or reduce workplace risks where it is reasonably practicable.’</p> <p>What is the risk to healthcare workers of blood borne virus (BBV) transmission following occupational exposure?</p> <p>Addition of new recommendation.</p> <p>‘There have been a total of 23 HCV seroconversions in HCWs reported in the UK, with the most recent reported in 2015. All of these seroconversions were the result of percutaneous exposures from hollowbore needles. A single HIV seroconversion in a HCW was reported in the UK in 1999, again from percutaneous exposure from a hollowbore needle. There have been no reported seroconversions of HBV in HCWs in the UK.’</p>

Version	Date	Summary of changes
3.0	July 2016	<p>What occupational health screening and protection should be offered to healthcare workers?</p> <p>Addition of new recommendation.</p> <p>'In addition, healthcare workers directly involved in patient care should be up-to-date with their routine immunisations (e.g. tetanus, diphtheria, polio and MMR) and be offered immunisation against Tuberculosis (BCG vaccine), Influenza and Varicella zoster, as appropriate.'</p> <p>What is the recommended procedure for managing significant exposure incidents?</p> <p>Addition of new recommendation.</p> <p>'There is currently no PEP available for HCV. A number of antiviral agents are known to be effective against acute infection. Monitoring for acquisition of infection over the 6 month period following the incident is therefore recommended'</p>
2.0	June 2014	Updated after review of current literature
1.0	January 2012	Final for publication

Approvals

Version	Date Approved	Name
4.0	March 2022	National Policies Guidance and Evidence Working Group
3.0	July 2016	National Policies Guidance and Outbreaks Steering Group
2.0	June 2014	Steering (Expert Advisory) Group for SICPs and TBPs
1.0	January 2012	Steering (Expert Advisory) Group for SICPs and TBPs

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1 Objectives

The aim of this review is to examine the extant scientific literature regarding management of occupational exposures to blood borne viruses. The specific objectives of the review are to determine:

- What is the definition of an “occupational exposure”?
- What is the definition of a “significant occupational exposure”?
- What are “sharps” and how are these defined in the health and care settings?
- What is the relevant legislation on occupational exposure management?
- What occupational health screening and protection should be offered to health and care workers?
- What is the risk to health and care workers of blood borne virus (BBV) transmission following occupational exposure?
- What is the recommended procedure for managing significant exposure incidents?
- What safe systems of work should be in place to prevent sharps incidents?
- What is the definition of an “exposure prone procedure” (EPP) in the health and care settings?
- What exclusions are there for health and care workers with a known BBV undertaking EPPs?

Further recommendations relating to the disposal of sharps can be found within the [Safe Management of Waste SICP Literature Review](#)

2 Methodology

This targeted literature review was produced using a defined single-person, systematic methodology as described in the National Infection Prevention and Control Manual: [Development Process](#).

3 Discussion

3.1 Implications for practice

What is the definition of an “occupational exposure”?

Much of the information on occupational exposure management is derived from legislation and best practice recommendations. Within the available evidence relevant to infectious pathogens, occupational exposures are defined by Public Health England and NHS Employers as percutaneous exposures (where the skin has been broken by a needle/sharp, human scratch or bite) and mucocutaneous exposures (where the mucous membranes (mouth, nose or eyes), or non-intact skin have been contaminated with blood or other bodily fluids).^{1, 2}

It is recognised that health and care workers may be exposed to pathogens occupationally by other routes of transmission (i.e. respiratory pathogens), however, these do not fall under the scope of this review and evidence available to form guidance on them is limited.

What is the definition of a “significant occupational exposure”?

Public Health England and the UK Department of Health define a “significant occupational exposure” (SOE) as a percutaneous or mucocutaneous exposure to blood or other body fluids from a source that is known, or found to be, positive for a BBV.^{1, 3}

What are “sharps” and how are these defined in the health and care settings?

The Health and Safety Executive define sharps as being any item that can cause laceration or puncture wounds.⁴

“The Sharps Regulations”⁵ define the terms “medical sharp” and “safer sharp”. A medical sharp is defined as “an object or instrument necessary for the exercise of specific health care activities, which is able to cut, prick or cause injury”. A safer sharp is defined as “a medical sharp that is designed and constructed to incorporate a feature or mechanism which prevents or minimises the risk of accidental injury from cutting or pricking the skin”.⁵

What is the relevant legislation on occupational exposure management?

The prevention and management of occupational exposure is broadly covered by UK health and safety at work legislation, specifically the Health and Safety at Work etc. Act 1974, the Hazardous to Health Regulations (COSHH) 2002, and the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 2013.⁶⁻⁹ In addition, the Health and Safety (Sharp Instruments in Healthcare) Regulations 2013 (“the Sharps Regulations”) came into force on 11th May 2013.⁵ These Regulations implement aspects of the European Council Directive 2010/32/EU (“the Sharps Directive”) that are not specifically addressed in existing UK legislation.¹⁰ The employer’s duties under the Sharps Regulations apply to healthcare employers (i.e. employers whose primary work activity is the management, organisation or provision of healthcare), and to healthcare contractors whose employees are at risk of injury from medical sharps, in relation to the provision of services to a healthcare employer.

What occupational health screening and protection should be offered to healthcare workers?

Guidance produced by the Scottish Government “Health Clearance for Tuberculosis, Hepatitis B, Hepatitis C and HIV”¹¹ and The Department of Health publication “Immunisation against infectious disease” (commonly known as the Green Book)¹² describe pre-employment health checks for all staff considered to be at risk of exposure to pathogens.^{11, 12} Staff members should be offered routine pre-exposure immunisation as appropriate. The EU Sharps Directive also states that, where risk assessment reveals that there is a risk to the health and safety of workers due to their exposure to biological agents for which effective vaccines exist, workers should be offered vaccination. ¹⁰Appropriate vaccination must be offered free of charge to all workers and students delivering healthcare and related activities at the workplace.^{4, 12, 13}

Guidance produced by the Scottish Government, recommends that all new HCW, including students, who will have direct clinical contact with patients and/or patients’ blood or blood-stained body fluids, should be offered immunisation against hepatitis b virus (HBV), with post immunisation testing of serological response.¹¹ The guidance further states that although HCW should be encouraged to commence immunisation, there is no requirement for them to do so.¹¹

Additionally, this guidance outlines a requirement that all new HCW, including students, who will have direct clinical contact with patients should be offered testing for hepatitis C virus (HCV)

and human immunodeficiency virus (HIV). It is only a requirement that such tests are offered; HCW are not required to undertake such tests.¹¹

Furthermore, this Scottish Government guidance dictates that all new HCW, including students, who will perform exposure prone procedures (EPPs), require additional health clearance checks which must be completed before confirmation of an appointment to an EPP post, as the HCW may be ineligible for appointment if found to be infectious.¹¹ The specific BBVs that must be tested for are: HIV, HBV; and HCV.¹¹ This is reiterated in the 2020 guidance on health clearance for HCWs living with BBVs published by Public Health England.¹⁴

In addition, it is recommended by the Scottish Government and the UK Department of Health that staff directly involved in patient care should be up-to-date with their routine immunisations, e.g. tetanus, diphtheria, polio and MMR.

There is consensus across UK legislation and guidance that formal risk assessment should be carried out to identify possible exposure risks present in HCW roles.^{2, 4, 8, 13, 15, 16} These risk assessment should also identify areas where risk elimination or reduction strategies can be implemented.²

COSHH Regulations and the Health and Safety (Sharp Instruments in Healthcare) Regulations 2013, state that employers should eliminate or reduce any risks to employee's health wherever it is reasonably practicable.^{4, 8, 12, 13, 16} Further guidance from the UK Government, the Health and Safety Executive, NHS Employers, and Loveday *et al* also recommends that employers put adequate control measures in place to ensure risk of sharps injuries and exposure to BBVs is eliminated or reduced. These include:

- minimising sharps use,
- incorporating safer sharps devices,
- using personal protective equipment (PPE) i.e. eye and face protection, water resistant aprons and gowns, or gloves,
- covering existing breaks in the skin with an appropriate dressing to avoid contamination.
- following guidance relevant to management of the care environment and safe disposal of waste^{2, 4, 5, 13, 15, 16}

Medical equipment which pose a risk of occupational exposure, such as sharps, should only be used when essential to perform effective medical care.¹⁵

HCWs have the responsibility to ensure that local guidelines are followed in order to reduce the risk of injury within health and care settings.¹

Guidance on personal protective equipment (PPE) is available in the relevant [ARHAI Scotland systematic literature reviews](#).

What is the risk to health and care workers of blood borne virus transmission following occupational exposure?

The main risks of infection from percutaneous or mucocutaneous exposures are from HBV, HCV and HIV.²

It should be noted that other infectious agents also have the potential to be transmitted through percutaneous/mucocutaneous exposures, but this is thought to occur extremely rarely in UK health and care settings. These include, but are not limited to; human T lymphotropic retroviruses I & II (HTLV I & II), hepatitis D virus, cytomegalovirus (CMV), Epstein Barr Virus (EBV), Parvovirus B19, West Nile Virus (WNV) and malarial parasites.²

The estimated risk of transmission following a sharps injury (deep penetrating injury involving hollowbore needle or device visibly contaminated with blood) has been estimated at 1 in 3 for HBV, 1 in 30 for HCV and 1 in 300 for HIV.^{3, 16-18} The risk of infection following a mucocutaneous exposure is lower - estimated at 1 in 1000 for HIV, with no evidence of the risk of transmission for HBV or HCV following mucocutaneous exposure.¹

Two retrospective cohort studies, conducted within healthcare settings in the USA, reported the seroconversion rates of HCV and HIV among HCWs in a single US academic medical centre over a 13 year study period. From 1,361 reported SOEs involving HCV-positive patients, 2 seroconversions were reported, both from percutaneous exposures.¹⁹ This resulted in a seroconversion rate of 0.1% from any SOE, and 0.2% from percutaneous exposures. From 266 reported SOEs involving HIV-positive patients, no HCW seroconversions were reported.²⁰

Within these studies, current findings were combined to those of other recent seroconversion studies, identified through literature review, to estimate average seroconversion rates. From the 17 combined studies, a HCV seroconversion rate of 0.7% was estimated.¹⁹ From 18 combined

studies, a HIV seroconversion rate of 0.13% was estimated.²⁰ Both of these estimates are lower than other reports, however, this could be due to the varying methodologies across the included studies, as well as the differing SOE reporting policies. These combined studies were also conducted in various countries, with studies included from Asia, Europe, North and South America, which could influence the estimated rates.

The ARHAI Scotland Significant Occupational Exposures report, compiled in 2021, reporting on occupational exposure data for 2019, reported 2,568 occupational exposure incidents. Of these, 84.2% were percutaneous exposures, and 7.9% were mucocutaneous.²¹ When occupational exposure rates per 100 Whole Time Equivalent (WTE) were calculated, a significant increase across Scotland, from 2.15 in 2018 to 2.52 in 2019 was reported (17.3%, $P < 0.001$). Similarly, for sharps related injuries only, a significant increase in rate per 100 WTE from 1.90 in 2018 to 2.13 in 2019 was reported ($p < 0.001$).²¹

Of the 2,568 occupational exposure incidents reported, 69 exposure incidents were classified as SOEs, of which 63.8% were percutaneous incidents. Seventy-seven percent ($n=54$) of SOEs involved a patient who was HCV antibody positive. However, evidence of cleared infection (i.e. RNA negative) was available for 11 of these cases. Ten percent of cases were co-infected with more than one BBV.²¹

Since 2010, there have been six reports of HCW seroconversion after occupational exposure to BBVs in Scotland. No seroconversions were reported for any BBVs in 2019, for the fifth consecutive year.²¹

The PHE Eye of the Needle report published in 2020 provides a summary of significant occupational exposures and subsequent seroconversions in HCWs across healthcare settings in the United Kingdom between 1997 and 2018.¹ Comparable data for England, Wales, Northern Ireland and Scotland was not presented within this period, however data from between January 2015 and December 2017 was available for all four nations. Between 2015 and 2017, 1450 SOEs were reported, with 1216 in England, Wales, and Northern Ireland, and 234 in Scotland.¹

There have been a total of 23 HCV seroconversions in HCWs reported in the UK, with the most recent reported in 2015.¹ All of these seroconversions were the result of percutaneous exposures from hollowbore needles. A single HIV seroconversion in a HCW was reported in the UK in 1999, again from percutaneous exposure from a hollowbore needle. There have been no

reported seroconversions of HBV in HCWs in the UK.¹It should be noted that under-reporting of significant occupational exposures may also impact on the reported low rate of transmission.^{1, 21}

NHS Employers outlined factors that may increase the risk of transmission and influence the management of the incident. These are:

- Percutaneous injury (rather than mucocutaneous).
- Injury from a device taken from a source patient's artery or vein.
- Blood exposure rather than exposure to blood-stained fluid, diluted blood (e.g. 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.
- Visible blood on the device.
- No protective equipment used (e.g. gloves, double gloves, eye protection).
- First aid measures not implemented (e.g. washing, bleeding).
- HCV RNA detectable in source patient on most recent blood test.
- High viral load of HIV in source patient.
- Hepatitis B e antigen (HbeAg) detectable in source patient blood.
- Exposed person not or inadequately immunised against HBV.
- Source patient co-infected with more than one BBV.²

What is the recommended procedure for managing significant exposure incidents?

The Sharps Regulations require employers to take specific actions in the event of a sharps injury (outlined below).⁵ Employers must have procedures in place to ensure that they can respond effectively and in a timely manner when an injury occurs.^{5, 15}

Notification of injuries:

An employee who receives a sharps injury at work must notify their employer as soon as is practicable. Employers must ensure that they have sufficiently robust arrangements in place to allow employees to notify them in a timely manner, including where the employee works out-of-hours or away from the employer's premises.^{5, 15}

Recording and investigating incidents:

When an employer is notified of a sharps injury, UK Health and Safety Executive, NHS Employers, and Association of Perioperative Registered Nurses (AORN) guidance outlines that they must:

- record the incident;
- investigate the incident; and
- take any necessary action to prevent a recurrence.^{2, 13, 15, 18, 22}

Treatment and follow-up of a sharps injury:

UK Government, UK Health and Safety Executive, and AORN guidelines state that, when notified of any incident in which an employee has been injured by a sharp that has or may have exposed them to a biological agent (including BBVs), the employer must ensure that:

- the employee has immediate access to medical advice;
- the employee has been offered Post Exposure Prophylaxis (PEP) and any other medical treatment as advised by a registered medical practitioner; and
- the employer has considered whether counselling would be appropriate for the employee.^{5, 13, 15, 18, 22}

Chapter 12 of 'The Green Book' and the UK Health and Safety Executive highlight that it may be necessary to seek advice from occupational health or local microbiology teams when significant occupational exposure incidents occur.^{12, 18}

In addition, the Reporting of Injuries, Diseases and Dangerous Occurrences (RIDDOR) Regulations 2013 place a statutory requirement on "responsible persons" to report deaths, injuries, diseases and dangerous occurrences that take place at work, or in connection with work.⁹

Guidance from the Department of Health and the UK Health and Safety Executive outlines the first aid actions to be taken immediately following any occupational exposure, whether or not the source is known to pose a risk of infection.^{3, 18} The guidelines make the following recommendations:

- The site of exposure (e.g. wound or non-intact skin) should be washed liberally with soap and water, but without scrubbing. Antiseptics and soaps should not be used.
- Wounds should be encouraged to bleed freely, but wounds should not be sucked.
- Wounds should be covered with waterproof dressing or plaster.
- Exposed mucous membranes, including conjunctivae, should be irrigated copiously with sterile water or eye wash (before and after removing any contact lenses).^{3, 13, 18}

Guidance on dealing with occupational exposures within settings where running water is not available can be found in the [NIPCM Appendix 10](#).

The detailed guidance outlined in Chapters 12 and 18 of the Green Book should be followed in cases of occupational exposure to blood or body fluids potentially infected with HBV.^{12, 23} Briefly, following exposure to HBV, passive immunisation with hepatitis B immunoglobulin (HBIG) may be considered, in addition to active immunisation with hepatitis B vaccine.¹⁸

The Department of Health published guidance produced by the UK Chief Medical Officers' Expert Group on AIDS in relation to HIV PEP in 2008.³ The guidance provides detailed advice on the actions to be taken in relation to PEP following occupational exposure to blood or body fluids potentially infected with HIV. Where an initial risk assessment indicates that a significant exposure has taken place (to blood or another high-risk body fluid from a patient or other source either known to be HIV infected, or considered to be at high risk of HIV infection, but where the

result of a HIV test has not or cannot be obtained), it is recommended that PEP should be offered to the affected HCW.³ PEP should be commenced as soon as possible after exposure, allowing for careful risk assessment, ideally within an hour. PEP is generally not recommended beyond 72 hours post-exposure and should be continued for 28 days.³

There is currently no PEP available for HCV.²⁴ A number of antiviral agents are known to be effective against acute infection. Monitoring for acquisition of infection over the 6 month period following the incident is therefore recommended.¹⁸

What safe systems of work should be in place to prevent sharps incidents?

As mentioned above, employers have the responsibility to eliminate or reduce risks to employee's health wherever it is reasonably practicable.^{8, 12, 13, 16} The Sharps Regulations contain four specific requirements intended to minimise the risks from the use of sharps.^{5, 15} The employer must ensure that:

- the use of medical sharps at work is avoided so far as is reasonably practicable;
- where medical sharps are used at work, safer sharps are used as far as is reasonably practicable (safety hazards or possible sources of blood exposure ('blood splatter') that use of the device may introduce, should be considered in all instances);
- needles are not recapped after use unless –
 - an employer risk assessment has identified that recapping is required to control a risk (e.g. to reduce the risk of contamination of sterile preparations)
 - the risk of injury is effectively controlled by the use of a suitable tool, appliance or other equipment (such as a needle-block).
- clearly marked and secure containers are located close to areas where medical sharps are used at work, with written instructions for employees for the safe disposal of medical sharps that are not designed for re-use.^{5, 15}

Implementation of good working practices such as appropriate personal protective equipment, no touch techniques, and safer sharps devices are recommended across a number of pieces of identified literature. It is noted that risk assessment should be carried out to inform where further protections may need to be implemented.^{1, 2, 4, 12, 14, 16, 17, 25}

NHS Employers note that a number of factors should be considered when choosing safer sharps devices including their safety and training requirements, fitness for use, and any cleaning or sterilisation procedures necessary.²

A single systematic literature review, one retrospective cohort, and one observational study were identified which provided evidence on the efficacy of safer sharps devices.²⁶⁻²⁸ Through meta-analysis of 22 studies (21 observational, 1 RCT) Ballout et al presented moderate to low quality evidence that the use of safety engineered devices reduce needlestick injury rates.²⁶ One study included in this meta-analysis reported an overall reduction in percutaneous injuries of 48% per 100,000 phlebotomies performed. This study was assessed using the SIGN methodology as level 1+ evidence.²⁶

A retrospective cohort study by Kanamori *et al*, conducted in a single tertiary care hospital in the United States, using data collected over a 15 year period within which safety-engineered sharps were implemented, reported that there was a significant reduction in reported percutaneous injuries ($p=0.0002$).²⁷ Similarly, the observational study performed by An *et al* reported a significant reduction in needlestick injuries ($p=0.001$) within 2 years of implementation of a safety-engineered device lancet for glucometer.²⁸ Both of these studies were assessed as level 3 evidence, however, both also presented limitations including being performed in single centres and lacking in detail for other sharps safety procedures (such as staff training) which were in place during the study period.^{27, 28}

The 2021 ARHAI Scotland Significant Occupational Exposure report highlights that the use of safer sharps devices and non-sharps alternatives have increased.²¹ However, the proportion of significant occupational exposures caused by safety devices is also increasing. This could be due to previous under reporting of injuries caused by these devices. Additionally, safety devices will not prevent all injuries and as their use increases, rates of associated injuries would also be expected to increase.²¹

The Sharps Regulations 2013 supplement existing requirements for employers to provide health and safety information and training for staff.^{5, 15}

Information provided to employees must cover:

- the risks from injuries involving medical sharps;
- relevant legal duties of employers and workers;

- good practice in preventing injury;
- the benefits and drawbacks of vaccination; and
- the support available to an injured person from their employer. ^{5, 15}

Employers must work with appointed safety representatives in developing and promoting the information given to workers. ^{5, 15}

Training provided to employees must cover:

- the correct use of safer sharps;
- safe use and disposal of medical sharps;
- what to do in the event of a sharps injury; and
- the employer's arrangements for health surveillance and other procedures. ^{5, 15}

Training should be in an appropriate form to ensure that employees know how to work safely and without risks to health with the specific sharps equipment they use. ^{5, 17, 22}

Used sharps should be immediately disposed of at the point of use by the user into a sharps disposal container conforming to current standards*. ^{16, 17}

Guidance produced by the National Institute for Health and Care Excellence and the epic3 guidelines for the prevention and control of healthcare associated infections make a number of recommendations in relation to the safe use and storage of sharps disposal containers. ^{16, 17}

The key recommendations are that sharps disposal containers:

- Should be colour-coded and fit for purpose.
- Should not be used for any purpose other than the safe disposal of waste.
- Should not be used for disposal of liquids.
- Should be located in a safe upright position that avoids spillage when in use.
- Should be located at a height that allows the safe disposal of sharps.

- Should not be placed on the floor or at low levels.
- Should never be placed on top of high surfaces.
- Should be located out of reach of children and positioned safely away from public access areas.
- Should be temporarily be closed when not in use.
- Should be secured to avoid spillage.
- Should not be filled above the fill line.
- Should be disposed of when the fill line is reached.
- Should be disposed of every 3 months, even if not full.
- Should be signed and dated on assembly and disposal.^{16, 17, 29-32}

Further guidance on the disposal of sharps can be found in the ARHAI Scotland systematic literature review regarding the [Safe Management of Waste](#).

What is the definition of an “exposure prone procedure” (EPP) in the health and care settings?

An “exposure prone procedure” (EPP) is defined as an invasive procedure where there is a risk that injury to the HCW may result in the exposure of the patient’s open tissues to the blood of the worker (bleed-back). These include procedures where the worker’s gloved hands may be in contact with sharp instruments, needle tips or sharp tissues (e.g. spicules of bone or teeth) inside a patient’s open body cavity (e.g. during open surgical procedures), wound (e.g. during deep suturing) or confined anatomical space (e.g. during root canal therapy) where the hands or fingertips may not be completely visible at all times.^{2, 11, 14, 33, 34}

Procedures may be categorised by the anticipated level of risk from BBV transmission. As a brief summary, Category I procedures are considered to constitute a minimal risk of transmission and include history taking and/or physical examination, as well as minor surface suturing; Category II procedures are considered to constitute a possible but unlikely risk of transmission and include bronchoscopy and ophthalmic surgery; Category III procedures are

considered to constitute a significant risk of transmission and are typically referred to as EPPs, as described with examples above.^{14, 33}

The majority of procedures are not classified as exposure prone since, provided appropriate IPC measures are in place, they will pose no risk of transmission of blood-borne viruses from an infected HCW to a patient.³³ Procedures where the hands and fingertips of the worker are visible and outside the patient's body at all times, and internal examinations or procedures that do not involve possible injury to the worker's gloved hands from sharp instruments and/or tissues, are not considered exposure prone, provided routine infection control procedures are adhered to at all times.³⁴

What exclusions are there for healthcare workers with a known BBV undertaking EPPs?

Guidance from the Scottish Government highlights that measures are not intended to prevent HCWs infected with BBVs from working within the NHS, only restrict work in areas where there is risk of transmission of infection from HCW to patient.¹¹ Positive test results for BBVs, such as Hepatitis B, Hepatitis C, and HIV, should not affect employment or training of staff who will not perform EPPs, as long as appropriate infection control precautions are adhered to.^{4, 11, 13, 34} HCWs do not have a legal obligation to disclose infection status or agree to testing, however, if HCWs decline to be tested for BBVs, they cannot be permitted to perform EPPs.^{3, 11, 13, 14} Any disclosure of BBV infection status of HCWs should remain confidential and only be passed on with employee's permission.^{4, 13}

Public Health England guidance, from the UK Advisory Panel for Healthcare Workers Infected with Bloodborne Viruses (UKAP), states that HCWs who have been diagnosed with a BBV, and may perform EPPs, should seek the advice of occupational health so that appropriate care can be provided, and, where required, to allow for any restrictions on working practice to be implemented.¹⁴ Until expert advice is sought and the appropriate working criteria are met, HCWs with BBVs should not undertake EPPs.¹⁴

The risk of transmission of HIV from HCW to patient is thought to be very low, with PHE reporting only three recorded cases of transmission during exposure prone procedures in their 2014 guidance. UK-based policy and guidance state that HIV infected HCWs must meet the following criteria before they can perform EPPs:

Either:

- a) be on effective combination antiretroviral therapy (cART), **and**
- b) have a plasma viral load <200 copies/ml

Or

- c) be an elite controller¹ **and**
- d) be subject to plasma viral load monitoring every three months **and**
- e) be under joint supervision of a consultant occupational physician and their treating physician, **and**
- f) be registered with the UKAP Occupational Health Monitoring Register (UKAP-OHR)¹⁴,

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The Scottish Executive Health Department issued guidance in 2002 on HCV infected HCWs.²⁴ In summary, the guidance recommends that HCWs who are known to have HCV (HCV RNA positive) should not perform EPPs.²⁴ HCV infected HCWs who respond successfully to antiviral therapy should be allowed to perform EPPs. A successful response to treatment is defined as the individual remaining HCV RNA negative 6 months after cessation of treatment.²⁴

The Scottish Government Health Workforce Directorate issued guidance in 2009 on HBV infected HCWs and antiviral therapy.³⁶ In summary, the guidelines recommend that HBV infected HCW who are HBeAg negative and who have pre-treatment HBV DNA levels between 10^3 and 10^5 genome equivalents/ml may be allowed to perform EPPs if, on antiviral therapy, their viral load is suppressed to below 10^3 genome equivalents/ml.³⁶ HCWs with baseline viral loads above 10^5 genome equivalents/ml are ineligible to perform EPPs while taking antiviral therapy, on the grounds of patient safety. The guidance further states that HCWs must not

¹ -An elite controller is a person living with HIV, not receiving antiretroviral therapy, who has maintained their viral load below limit of detection for 12 months. This must be based on at least three separate viral load assays.

¹⁴England PH. Integrated Guidance on Health Clearance of Healthcare Workers and the Management of Healthcare Workers Living with Bloodborne Viruses (Hepatitis B, Hepatitis C, and HIV) Guidance from the UK Advisory Panel for Healthcare Workers Infected with Bloodborne Viruses (UKAP) 2020.

perform EPPs if their HBV DNA levels rise to greater than 10^3 genome equivalents/ml while on or after treatment.³⁶

3.2 Implications for research

The prevention and management of occupational exposure incidents is subject to legislation and guidance, on which the majority of recommendations of this review are based. However, there is a paucity of original research available, which is of a high quality, and meets the ARHAI Scotland inclusion criteria. Further studies assessing the risk of transmission of BBV to HCWs, and the efficacy of sharps safety devices would assist in forming future recommendations on this topic.

Additionally, while it is out of the scope of this review, HCWs may also be exposed to non-BBV pathogens while working. There is limited evidence related to these instances and so further research in this area is required. ARHAI Scotland expect that during remobilisation after the COVID-19 pandemic, guidance on other types of occupational exposure and transmission within health and care settings will become available. Updates to this and other NIPCM reviews will be made as appropriate.

Recommendations

This review makes the following recommendations based on an assessment of the extant professional literature on occupational exposure management:

What is the definition of an “occupational exposure”?

An occupational exposure is a percutaneous or mucocutaneous exposure to blood or other body fluids.

What is the definition of a “significant occupational exposure”?

A significant occupational exposure is a percutaneous or mucocutaneous exposure to blood or other body fluids from a source that is known, or found to be, positive for a BBV infection.

What are “sharps” and how are these defined in health and care settings?

A medical “sharp” is an object or instrument necessary for the exercise of specific healthcare activities which is able to cut, prick or cause injury.

A “safer sharp” is a medical sharp that is designed and constructed to incorporate a feature or mechanism which prevents or minimises the risk of accidental injury from cutting or pricking the skin.

What is the relevant legislation on occupational exposure management?

The prevention and management of occupational exposures is broadly covered by UK health and safety at work legislation, specifically the Health and Safety at Work etc. Act 1974, the Management of Health and Safety at Work Regulations 1999, the Control of Substances Hazardous to Health Regulations (COSHH) 2002, and the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 2013. The European Council Directive

2010/32/EU (“the Sharps Directive”) and the Health and Safety (Sharp Instruments in Healthcare) Regulations 2013 (“the Sharps Regulations”) outline specific requirements in relation to sharps.

(Mandatory)

What occupational health screening and protection should be offered to healthcare workers?

Risk assessment of job roles should be undertaken to identify areas where occupational exposure may occur. There should also be policies and procedures in place to update these risk assessments when necessary.

Employers are required to eliminate or reduce workplace risks where it is reasonably practicable.

(Mandatory)

Healthcare workers have the responsibility to ensure that local guidelines are followed in order to reduce the risk of injury within health and care settings.

(Category C)

Where risk assessment reveals that there is a risk to the health and safety of workers due to their exposure to biological agents for which effective vaccines exist, workers must be offered vaccination. Appropriate vaccination must be offered free of charge to all workers and students delivering healthcare and related activities at the workplace.

(Mandatory)

All new healthcare workers, including students, who will have direct contact with patients and/or direct contact with patients’ blood or blood-stained body fluids, should be **offered** immunisation against hepatitis B virus (HBV), with post immunisation testing of serological response.

(Mandatory)

All new healthcare workers, including students, who will have direct contact with patients, should be **offered** testing for hepatitis C virus (HCV) and human immunodeficiency virus (HIV). [Healthcare workers are not required to undertake such tests].

(Mandatory)

All new healthcare workers, including students, who will perform exposure prone procedures (EPPs) are required to undergo additional health clearance checks before confirmation of an appointment to an EPP post. **The specific blood borne viruses (BBVs) that must be tested for are: HIV, HBV and HCV.**

(Mandatory)

In addition, healthcare workers directly involved in patient care should be up-to-date with their routine immunisations (e.g. tetanus, diphtheria, polio and MMR)

(Mandatory)

Although healthcare workers should be encouraged to commence immunisation and undertake testing, there is no requirement for them to do so.

What is the risk to healthcare workers of blood borne virus (BBV) transmission following occupational exposure?

The estimated risk of transmission following a sharp injury (deep penetrating injury involving hollowbore needle or device visibly contaminated with blood) has been estimated at 1 in 3 for HBV; 1 in 30 for HCV; and 1 in 300 for HIV.

(Category B)

There have been a total of 23 HCV seroconversions in HCWs reported in the UK, with the most recent reported in 2015. All of these seroconversions were the result of percutaneous exposures from hollowbore needles. A single HIV seroconversion in a HCW was reported in the UK in 1999, again from percutaneous exposure from a hollowbore needle. There have been no reported seroconversions of HBV in HCWs in the UK.

(Category C)

What is the recommended procedure for managing significant exposure incidents?

The following first aid actions should be taken immediately following any occupational exposure:

- The site of exposure (e.g. wound or non-intact skin) should be washed liberally with soap and water, but without scrubbing. Antiseptics and soaps should not be used.
- Wounds should be encouraged to bleed freely, but wounds should not be sucked.
- Exposed mucous membranes, including conjunctivae, should be irrigated copiously with sterile water or eyewash (before and after removing any contact lenses).

(Category C)

Employers must have procedures in place to ensure that they can respond effectively and in a timely manner when a sharps injury occurs.

(Mandatory)

An employee who receives a sharps injury at work must notify their employer as soon as is practicable.

(Mandatory)

Employers must have sufficiently robust arrangements in place to allow employees to notify them in a timely manner (including where the employee works out-of-hours or away from the employers' premises).

(Mandatory)

When an employer is notified of a sharps injury, they must:

- record the incident;
- investigate the incident; and
- take any necessary action to prevent a recurrence.

(Mandatory)

The employer must ensure that, when notified of any incident in which an employee has been injured by a sharp that has, or may have exposed them to a biological agent:

- The employee has immediate access to medical advice.
- The employee has been offered Post Exposure Prophylaxis (PEP) and any other medical treatment as advised by a registered medical practitioner; and
- The employer has considered whether counselling would be appropriate for the employee.

(Mandatory)

Significant occupational exposure incidents should be reported in accordance with Reporting of Injuries, Diseases and Dangerous Occurrences (RIDDOR) Regulations 2013.

(Mandatory)

Guidance on PEP for Hepatitis B outlined in the Department of Health “Green Book” should be followed in cases of occupational exposure to blood or body fluids potentially infected with HBV.

(Mandatory)

There is currently no PEP available for HCV. A number of antiviral agents are known to be effective against acute infection. Monitoring for acquisition of infection over the 6 month period following the incident is therefore recommended

(Mandatory)

In cases of significant occupational exposure to blood or body fluids potentially infected with HIV, PEP should be offered to the affected healthcare worker. PEP should be commenced as soon as possible after exposure, ideally within an hour (PEP is not generally recommended beyond 72 hours post-exposure).

(Mandatory)

What safe systems of work should be in place to prevent sharps incidents?

Use of medical sharps at work must be avoided so far as is reasonably practicable.

(Mandatory)

When medical sharps are used at work, safer sharps must be used as far as is reasonably practicable.

(Mandatory)

Needles should not be re-sheathed unless an employer risk assessment has identified that recapping is required to control a risk, or risk of injury is effectively controlled by the use of a suitable tool, appliance or other equipment (such as a needle-block).

(Mandatory)

Sharps should be disposed of in clearly marked and secure containers with written instructions for employees located close to areas where medical sharps are used.

(Mandatory)

Used sharps should be immediately disposed of at the point of use by the user into a sharps disposal container conforming to current standards.

(Mandatory)

Sharps disposal containers should be:

- Colour-coded and fit for purpose.
- Located in a safe upright position that avoids spillage when in use and at a height that allows the safe disposal of sharps.
- Located out of reach of children and positioned safely away from public access areas.
- Temporarily be closed when not in use.
- Secured to avoid spillage.
- Disposed of when the fill line is reached or every 3 months, even if not full.
- Signed and dated on assembly and disposal. Sharps disposal containers should not be:
- Used for any purpose other than the safe disposal of sharps.
- Used for disposal of liquids.

- Placed on the floor or low-level surfaces.
- Placed on top of high surfaces.
- Filled above the fill line.

(AGREE rating: recommend)

Employers must provide health and safety information and training for staff.

Information provided to employees must cover:

- The risks from injuries involving medical sharps.
- Relevant legal duties for employers and workers.
- Good practice in preventing injury.
- The benefits and drawbacks of vaccination.
- The support available to an injured person from their employer.

Employers must work with appointed safety representatives in developing and promoting the information given to workers.

Training provided to employees must cover:

- safe use and disposal of medical sharps;
- the correct use of safer sharps;
- what to do in the event of a sharps injury; and
- the employer's arrangements for health surveillance and other procedures.

Training should be provided in an appropriate form to ensure that employees know how to work safely and without risks associated with the specific sharps equipment they use.

(Mandatory)

What is the definition of an “exposure prone procedure” in the health and care settings?

An “Exposure Prone Procedure” (EPP) is defined as an invasive procedure where there is a risk that injury to the healthcare worker may result in the exposure of the patient’s open tissues to the blood of the worker (bleed-back). EPPs include procedures where the worker’s gloved hands may be in contact with sharp instruments, needle tips or sharp tissues (e.g. spicules of bone or teeth) inside a patient’s open body cavity (e.g. during open surgical procedures), wound (e.g. during deep suturing) or confined anatomical space (e.g. during root canal therapy) where the hands or fingertips may not be completely visible at all times.

What exclusions are there for healthcare workers with a known BBV undertaking EPPs?

Healthcare workers who do not wish to be tested for BBVs should not be permitted to perform EPPs.

(Category C)

Healthcare workers infected with BBVs should seek advice of occupational health before being cleared to undertake EPPs.

(Category C)

HIV infected healthcare workers must meet the following criteria before they can perform EPPs:

Either:

- a) be on effective combination antiretroviral therapy (cART), **and**
- b) have a plasma viral load <200 copies/ml

Or

- c) be an elite controller **and**
- d) be subject to plasma viral load monitoring every three months **and**
- e) be under joint supervision of a consultant occupational physician and their treating physician, **and**

f) be registered with the UKAP Occupational Health Monitoring Register (UKAP-OHR)

(Mandatory)

Healthcare workers infected with HCV (HCV RNA positive) must not perform EPPs. This restriction does not apply to infected healthcare workers who respond successfully to antiviral therapy (i.e. HCV RNA negative 6 months after cessation of treatment).

(Mandatory)

Healthcare workers infected with HBV who are Hepatitis B e antigen (HBeAg) negative and who have pre-treatment HBV DNA levels between 10³ and 10⁵ genome equivalents/ml may be allowed to perform EPPs if on antiviral therapy their viral load is suppressed to below 10³ genome equivalents/ml.

Healthcare workers infected with HBV who have baseline viral loads above 10⁵ genome equivalents/ml are restricted from performing EPPs while taking antiviral therapy.

Healthcare workers infected with HBV must not perform EPPs if their HBV DNA levels are greater than 10³ genome equivalents while on or after treatment.

(Mandatory)

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Appendix 1 Grading of recommendations

Grade	Descriptor	Levels of evidence
Mandatory	'Recommendations' that are directives from government policy, regulations or legislation	N/A
Category A	Based on high to moderate quality evidence	SIGN level 1++, 1+, 2++, 2+, AGREE strongly recommend
Category B	Based on low to moderate quality of evidence which suggest net clinical benefits over harm	SIGN level 2+, 3, 4, AGREE recommend
Category C	Expert opinion, these may be formed by the NIPC groups when there is no robust professional or scientific literature available to inform guidance.	SIGN level 4, or opinion of NIPC group
No recommendation	Insufficient evidence to recommend one way or another	N/A