

REVIEW OF LITERATURE

TEAM UNDERTAKING REVIEW: Parts A and B - Health Protection Scotland. Part C - WHAIP				
CONTACT PERSON: Dawn Hill				
TOPIC: Occupational exposure management, including sharps injuries to blood and body fluids.				
PRINCIPAL RESEARCH QUESTION/OBJECTIVE: To review the literature pertaining to the prevention and management of occupational exposures, including sharps injuries, to blood and body fluids.				
METHODOLOGY				
i) Search strategy for identification of studies				
Period of publication	Part A: 1966 – 2004			
	Part B: 2004 – 2006			
	Part C: 2007- 2009			
Strategy key words for Part C	Occupational exposure [prevention and control] Occupational hazard\$ Occupational transmission Cross infection Infection control Blood borne pathogens [viruses] Body fluids Needlestick injuries Sharp injuries Blood spills[spillage] [Antibiotic] prophylaxis Hepatitis B Immunoglobulin Mucosal contamination Percutaneous injuries Wounds, penetrating [Safety]management Prevention Medical personnel Health personnel Personnel hospital Healthcare workers			
Electronic databases for Part C <i>(tick as appropriate)</i>	MEDLINE	√	EMBASE	√
	CINCINLAHL	√	Health Technology Assessment	√
	Cochrane Library	√	HMIC	√
	British Nursing Index	√		
Specialist websites / portals for Part C	National Electronic Library-Infection, National Library for Health Guidelines finder, CDC, Welsh Assembly Government (WAG), Scottish Executive Health Dept. (SEHD), Health Protection Agency (HPA), Health Protection Scotland (HPS), Department of Health (DH), Department of Health & Social Services & Public Safety (DHSSPS-NI) Northern Ireland,			

<i>Hand searching journals for Part C</i>	Journal of Hospital Infection
ii) Selection criteria for inclusion of studies	
<i>Sample</i>	All health and social care workers.
<i>Outcome measure(s)</i>	Interventions to a) prevent occupational exposures, b) minimise likelihood of transmission of infection, c) facilitate administration of appropriate treatment, d) maximise effectiveness of treatment.
<i>Other inclusion criteria</i>	N/A
<i>Language Limitations</i>	English language only.
iii) Quality assessment	
<i>Study quality assessment</i>	
<i>Part A (1966 – 2004)</i>	Identified articles were reviewed according to Roe's model. Guidance documents, however, were unable to be subjected to all such criteria.
<i>Part B (2004 – 2006) and Part C (2007- 2009)</i>	Identified articles were reviewed according to either the ROE model for critical appraisal of scientific studies, Sign 50 methodology for systematic reviews and meta-analyses and the AGREE instrument for the evaluation of guidance documents as appropriate.
<i>Data collation and analysis</i>	Qualitative analysis of data performed on studies uncovered was undertaken using a case study approach. Guidance documents reviewed for any relevant commentary.

RESULTS

Part A (1966-2004)

Occupational exposure to blood and body fluids poses a potential risk for transmission of infection to healthcare workers (HCWs). On the assumption that any patient could be carrying potentially pathogenic microorganisms, measures must be put in place to protect staff from potential infection as far as possible both by minimising the likelihood of injury and by facilitating treatment in the event of an injury. Within the UK, surveillance for England, Wales and Northern Ireland has revealed that from 1997 until 2004 nine healthcare workers have seroconverted to hepatitis C and one to HIV following occupational exposures (Health Protection Agency (HPA) Report, 2005). As sharps injuries are one of the most common types of injury to be reported to NHS Scotland Occupational Health departments by staff, according to the Scottish Executive's strategy document *Towards a Safer, Healthier Workplace* (1999), prevention is crucial.

For the purpose of this review, the definition of 'sharp', as outlined in the 1998 UK Health Departments' guidance for the protection of clinical health care workers against infection with blood borne viruses (BBVs), will be adopted and includes needles, sharp edged instruments, broken glassware or any other item which may be contaminated with blood/body fluids and which may cause laceration or puncture wounds. Sharp tissues such as spicules of bone/teeth are also included.

Literature in this field is abundant and related guidance has been revised in recent years in line with the evidence base. Within the UK, the Health Departments' (1998) guidance is the principal piece of guidance to be published to date and outlines key procedures to be undertaken by staff to protect themselves against infection via occupational exposure to blood and body fluids.

A great deal of work has been carried out in recent years, with many studies being published in an attempt to establish the risk to staff when exposed to blood borne viruses (BBVs) and other infections through sharps injuries and mucocutaneous exposures.

The potential risk of transmission of BBVs arises from the exposure to blood and other body fluids from an infected patient. Body fluids, other than blood, which also pose a risk of infection include cerebrospinal fluid, peritoneal fluid, pleural fluid, pericardial fluid, synovial fluid, amniotic fluid, semen, vaginal secretions, breast milk, and any other body fluid containing visible blood, including saliva in association with dentistry, unfixed tissues and organs.

Exposure to viruses such as HIV, hepatitis B (HBV) and hepatitis C (HCV) can be the most consequential (Lanphear, 1994) and, as such, they are the focus of much of the guidance. However, other infections, including herpes, MRSA and tuberculosis, can also be transmitted via exposure to blood or other body fluids, however, research in this area is limited in comparison. The risk of transmission of BBVs is greater from patient to HCW than from HCW to patient, according to the literature. The risk to the HCW is in fact proportional to the prevalence of a particular infection in the population served, the infectious status of the individual source patient which may or may not be known, and the risk of significant occupational exposure occurring during procedures undertaken.

Studies conducted worldwide indicate the greatest occupational risk for transmitting a BBV is through parenteral exposure (i.e. entering the body by the subcutaneous, intramuscular or intravenous route, e.g. parenteral nutrition – infusion administered into a vein) to an infected person (Centers for Disease Control (CDC), 1989; Henderson et al., 1990; Geberding, 1994). In the healthcare setting, percutaneous exposures (i.e. those passed through the skin) including sharps injuries and bites, as compared to mucocutaneous exposures (i.e. splashes to mucous membranes of the eyes, nose or mouth), carry a higher risk of possible infection given the inoculation of blood which occurs. However, the majority of the literature focuses on the transmissibility of infection to healthcare workers via sharps injuries with little discussion to date being devoted to transmission via human bites. There is no evidence to show that BBVs can be transmitted by blood contamination of intact skin, by inhalation or by faecal-oral examination.

Studies have shown that HIV, for example, is predominantly transmitted by exposure to blood, blood products, semen, vaginal secretions, donor organs and tissues and breast milk (UK Health Departments' Guidance, 1998). Most HIV transmission occurs by unprotected penetrative sexual intercourse with an infected person (between men or between man and woman), by inoculation of infected blood (mainly from drug misusers sharing contaminated equipment), or from an infected mother to her baby before or during birth or while breast feeding.

This guidance outlines that no vaccine is currently available, although post exposure prophylaxis (PEP) can offer a potential means of treatment. HBV is transmitted by similar routes with blood, semen and vaginal fluids mainly being implicated in the spread of infection, but a vaccine is available to offer healthcare workers protection. Immunisation should not, however, be considered a substitute for good infection control practice and provides no protection against infection with other BBVs. PEP is also available for HBV in the form of immunoglobulin, although through the uptake of HBV immunisation programmes, this is not used as frequently in current times. HCV, on the other hand, is most frequently acquired by direct blood to blood contact with the commonest mode of transmission being sharing of blood contaminated injecting equipment. Treatments for HCV are in the development stage and currently come in the form of pegylated interferon. Initially, the beneficial effect was thought to target the acute rather than the chronic form of the infection (Jaeckel et al., 2001); however, studies now indicate a 60% sustained response ???when No vaccines are available to date.

The actual risk of transmission of any of these viruses has been calculated by scientists over the years and these figures have changed regularly as cases of transmissions have come to light and as forms of treatment have been developed. In light of the evidence, healthcare workers who suffer an exposure to HBV e-antigen positive infected blood, but who have not been vaccinated, have a 22-31% risk of becoming infected (CDC, 2001; Beltrami et al., 2000; Mauskopf et al. 1991). If the source patient is e-antigen negative, but s-antigen positive, this risk is reduced to between 1-6%. It is estimated that the risk of transmission of HCV following a single percutaneous exposure to an anti-HCV positive source is on average 1.8 % (1-7% range) (CDC, 2001; Beltrami et al., 2000; Kiyosawa et al., 1991; Mitsui et al., 1992). Analyses of worldwide studies suggest the risk for HIV exposure lies between 0.3% and 0.4% (Marcus et al., 1988; Henderson et al., 1990; Tokars et al., 1993, Beltrami et al., 2000; CDC, 2001). Estimations of risk following mucocutaneous exposure are considerably lower for all of these viruses.

Within the revised UK guidance for HIV post exposure prophylaxis published in February 2004, recommendations are made regarding the precautions which should be taken by healthcare staff to protect themselves against injury and risk of infection in the first instance. Due to the fact that not all infected patients have been diagnosed, staff must apply standard infection control precautions in all circumstances and regard all blood/body fluids as potentially infectious.

As a vaccine is available for HBV, it is necessary for all healthcare workers to receive a full course of hepatitis B immunisation prior to commencing employment within the healthcare sector although this should not negate the importance of good infection control practice (HIV PEP Guidance, 2004). Occupational Health departments hold details of vaccination and serological testing for each member of staff.

The appropriate use of personal protective equipment (PPE) is advised at all times. Risk assessments should be conducted locally to determine the appropriate level of PPE for individual procedures. In particular, it is recommended that healthcare staff wear gloves when contact with blood is anticipated in order to minimise the potential for contact with blood (CDC, 2001). When dealing with sharps, gloves should again be worn (HIV PEP Guidance, 2004). Evidence would indicate that by wearing gloves, although a sharps injury cannot be avoided, the glove itself could wipe the outer surface of the sharp clean, reducing the amount of blood transferred, thereby minimising the risk of transmission. UK guidance further stipulates that sharps usage should be avoided where possible. Indeed, it is recommended that prior to donning gloves or other PPE, it is important to cover all cuts and abrasions to prevent tissues becoming contaminated with body fluids. Those individuals with skin conditions should seek advice to minimise their risk of infection. Eyewear and /or face protection is also recommended when undertaking a procedure where the potential for blood or body fluid exposure exists to protect the mucous membranes of the eyes, nose and mouth from potential exposure to blood or body fluids through splattering. For example, when engaging in mouth-to-mouth resuscitation devices such as Pocket Masks should be used to minimise potential infection. This Department of Health guidance also advises that healthcare workers do not wear open footwear in situations where blood may be spilt or sharps are being handled as sharps injuries can potentially occur.

Guidance from a variety of settings recommends that to prevent avoidable sharps injuries, several simple actions can be taken. First of all, healthcare workers are advised not to resheath needles according to both CDC guidelines (1982, 1987, 2001) and UK Health Departments' guidelines (1998). Although the studies reviewed have failed to demonstrate a notable reduction in injuries as a result of this recommendation (Sellick et al., 1991; Smith et al., 1992), this may be due to increased awareness of staff to the risks associated with sharps injuries and, therefore, have resulted in increased reporting. Another means of avoiding injury which has been highlighted by considerable research is the immediate disposal of used sharps after use, thereby eliminating the risk of potential exposure.

Furthermore, the appropriate use of approved puncture-resistant sharps containers (BS7320) (i.e. not overfilled above the 3/4 mark, sealed properly for both use and for disposal, labeled appropriately for tracing) has similarly been highlighted as a means of reducing the risk of downstream injuries (UK HIV PEP Guidance, 2004). In more recent years, safety devices have been developed in an attempt to eliminate those injuries which are preventable and these are available in a variety of forms (e.g. retractable, shielded, blunted). In the US, legislation was passed in 2000 to ensure all employers make safety devices available to staff. In the UK, however, progress has been hampered by the limited number of studies undertaken to support their effectiveness and the associated cost implications. Instead, research has focused on the clinical acceptability of these devices. A recent study conducted by Health Protection Scotland (HP S) in conjunction with all NHS Scotland Occupational Health departments suggests safety devices could have prevented a considerable proportion of reported injuries, indicating the need for devices to be initially introduced for certain procedures.

In the event of an injury, there are several key pieces of advice which healthcare workers should follow, according to the literature. Prompt action should be taken, primarily in the form of First Aid and, thereafter, in the form of reporting and treatment. CDC, HPA and HPS all recommend that the following First Aid be applied:

- Encourage bleeding (Fahey et al., 1993) (although the particular efficacy of this intervention is unknown). Do not suck the wound;
- Wash the area thoroughly with warm water, but without scrubbing (Geberding & Henderson 1992);
- Cover with a waterproof plaster (UK Guidance, 1998);
- Irrigate exposed mucous membranes with copious amounts of water, before and after removing any contact lenses (UK HIV PEP Guidance, 2004);
- Ensure the safe disposal of the sharp into an approved sharps container;
- Report injury immediately to Line Manager and to the local OH department (UK Guidance 2004, CDC 2001).

Reporting an injury promptly will enable the necessary risk assessment to be carried out to establish the appropriate treatment required. Given that BBV infections cannot be prevented by pre-exposure vaccination, except for HBV, appropriate post exposure treatment is essential. UK guidance on PEP for HIV (2004) outlines the importance of timely reporting of injuries to maximise the effectiveness of the regime.

On review of the abundant guidance in the field, staff reporting an injury should be offered counseling, testing and an explanation of the results. Testing of the source patient is also recommended. If the source is known to be positive for a BBV, the healthcare worker involved should be tested at monthly intervals to ascertain whether infection develops (UK Health Departments' Guidance, 1998). Evidence of HIV, for example, normally appears within 6 months of exposure, although one report of an 8-month lapse appears in the literature (Meyohas et al., 1995). Post-exposure prophylaxis is available for HIV in the form of antiretroviral treatment. Such treatment is in combination format due to the increased prevalence of zidoudine resistance amongst HIV infected individuals. Based on a number of studies the UK HIV PEP guidance (2004) recommends that, for optimum efficacy, PEP should be commenced as soon as possible after the incident, ideally within an hour. However, given the realities of the healthcare environment, it is often the case that PEP is given up to 24 hours after the injury. Nevertheless, to facilitate treatment, healthcare workers should be aware of the local arrangements for reporting injuries and receiving treatment and the relevant policies should be in place. The amended US Occupational Exposure to Blood Borne Pathogens Final Rule (2001) underlines this need.

Staff who may be involved in the prescription of such medication should be fully trained and be aware of available treatment (UK HIV PEP Guidance, 2004; OSHA, 2001). Within the UK and, in particular within NHS Scotland, injury reporting can be problematic if out-of-hours. Therefore, staff working in Accident and Emergency or GUM departments may also need to be trained to deal with these situations should they arise. In certain circumstances, initial doses may be prescribed to an injured healthcare worker with a fuller discussion and risk assessment to follow. Nevertheless, whether a near miss or an actual exposure, all incidents should be documented fully to protect the healthcare worker should infection result. This guidance would appear to be uniform, however, supporting evidence is scarce.

As this review uncovers, the consequences of exposures to blood and/or other body fluids are potentially serious and given the limited availability of post-exposure treatments, prevention is crucial. Although steps can be taken to minimise the likelihood of injury and the risk of exposure to a blood borne virus, no precautions can supersede use of a good infection control technique at all times and in all clinical situations to avoid injury. Further supporting evidence is required in some areas to back up recommendations outlined. However, this area of research has grown considerably since the first discovery of HIV and is likely to continue to grow in the years to come.

<p>Part B (2004 – 2006)</p>	<p>The annual review aims to identify, review and critique any scientific studies or guidance, which have been published in the intervening period since the original literature review, to determine if changes to guidance are required.</p> <p>There was only one scientific study published within the period of the review which specifically covered occupational exposure to blood (Van Wijk <i>et al.</i>, 2006). This article is a retrospective study of cases of occupational exposure, which were handled using a standardised protocol with set algorithms to define methods of dealing with high and low risk incidents, which was established within the healthcare system in the Netherlands. However the study demonstrated that even with the use of standardised operational protocols and flowcharts, the management of occupational exposures can be difficult and underlines the importance of prevention in the first instance, by adherence to infection control guidance and precautions.</p> <p>In addition, there was no additional guidance documents published during the period of the review, which specifically covered occupational exposure management. Therefore there are no recommended changes to guidance contained within this model policy.</p>
<p>Part C (2007-2009)</p>	<p>This review aims to identify, review and critique any scientific studies or guidance, which have been published in the period since the last literature review, to determine if changes to guidance are required.</p> <p>A report was published by the HPA (2008), using the information submitted to the United Kingdom Surveillance of Significant Occupational Exposures to Bloodborne Viruses in Healthcare Workers scheme.</p> <p>*914 incidents were reported to the scheme between 2006 (483) and 2007 (431).</p> <p>*Percutaneous injuries involving hollow bore needles remain the most commonly reported occupational exposures in the healthcare setting.</p> <p>*HCV exposures to infected source patients remain the greatest proportion of percutaneous exposures reported. Of concern, is that over a third of incidents occurring between 2000 and 2007 in the ward or in A&E (43% and 37% respectively), and around 20% in ITU and in operating theatres (22% and 20% respectively) were preventable with proper adherence to universal precautions and safe disposal of clinical waste.</p> <p>*HCW's exposed to HCV positive source patients are still not routinely receiving follow up testing in line with national guidelines; only 22% (40/184) in 2007 had the correct type of tests at the correct time points.</p> <p>* In 2006-2007, there were a further 3 patient to HCW transmissions following percutaneous exposure, bringing the total number of HCV seroconversions in HCWs reported between 1997 and 2007 to 15 cases in England. In addition, one case has been reported from Scotland. To date, no cases have been reported from Wales or Northern Ireland.</p>

* Most (78%) HCWs exposed to an HIV positive source patient began HIV PEP after sustaining a significant exposure in 2007. Of these, a third (37%) commenced on treatment within an hour of the exposure, and 89% within 24 hours.

* Since 1999, there have been no new cases of HIV seroconversion following percutaneous exposures of HCWs to HIV positive source patients. This brings the total number of UK documented seroconversions reported by 2007 to 5.

Recommendations from this report are:

* Greater emphasis is needed on (i) conducting source patient and follow up testing, (ii) the reporting of incidents at local and national level, and (iii) alerting this surveillance programme of any potential bloodborne (BBV) virus seroconversions.

* Primary care Trusts and hospital services should ensure that appropriate OH systems are in place with an identified healthcare provider to whom HCWs can be urgently referred to in case of the occupational exposure. Local health policies should specifically identify those staff responsible for (1) the management of occupational exposures, (ii) the provision of PEP and (iii) clinical and serological post-exposure follow up. As part of the local protocols for appropriate reporting, management and follow up of those exposed to BBVs, Primary Care Trusts and Hospital Trusts must ensure that all HCWs are made aware of how to report an exposure and to whom it should be reported in line with current national guidance.

* Primary care Trusts, Virology Services and the HCWs themselves need to work in collaboration to ensure the correct types of HCV tests are performed at the correct time intervals. In addition, HCWs who transfer to different trusts during follow up of their HCV exposure should ensure remaining follow up tests are completed.

* Primary Care Trusts and Hospital Trusts and any other relevant healthcare settings, should be encouraged to adopt safety devices in place of conventional devices, in order to prevent needlestick injuries in HCWs.

The epic2 guidelines (*Pratt et al., 2007*) reviewed literature relevant to this area and recommend several standards that should be met for the safe use and disposal of sharps:

* Sharps must not be passed directly from hand to hand and handling should be kept to a minimum.

* Needles must not be recapped, bent broken or disassembled after use.

* Used sharps must be discarded into a sharps container (conforming to UN3291 and BS 7320 standards) at the point of use by the user. These must not be filled above the mark that indicates the bin is full.

* All sharps bins should be positioned out of the reach of children at a height that enables safe disposal by all members of staff. They should be secured to avoid spillage.

* All staff both clinical and non clinical must be educated about the safe use and disposal of sharps.

* Consider the use of needlestick- prevention devices where

there are clear indications that they will provide safe systems of working for healthcare practitioners.

*Conduct a rigorous evaluation of needlestick-prevention devices to determine their effectiveness, acceptability to practitioners, impact on patient care and cost benefit prior to widespread introduction.

Updated proposed guidance was produced by the Advisory Committee on Dangerous Pathogens (ACDP) in consultation with HSE (*HSE, 2009*). The aim of this guidance is to offer assistance to a wide readership, including those with responsibility for Health and Safety, as well as those in Occupational Health disciplines that need to assess the risks associated with exposure to such viruses. It is intended to cover any workplace situation where exposure to blood-borne viruses (BBV) is possible. Controls that minimise risks during exposure-prone procedures, and recommended actions in the event of an exposure, are presented. The guidance is divided into 4 main sections covering background information, Health and Safety law, control measures against bloodborne infections and guidance on management of incidents potentially involving exposure to a bloodborne virus (BBV).

In 2008, the Department of Health published updated guidance HIV post-exposure prophylaxis (PEP) (*Department of Health, 2008*). This document supersedes guidance on occupational HIV PEP from the UK Chief Medical Officers' Expert Advisory Group on AIDS (EAGA) issued in February 2004 and the interim update following the withdrawal of Viracept (nelfinavir) published in July 2007.

An integrated approach to post-exposure management with respect to HIV, HBV and HCV is recommended. In reviewing the guidance, EAGA's PEP Working Group highlighted the following basic principles, which apply to the management of all exposures to HIV (i.e. occupational and non-occupational):

*EAGA recommends the inclusion of local PEP policy guidance in induction programmes for new staff to educate and raise awareness among those at risk, including where to access PEP and the need for prompt attendance.

*Timely provision of PEP (24-hour access).

*Risk assessment.

*Management and follow-up of all exposed individuals.

Updated recommendations include:

*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

*As a minimum, follow-up should be for at least 12 weeks after the HIV exposure event or, if PEP was taken, for at least 12 weeks from when PEP was stopped

* Recommended regimens for PEP starter packs

* a good practice recommendation that all hospitals have the capacity to obtain an HIV test result (for all source patient testing) ideally within 8 hours and not more than 24 hours after blood is taken

As nursing care in the community becomes more complex, a review by *Cutter et al. (2007)*, examined compliance with standard precautions by community nurses and discussed strategies aimed at improving compliance with one of these elements i.e. sharps management. The review highlights that:

- *There is a lack of statistics about needlestick injuries in primary care and under-reporting a problem.
- *21% of nurses reported having sustained a needlestick injury while working in the community.
- *Re-sheathing needles in the community has been identified.
- *13.5% of injuries occurred either during or after taking blood.
- *Poor disposal of sharps causes problems with injuries.
- *Improvements in safety can only come with improvements to practice. Varied factors account for poor compliance with standard precautions and poor practices, leading to injury.
- *26% of community nurses rated their knowledge of standard precautions as inadequate.

Future research needs to identify how the behavior of community practitioners can be influenced to reinforce compliance with infection control precautions, thereby minimizing inoculation injuries.

Under-reporting of needlestick injuries continues to be a problem (*Cutter et al., 2007, Au et al. 2008*) and the need to educate healthcare workers has been strongly re-emphasized (*Pratt et al., 2007; Department of Health, 2008; HSE, 2009*). *Krishnan et al. (2007)*, used cluster randomization to assess the impact of educational interventions on primary health care workers knowledge of the management of occupational exposure to blood or body fluids. Medical and dental practices were randomized to four groups. Staff in the first group received no educational interventions, staff in another group received a flow chart about the management of blood/body fluid exposures, staff in a third group received an e-mail with the flow chart, and staff in the last group received an oral presentation of the information in the flow chart. Staff knowledge was assessed afterwards using a postal questionnaire. The study found that:

- * Face to face training was the most effective intervention
- *Only 80% of workers who were exposed to blood/body fluids thought they were at risk of exposure to BBV.
- *16% of “at risk” staff had not been immunized against hepatitis B
- *48% of “at risk “ staff had not received training about BBV
- *There is a need for education of “at risk” primary health care workers.

It is important that further research is undertaken to identify how the behavior of community practitioners can be influenced to reinforce compliance with standard infection control precautions, and so minimise inoculation injuries.

There is on-going debate about the use of needlestick-prevention devices. The epic2 standards are stated earlier. *Azar-Cavanagh et al.(2007)*, published results of a controlled, retrospective, interventional before/after study over a period of 3 years looking at the effect the introduction of one type of engineered sharps injury prevention device (intravenous catheter stylet with a retractable protection shield)) had on the incidence of percutaneous injuries (PI) amongst HCWs. Only PIs that resulted from suture needles (used as a comparison group), iv catheters prior to the intervention and iv catheter ESIPDs after the intervention were analysed. Analysis of data showed that after the intervention the incidence of PIs from iv catheters decreased significantly ($p<0.01$), whereas the incidence injuries from suture needles increased significantly ($p<0.008$). Limitations include the fact there was no information about the cause of the PIs and that this was only one centre and one device.

A paper by *Whitby et al. (2008)*, looked at the impact on needlestick injuries (NSI) of the substantial replacement of conventional hollow bore needles safety engineered devices (SED), including retractable syringes, needle free intravenous systems, and safety winged butterfly needles in an 800 bed Australian hospital. NSIs were prospectively monitored for 2 years after the introduction of SEDs, and were compared with retrospective data going back 4 years. They document a fall of 49% in hollow-bore NSIs. However the paper raises other practical issues with the use of these devices which suggest that they need to be carefully assessed, trialed and implemented.

CONCLUSIONS

Part A (1966 – 2004)

*Sharps injuries are one of the most common types of injury to be reported to Occupational Health departments by staff.

*Measures must be put in place to protect staff from potential infection as far as possible both by minimizing the likelihood of injury and by facilitating treatment in the event of an injury.

*Literature in this field is abundant and related guidance has been revised in recent years in line with the evidence base.

*The potential risk of transmission of BBVs arises from the exposure to blood and other body fluids from an infected patient.

*Exposure to viruses such as HIV, HBV and HCV can be the most consequential (Lanphear, 1994) and, as such, they are the focus of much of the guidance.

*The risk of transmission of BBVs is greater from patient to HCW than from HCW to patient.

*The risk to the HCW is in fact proportional to the prevalence of a particular infection in the population served, the infectious status of the individual source patient which may or may not be known, and the risk of significant occupational exposure occurring during procedures undertaken.

*Studies conducted worldwide indicate the greatest occupational risk for transmitting a BBV is through parenteral exposure to an infected person (Henderson et al., 1990; Geberding, 1994; CDC, 2001).

*There is no evidence to show that BBVs can be transmitted by blood contamination of intact skin, by inhalation or by faecal-oral examination.

*Healthcare workers who suffer an exposure to HBV infected blood, but who have not been vaccinated, have a 22-31% risk of becoming infected (if e-antigen positive) and a 1-6% risk of becoming infected if s-antigen positive.

*The estimated risk of transmission of HCV following a single percutaneous exposure to a positive source is between 0 and 7%.

*Studies suggest the risk for HIV exposure lies between 0.3 and 0.4%.

	<p>*Estimations of risk following mucocutaneous exposure are considerably lower for all of these viruses.</p> <p>*Not all infected patients have been diagnosed, therefore, staff must apply standard infection control precautions in all circumstances and regard all blood/body fluids as potentially infectious.</p> <p>*Following risk assessment, the appropriate use of personal protective equipment (PPE) is advised at all times when sharps injuries might occur.</p> <p>*Actions can be taken to prevent avoidable sharps injuries (e.g. no resheathing of needles, disposal of sharp at point of use, appropriate use of approved puncture-resistant sharps containers).</p> <p>*In more recent years, safety devices have been developed in an attempt to eliminate those injuries which are preventable and these are available in a variety of forms (e.g. retractable, shielded, blunted). In the US, legislation was passed in 2000 to ensure all employers make safety devices available to staff. In the UK, however, progress has been hampered by the limited number of studies undertaken to support their effectiveness and the associated cost implications.</p> <p>*Prompt action should be taken in the event of an injury, primarily in the form of First Aid and, thereafter, in the form of reporting and treatment.</p> <p>*Whether a near miss or an actual exposure, all incidents should be documented fully to protect the healthcare worker should infection result.</p> <p>*As this review uncovers, the consequences of exposure to blood and/or other body fluids are potentially serious and given the limited effectiveness and availability of post-exposure treatments, prevention is crucial.</p>
<p>Part B (2004 – 2006)</p>	<p>There are no additional publications specifically on this subject produced, which would impact on the content of the model policy on Occupational Exposure Management, within the period of this annual review. Therefore there is no change to guidance recommended.</p>

Part C (2007-2009)

*914 incidents were reported to the United Kingdom Surveillance of Significant Occupational Exposures to Bloodborne Viruses in Healthcare Workers scheme in 2006/7.

* Percutaneous injuries involving hollow bore needles remain the most commonly reported incident.

* HCV exposures to infected source patients remain the greatest proportion of percutaneous exposures reported. In 2006-2007, there were a further 3 patient to HCW transmissions following percutaneous exposure.

* HCW's exposed to HCV positive source patients are still not routinely receiving follow up testing in line with national guidelines.

* Greater emphasis is needed on conducting source patient and follow up testing.

* Updated guidance from the Advisory Committee on Dangerous Pathogens (ACDP) in consultation with HSE (*HSE, 2009*) and the Department of Health (*Department of Health, 2008*) on HIV post-exposure prophylaxis offers guidance and best practice advice for the development of national and local policies on occupational exposure including needlestick ("sharps") injuries.

* Under-reporting of needlestick injuries continues to be a problem in all healthcare settings.

* Poor compliance with universal precautions and safe disposal of clinical waste continues to cause preventable needlestick exposures.

*In a community study it was found that there was a need to educate "at risk" primary health care workers about the management of occupational exposure to blood or body fluids. In this setting, face to face training was the most effective intervention.

*Consider the use of needlestick- prevention devices where there are clear indications that they will provide safe systems of working for healthcare practitioners.

*Conduct a rigorous evaluation of needlestick-prevention devices to determine their effectiveness, acceptability to practitioners, impact on patient care and cost benefit prior to widespread introduction.

RECOMENDATIONS
Part A (1966 – 2004)

*Measures must be put in place to protect staff from potential infection as far as possible both by minimising the likelihood of injury and by facilitating treatment in the event of an injury.

*Not all infected patients have been diagnosed and, therefore, staff must apply standard precautions in all circumstances and regard all blood/body fluids as potentially infectious.

*As a vaccine is available for HBV, it is necessary for all healthcare workers to receive a full course of hepatitis B immunisation prior to commencing employment within the healthcare sector. Immunisation should not, however, be considered a substitute for good infection control practice and provides no protection against infection with other BBVs.

*The appropriate use of personal protective equipment (PPE) is advised at all times.

*It is recommended that healthcare staff wear gloves when contact with blood is anticipated and when dealing with sharps, although sharps usage should be avoided where possible.

*Prior to donning gloves or other PPE, it is important to cover all cuts and abrasions to prevent tissues becoming contaminated with body fluids.

*Those individuals with skin conditions should seek advice to minimise their risk of infection.

*Eyewear and /or face protection is also recommended when undertaking a procedure where the potential for blood or body fluid exposure exists.

*Healthcare workers are also advised not to wear open footwear in situations where blood may be spilt or sharps are being handled.

*To prevent avoidable sharps injuries, healthcare workers are advised not to resheath needles.

*Used sharps should be disposed of immediately after use to eliminate the risk of potential injury.

*Approved puncture-resistant sharps containers (BS7320) should be used appropriately (i.e. not overfilled above the 3/4 mark, sealed properly for both use and for disposal, labeled appropriately for tracing) to reduce the risk of downstream injuries.

*In the event of an injury, prompt action should be taken, primarily in the form of First Aid as detailed below and, thereafter, in the form of reporting and treatment.

- Encourage bleeding. Do not suck the wound;
- Wash the area thoroughly with warm water, but without scrubbing;
- Cover with a waterproof plaster;
- Irrigate exposed mucous membranes with copious amounts of water, before and after removing any contact lenses;
- Ensure the sharp involved is disposed of safely into an approved sharps container;

	<p>*Report injury immediately to Line Manager and to the local OH department.</p> <p>*Whether a near miss or an actual exposure, all incidents should be documented fully to protect the healthcare worker should infection result.</p> <p>*Staff reporting an injury should be offered counseling, testing and an explanation of the results.</p> <p>*Testing of the source patient is also recommended. If the source is known to be positive for a BBV, the healthcare worker involved should be tested at monthly intervals to ascertain whether infection develops. Evidence of infection normally appears within 6 months of exposure.</p> <p>*Post-exposure prophylaxis is available for HIV in the form of antiretrovirals. For optimum efficacy, PEP should be commenced as soon as possible after the incident, ideally within an hour. In certain circumstances, initial doses may be prescribed to an injured healthcare worker with a fuller discussion and risk assessment to follow.</p> <p>*To facilitate treatment, healthcare workers should be aware of the local arrangements for reporting injuries and receiving treatment and the relevant policies should be in place.</p> <p>*Staff who may be involved in the prescription of such medication should also be fully trained and be aware of treatment.</p> <p>*Good infection control techniques should be applied at all times and in all clinical situations to help avoid injury</p>
<i>Part B (2004 – 2006)</i>	No change to present guidance recommendations in literature review available 10/10/05
<i>Part C (2007-2009)</i>	National and local policies should reflect updated specialist guidance produced in this period and reviewed here.
PRACTICAL APPLICATION	As the management of occupational exposures described has been recommended for some time, no significant change to practice should be required; however, the standards set down must be achieved.
RESOURCE IMPLICATIONS	As per current policies. All resources required for dealing with the management of occupational exposures should already be in place.

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