



Ophthalmic Services Guidance

Prevention of transmission of blood-borne viruses in ophthalmic surgery

Any ophthalmologist who has experienced a needle-stick injury whilst operating will have had cause to reflect on the risks of transmission of blood-borne viral infections between surgeon and patient. This paper aims to provide a synopsis of current guidance and published research on safe practice for minimising the risks of transmission of infection during surgery, from the ophthalmologist's perspective. It also provides advice for ophthalmic surgeons who are HIV, hepatitis B or hepatitis C positive in relation to continuing surgical practice.

Percutaneous injury to surgeons during ophthalmic procedures occurs in at least 5% of cases (see below). In up to a third of such injuries, the causative instrument may recontact the patient's tissues¹. However, the risk of transmission of a blood borne virus from an ophthalmologist to their patient remains very low, and to date there has been no published report of this in the developed world.

ABBREVIATIONS

CDC	Centre for Disease Control and Prevention (USA)
DPH	Director of Public Health
DH	Department of Health (UK)
HIV	Human Immunodeficiency Virus
HBV	hepatitis B virus
HCV	hepatitis C virus
UKAP	United Kingdom Advisory Panel for Health Care Workers Infected with Blood Borne Viruses

STANDARD PRECAUTIONS

Any blood or other body fluids should be regarded as potentially infected with a blood borne virus, and measures taken to reduce the risk of transmission. These include:

1. General measures such as hand-washing, the wearing of gloves and protective clothing, care of skin lesions, prompt cleaning and disinfection following spillages, etc.
2. Avoiding sharps usage wherever possible, and exercising care in their handling and disposal.
3. Following approved procedures for the sterilisation and disinfection of instruments, and for safe disposal of contaminated waste.
4. Following safety measures to reduce the risk of percutaneous exposure during surgery.

These recommendations are described in detail in the Department of Health Publication: *Guidance for Clinical Health Care Workers: Protection Against Infection with Blood Borne Viruses*². It is also strongly recommended that all ophthalmic surgeons examine and modify their practice to identify and prevent injury from sharps and surgical equipment. Examples of safe practice are described below, but every surgeon must recognize that the



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potential for injury includes not only the surgeon, but also the patient, scrub staff, nurses, theatre technicians, cleaners, orderlies and staff working in the sterilization department.

BARRIER PROTECTION

Gloves must be worn whenever there is a risk of exposure to blood or body fluids. Gloves should be changed between each patient, and between separate procedures on the same patient, and as soon as damaged. Intact latex gloves are effective at excluding blood borne viruses. However, there is a perforation rate in unused gloves (5% in one study)^{3,4}. The quality of the gloves being used should conform to the European Standard 455².

Glove perforation during intraocular surgery occurs in 3-10% of operations, but the incidence may be as high as 19% in retinal detachment repair and strabismus surgery, and 40% during oculoplastic surgery. The assistant and scrub nurse are at risk as well as the surgeon, and it occurs more commonly where a trainee is the primary surgeon. The left hand (most frequently the non-dominant thumb and index finger) is more frequently involved than the right due to manual handling of needles. Glove perforation also occurs more often in longer surgical procedures, hence regular changing of gloves is advisable during prolonged operations even if no glove perforation is suspected. Many perforations are unrecognised at the time of surgery^{1,3-7}.

Double gloving may reduce the risk of inner glove perforation and hence is recommended for exposure prone procedures. An alternative is the use of thicker, laceration-resistant gloves⁸⁻¹¹.

Surgical face masks are worn on the assumption that exhaled droplets from the surgeon may contaminate a wound, although their efficacy in preventing infection has not been proven. However masks, and visors where appropriate are recommended, as they may protect the surgeon and scrub personnel from blood splash².

Theatre personnel with open skin lesions on their hands or arms should be excluded from the operating team.

Closed shoes should be worn by all personnel in order to reduce the risk from dropped instruments.

SHARP INSTRUMENTS: TECHNIQUES FOR INJURY PREVENTION

Wherever practicable, sharp instruments and needles should be replaced with alternatives. Where sharps are necessary, the following safety behaviours are recommended.

1. Sharp use:

- Manipulation of needles or other sharp instruments by hands or fingers should be avoided, and instruments used wherever possible.
- Sharps should not be recapped
- Sharps should not be handed from one person to another
- Surgeons should announce the movement of sharps



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- Passing sharps over the body of a patient should be avoided
 - A designated area of the theatre trolley should be reserved for keeping sharp instruments, and minimal handling in the area applied
 - Magnetic pads should be used for keeping discarded needles
2. Disposal: All disposable sharp needles should be placed in colour coded, puncture proof containers, located as close as practical to the area of use. Sharps containers should be provided in adequate numbers and must not be allowed to overfill.

Protocols for deciding who disposes of sharps after an operation should be developed for each unit. Persons inexperienced in the handling of sharps should not be assigned to their disposal.

3. Design: Wherever practicable, single use disposable sharp instruments should be used rather than detachable blades. Where detachable blades are used, disposal techniques should be used that avoid manipulation by hands or fingers (eg scalpel blade removal devices).

Non-hollowed needles are preferable to hollowed ones.

4. Non-touch techniques, where tissue is manipulated with instruments rather than by hands or fingers, should be employed.

Efforts should be made to protect the hands and fingers of assistants.

CLASSIFICATION OF PROCEDURES¹²⁻¹⁸

Non-Exposure Prone Procedures:

These are procedures, including invasive surgery, where there is no opportunity for the blood of a surgeon to come into contact with the patient's open tissues. The hands and fingers of the surgeon must be completely visible at all times. Provided that the general principles described above are adhered to scrupulously, these procedures pose no risk for transmission of a blood borne virus from an infected health care worker to a patient and can be safely performed.

Exposure Prone Procedures (EPPs):

These are procedures where an opportunity does exist for injury to the surgeon resulting in their blood contaminating the patient's open tissues ("bleed back"). This includes procedures where the hands or fingers of the surgeon are inside a wound or body cavity, have the potential to come into contact with a sharp object, and may not be completely visible at all times. It also involves emergency situations where there may be a risk of biting.

Exposure prone procedures in ophthalmology are orbital surgery and some operations in oculoplastic and lacrimal surgery. Routine ocular surgery is not considered exposure prone, as the operator's fingers are not concealed in the patient's tissues.



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The decision about whether an infected surgeon should continue to perform a procedure is made on an individual basis, with advice from a specialist occupational physician and the UKAP (UK Advisory Panel for Health Care Workers Infected with Blood Borne Viruses), considering the likelihood of the procedure becoming exposure prone and various other factors including the experience of the surgeon.

BLOOD BORNE VIRUS STATUS, HEALTH CLEARANCE, AND THE NHS¹⁸

Recent DH guidelines require that all healthcare workers at the commencement of training or working in the NHS, or on return to work after prolonged absence have appropriate clearance from their occupational health department.

All surgeons at the commencement of employment should be offered testing for HIV, and hepatitis B and C, together with immunisation for hepatitis B and post-immunisation testing of response (*standard health clearance*).

As part of *additional health clearance* surgeons performing exposure prone procedures should be:

- a. HIV negative
- b. hepatitis B surface antigen negative, or if positive, e antigen negative with a viral load of 10^3 genome equivalents / ml or less
- c. hepatitis C antibody negative, or if positive, negative for hepatitis C RNA

In addition, all surgeons have an obligation to seek and follow confidential advice about the need to be tested in the event of potential exposure to a blood borne virus.

The occupational health department, by means of a certificate to the trusts management, should confirm clearance to perform relevant clinical duties. In addition, appropriate clearance may be recorded on the 'smart card' system.

Surgeons who decline testing, either at the commencement of employment or during continuing practice, may be precluded by their trust from performing EPPs.

ETHICAL AND LEGAL CONSIDERATIONS¹²⁻²⁰

Under the Health and Safety at Work etc Act 1974, all surgeons have a legal and ethical duty to protect the health and safety of their patients, themselves and colleagues, and to cooperate with their employer in health and safety matters.

A surgeon who has any reason to believe that they may have been exposed to infection with a blood borne virus should seek and follow confidential advice on whether they should be tested.

In 1991 the Centre for Disease Control and Prevention (CDC) issued guidelines for HIV and HBV positive health care workers in the United States. One of the most problematic was the requirement that an infected practitioner notify prospective patients of his or her infective status. Repercussions of this statute included unnecessary anxiety and alarm



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amongst patients, and severe consequences to health care workers' careers. In the United Kingdom such disclosure is currently not necessary, with the decision of whether to inform patients and colleagues being made by the individual.

Surgeons who are HIV, hepatitis B or hepatitis C positive should inform their occupational health department. They must not rely on their own assessment of the risk they pose to patients, but should seek and follow expert medical and occupational health advice. There is a legal obligation on the occupational health department to keep such information confidential and not to disclose information to the employer unless that individual consents, or under exceptional circumstances (such as where the occupational physician believes that patients are or may have been at risk). The employer also has a legal duty not to discriminate against workers performing non-exposure prone procedures, although discrimination is justifiable for exposure prone procedures (The Disability Discrimination Act 1995, 2005).

In most situations co-workers and supervisors do not need to be aware of a surgeons infectivity status. If they are made aware, these employees should have explicit instructions that no additional persons should learn of the infection, unless the infected individual gives their permission.

If there is any uncertainty about whether an exposure prone procedure has been conducted, the surgeon should inform their occupational health department for an assessment of whether a patient notification exercise needs to be considered.

It is recommended that surgeons continuing in medical practice have appropriate medical supervision.

ADVICE

Advice for surgeons who are infected, or believe they may be infected, with a blood borne virus may in the first instance be obtained from the occupational health department, who should place the worker in contact with a specialist occupational health care physician. This person would be the most appropriate to represent the workers interests. Independent legal advice may also be sought. Further advice may be obtained from the UKAP (UK Advisory Panel for Health Care Workers Infected with Blood Borne Viruses).

PREVENTING DOCTOR TO PATIENT TRANSMISSION OF HIV

BACKGROUND

There are some 58000 HIV positive individuals in the United Kingdom, almost half of whom live in London. One third are unaware that they have the disease²¹.

After a single needlestick injury the risk of seroconversion is approximately 0.3%. Modifying factors include the source's viral load and the nature of the injury (blood involved, amount of material transferred, and depth of injury). There is thought to be no risk of transmission when blood is in contact with intact skin. There is a low (less than 1 in 1000) risk for exposure to intact mucous membranes¹³.



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Worldwide there have been only three health care workers who have transmitted the virus to their patients. A French orthopaedic surgeon during a long operation transmitted the infection to a patient. A Florida dentist transmitted HIV to five patients. A Spanish gynaecologist transmitted the infection during a caesarian section. In the UK there has been no detected transmission of HIV from an infected health care worker to a patient, despite over 7000 patients being tested during 28 patient notification exercises¹³. The risk of transmission from an infected surgeon to a patient during a single operation is very low, having been estimated to be around 0.0024%²².

RESTRICTIONS ON PROCEDURES PERFORMED BY HIV POSITIVE SURGEONS^{13,17,18,23}

Exposure prone procedures should not be performed by HIV positive surgeons, who would need to modify their practice, or seek retraining or redeployment.

There are no restrictions on performing non-exposure prone procedures.

PATIENT NOTIFICATION EXERCISES¹³

Not all patients who have undergone an exposure prone procedure by an HIV positive surgeon need to be notified and tested. This decision should be made on a case-by-case basis by the occupational health department and the local DPH (Director of Public Health), supported where necessary by the Regional Epidemiologists and Regional Directors of Public Health based on the level of risk. Where necessary the UKAP may be approached for advice. The surgeon has an ethical obligation to cooperate in the provision of required information.

PROCEDURES FOR MANAGEMENT OF BLOOD EXPOSURE INCIDENTS¹³

Management of accidental exposure of a patient to the blood of a HIV infected surgeon should follow the local NHS trust guidelines for appropriate management, and be undertaken by a suitable medical practitioner appointed by the trust to manage such situations. These procedures would include an assessment of the risk of injury, followed by testing of the surgeon and patient, and counselling. HIV transmissibility is low and may be further reduced by immediate treatment with anti-retroviral medications (Post Exposure Prophylaxis – see Appendix 2)²⁴.

PREVENTING DOCTOR TO PATIENT TRANSMISSION OF HBV

BACKGROUND

The World Health Organization estimated prevalence of hepatitis B infection in the United Kingdom is 0.3%. However among migrants from sub-Saharan Africa and Asia the prevalence may be more than 10%²⁵.

Acute infection with hepatitis B in adults is often subclinical. Symptomatic adults develop a flu-like illness, with jaundice occurring in 30-50%. Chronic hepatitis B infection, defined as persistence of HbsAg in the serum for longer than six months, occurs in 5% of previously healthy people infected as adults.



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The risk of acquiring infection from a hepatitis B positive source depends on their infectivity, and the nature of the injury. After a single needlestick injury from an e-antigen positive source to a non-immunised recipient the risk of seroconversion is up to 30%. Various factors modify the risk (eg hollow bore needle, depth of injury, amount of blood transferred). If the injured party is fully up to date with their immunisation and has shown a good antibody response to the vaccine, they are protected against infection with hepatitis B^{14,15}.

In the United Kingdom there have been nine episodes of documented transmission of hepatitis B from infected surgeons to patients since 1991, when hepatitis B vaccination became widespread. Worldwide since 1970 there have been more than 45 clusters where over 400 patients contracted hepatitis B from a health care worker^{14,15,26}. These incidents have mainly involved gynaecologic, cardiac and dental procedures. The incidence of such transmission has markedly decreased since the introduction of the hepatitis B vaccine and immunoglobulin^{14,15,26}. However the seroprevalence of practising HBV positive health care workers in European countries ranges from 0.3 to 3%, and hence it may still pose a significant risk to patients²⁶. From look-back studies, the risk of transmitting the virus to a patient during an operation performed by a HBV positive surgeon has been estimated to be 0.24%, but may be up to 2.8% or higher when considering the infectivity of the surgeon and high risk procedures²⁶⁻³¹.

HEPATITIS B SEROLOGY

Immunity (after vaccination) is recognized by **anti-hepatitis B surface antibodies (anti-Hbs)**.

The presence of **Hepatitis B surface antigen (HbsAg)** indicates infection. Persistence of HbsAg in the blood for more than six months is regarded as evidence of chronic infection. The additional presence of the **e-antigen** indicates high infectivity. However there is a genetic variant of the virus (the codon 28 precore mutation) that is unable to produce the e-antigen but is still capable of assembling infectious viral particles, hence the need to test viral loads in e-antigen negative individuals. In the UK there have been several transmissions to patients from e-antigen negative doctors with high viral loads. Transmission from sources with viral loads less than 10^3 genome equivalents per ml is uncommon^{14,15,26-31}.

HEPATITIS B TESTING AND VACCINATION^{18,26,32,33}

All surgeons should be tested for HbsAg at the beginning of their careers and when taking up new posts. Because high levels (>100 IU/l) of anti-hepatitis B surface antibodies have occasionally been documented in infected carriers, this test should not be used on its own to indicate non-infectivity.

All HbsAg negative surgeons should be vaccinated against hepatitis B and should receive post-immunisation testing to establish the adequacy of response, or investigation of non-response. The standard vaccination course comprises three doses of vaccine given at zero, one and six months. Antibody levels should be checked within two months of the final dose. The HBV vaccine provides a protective response in 80 to 95% of those



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vaccinated, and persons with anti-hepatitis B surface antibody titres > 100 IU/l have virtually 100% protection against infection. After successful vaccination antibody titres decrease, but an antibody response may still be generated up to two decades later. However current recommendations suggest a booster dose of the vaccine if exposure to blood from an HbsAg positive source occurs (Appendix 3).

Surgeons with anti-Hbs levels < 100 IU/l should have further doses of the vaccine. Anti-Hbs levels between 10-100 IU/l may falsely suggest immunity; furthermore HBV carriers may produce antibody levels in this range. Surgeons with persistently poor response after up to three boosters should have their HbsAg levels checked. If negative, an occupational physician should be consulted to assess the risk of performing exposure prone procedures.

RESTRICTIONS ON PROCEDURES PERFORMED BY HEPATITIS B POSITIVE SURGEONS^{14,15,17,18,23,26-31,34}

Hepatitis B surface antigen positive and e-antigen positive surgeons should not perform exposure prone procedures.

Hepatitis B surface antigen positive and e-antigen negative surgeons should be viral load tested every year:

- a. Surgeons in whom the viral load does not exceed ***10³ genome equivalents per ml*** (geq/ml) may continue to perform exposure prone procedures but should receive appropriate occupational health advice. If subsequent annual testing shows a viral load raised above this level performance of exposure prone procedures should cease.
- b. Those whose viral load exceeds 10³ genome equivalents per ml should not perform exposure prone procedures.

There are two designated laboratories with assays that are able to detect viral loads at these levels and which should be used for testing^{14,15}. Two different serum samples are taken a week apart and tested in a designated laboratory.

For oculoplastic and lacrimal cases, even if non-exposure prone, double gloving may be advisable for an HBV positive surgeon.

If investigation of a case of hepatitis B in a patient indicates possible transmission from a surgeon, the surgeon should cease to perform exposure prone procedures.

Hepatitis B surface antigen positive surgeons and antiviral therapy³⁴

Previous DH guideline suggested that HbsAg positive surgeons on interferon or antiviral therapy not perform exposure prone procedures. Those who had undergone treatment were required to have a viral load of less than 10³ genome equivalents per ml one year after cessation of treatment, before a return to unrestricted working practices was considered.



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This policy has recently been revised. HbsAg positive surgeons who are e-antigen negative and who had pre-treatment viral loads between 10^3 and 10^5 geq/ml may perform EPPs if their viral load on treatment is suppressed to below 10^3 geq/ml (confirmed by two tests one month apart). Their viral load should be monitored three monthly, with samples sent to one of two designated laboratories (see DH guidelines). Performance of exposure prone procedures should cease if:

1. viral load exceeds 10^3 geq/ml while on therapy
2. breakthrough infections occur due to the development of resistant strains; EPPs should cease until stabilisation on different antiviral medications results in viral loads less than 10^3 geq/ml on two consecutive tests no less than one month apart.
3. antiviral therapy is stopped for any reason. Only if the viral load one year after cessation of therapy is less than 10^3 geq/ml can a return to EPPs be considered (subject to a repeat test 6 months later and annual re-testing, as recommended in prior DH guidelines)

Hepatitis B positive surgeons should thus be under the continuing care of a consultant occupational physician and a physician with expertise in treating chronic hepatitis B infection.

PROCEDURES FOR MANAGEMENT OF BLOOD EXPOSURE INCIDENTS^{14,15}

Management of accidental exposure of a patient to the blood of a hepatitis B infected surgeon should follow the local NHS trust guidelines for appropriate management, and should be undertaken by a medical practitioner appointed by the trust to manage such situations. These would include an assessment of the risk of injury, followed by testing of the surgeon and patient, and counselling. Hepatitis B immunisation or booster doses, or hepatitis immune globulin should be considered.

PATIENT NOTIFICATION EXERCISES^{14,15}

Not all patients who have undergone an exposure prone procedure by an infected surgeon need to be notified and tested. This decision should be made on a case-by-case basis by the occupational health department and the local DPH (Director of Public health), supported where necessary by the Regional Epidemiologists and Regional Directors of Public Health. Where necessary the UKAP may be approached for advice. The surgeon has an ethical obligation to cooperate in the provision of required information.

PREVENTING DOCTOR TO PATIENT TRANSMISSION OF HCV

BACKGROUND

Although there is no study on the prevalence of Hepatitis C in the United Kingdom, it is a low risk population and estimates are in the order of 0.4%. However in injecting drug users the prevalence of infection is at least 30%³⁵.

The risk of HCV seroconversion in a health care worker following a single percutaneous injury from a hepatitis C positive source is probably between 1.2 and 3%. Deep injury from



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a hollow needle may increase the risk to 10%. The risk of seroconversion of a patient following bleed-back from an infected surgeon is unknown; however the risk of transmission from a HCV positive surgeon to patient during a single exposure prone procedure has been estimated to be between 0.014% and 0.5%, depending on the type of surgery performed and the infectivity of the surgeon^{22,36-39}.

The estimated prevalence of hepatitis C positive health care workers in the United Kingdom is around 0.3%²⁵. Five hepatitis C positive surgeons have transmitted the virus to nine patients in the UK since 1994, although further unpublished cases also exist²⁶; however this may be an underestimate of the true number as many cases may remain asymptomatic for years. Once infected 80% of people will develop chronic liver disease.

RESTRICTIONS ON PROCEDURES PERFORMED BY HEPATITIS C POSITIVE SURGEONS^{16,18,36-39}

Testing and advice for surgeons potentially infected with hepatitis C should be undertaken through the local trust's occupational health department.

The risk of transmission of hepatitis C from a surgeon of unknown hepatitis C status during exposure prone procedures has been assessed to be low. Surgeons who believe they have been exposed to hepatitis C should seek confidential and professional advice on whether they should be tested. Testing should be for antibodies to hepatitis C virus and if positive, for hepatitis C virus RNA.

Surgeons who know they have been infected with hepatitis C (i.e. antibody positive) and who perform exposure prone procedures should be tested for hepatitis C virus RNA. Those found to be carrying the virus (ie hepatitis C virus RNA positive) should not perform exposure prone procedures.

Hepatitis C infected surgeons who have responded successfully to treatment with antiviral therapy may resume exposure prone procedures. Successful response is defined as remaining hepatitis C virus RNA negative six months after cessation of treatment. A return to exposure prone procedures may be made at that time, but the surgeon should be shown still to be hepatitis C virus RNA negative six months later in order to continue performing such procedures.

PROCEDURES FOR MANAGEMENT OF BLOOD EXPOSURE INCIDENTS¹⁶

Management of accidental exposure of a patient to the blood of a hepatitis C infected surgeon should follow the local NHS trust guidelines for appropriate management. This should be undertaken by a medical practitioner appointed by the trust to handle such situations. In high-risk situations post-exposure treatment with interferon and antivirals may prevent the risk of chronic infection, although there is currently no official post-exposure prophylaxis for hepatitis C (see Appendix 4).



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PATIENT NOTIFICATION EXERCISES¹⁶

In cases where transmission of hepatitis C from an infected surgeon to a patient is detected, notification and testing of other patients who have undergone exposure prone procedures would normally follow. It has yet to be determined whether there is a need for automatic patient notification exercises when a hepatitis C virus RNA positive health care worker is identified in the absence of evidence of transmission. In this situation the UKAP should be approached for advice. The responsibility for these decisions rests with the local Director of Public Health (DPH) in consultation with the local Trust. The surgeon has an ethical obligation to cooperate in the provision of required information.

JUNIOR DOCTORS AND DOCTORS IN TRAINING

In line with new DH guidelines (see section on blood borne virus status and NHS clearance regulations above), the College recommends that all junior doctors be aware of their infectivity status prior to entering training, and satisfy standard health clearance. Positive tests and failure to satisfy additional health clearance may restrict the performance of exposure prone procedures and may thus have a negative impact on training. Such trainees should seek advice from an occupational physician, and the College prior to embarking on a career in ophthalmology.

The subject of health clearance for medical students is not dealt with in detail in this paper, as they are unlikely to assist in ophthalmic procedures. Those interested are referred to the DH guidelines mentioned above¹⁸.

COMPENSATION AND RETRAINING

Employers through their occupational health departments should advise health care workers about retraining, redeployment and compensation. Every effort should be made by the employer, assisted by the postgraduate medical deans, to find suitable retraining and alternative work.

The NHS Injury and Benefits Scheme and the Industrial Disablement Benefits Scheme provide benefits in circumstances where a blood borne virus has been occupationally acquired. For claimants who have needed to retire as a result of the infection, the scheme provides up to 85% of pre-injury NHS earnings.

Further information should be available from the occupational health department of the worker's organisation¹²⁻¹⁶.



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APPENDICES

APPENDIX 1: GENERAL PRINCIPLES OF MANAGEMENT OF NEEDLESTICK INJURY²

Employers have a duty to ensure that access to emergency care is available at all hours for staff exposed to blood borne viruses. NHS Trusts should have procedures in place to ensure access to post exposure prophylaxis, advice and administration, usually via A&E departments under the supervision of HIV, GUM or Infectious Disease Teams. The employer should ensure that employees are aware of these procedures; the employee has a duty to abide by these. Post-exposure counselling and psychological support should be available to any health care worker who reports an exposure incident. An integrated approach to post-exposure management with regards to HIV, HBV and HCV is recommended.

In the event of an exposure, first aid consists of gently squeezing the wound to encourage bleeding, washing with plain soap and copious water and then covering it with a waterproof dressing. Antiseptics and skin washes should not be used. The injury should be reported to a line manager who should ensure that further management is carried out as appropriate. Injured members of staff should not manage their own injuries nor should they be responsible for obtaining blood from the donor patient for testing.

A health care practitioner designated to manage exposures should conduct a risk assessment. This includes ascertaining factors such as the transmissibility of the virus, infectivity (eg viral load), immunisation status of the recipient, high-risk source groups, mechanism of injury (eg hollow bore needle) and the amount and nature of body fluid transferred. Blood from the source, taken with their consent, should be tested for blood borne virus status. When the source patient lacks the capacity for consent (e.g. when they are unconscious), their tissue can only be tested if held to be in their best interests in accordance with the Mental Capacity Act 2005. If the source patient is deceased and their infection status unknown, obtaining and testing samples requires consent from a nominated representative (if appointed) or a person in a 'qualifying relationship' to the source in accordance with the Human Tissue Act 2004. Blood taken from the recipient at the time of injury should be stored for a minimum of two years. If further testing reveals sero-positivity to a blood borne virus, the sero-negativity of this initial sample provides evidence (in combination with genotyping and sequencing of the virus) that the BBV was acquired from the injury.

APPENDIX 2: HIV POST-EXPOSURE PROPHYLAXIS^{24,40,41}

HIV Post Exposure Prophylaxis (PEP) in the UK should be managed according to current guidance from the Department of Health's Expert Advisory Group on AIDS (accessible at www.doh.gov.uk) for occupational exposures.

The estimated risk of HIV transmission from a known HIV positive source after a needlestick injury is estimated at 0.3%. The probability of transmission is likely to increase if there is a higher viral load (for example in advanced disease or not on antiretroviral



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therapy) or if the injury involves a larger inoculum. Where the HIV status of the source is unknown, risk assessment needs to consider the HIV prevalence of the group (e.g. ethnicity, sexuality, intravenous drug use) to which the source belongs. It is recommended that testing of the source is performed (with consent and after pre-test counselling, and not by the direct health professional involved) ideally within 8 hours and not more than 24 hours after source blood is taken in order to minimise unnecessary use of PEP.

There is no robust evidence for effectiveness of PEP. Biological plausibility is suggested from animal models and from mother to child HIV transmission studies. A case-controlled study of health-care workers suggested that AZT monotherapy may reduce transmission by approximately 80%^{40,41}.

If PEP is indicated after an exposure it is given typically as a three-drug combination, for the duration of four weeks. PEP should be commenced within 72 hours after exposure. PEP is generally not recommended beyond 72 hours post-exposure. The combination of drugs chosen will reflect current PEP guidelines and consideration of possible HIV resistance in the source. If toxicity or intolerance should occur during the therapy period, modification of the regime is possible.

Post exposure HIV antibody testing should be performed at least 12 weeks after exposure or completion of PEP. Longer followup with additional testing may be indicated in complex cases (e.g. if the exposed worker is immunocompromised, experiences an illness compatible with acute retroviral syndrome or when the source patient is dually infected where delayed seroconversion for HIV has been reported in the case of HIV and hepatitis C co-infection).

A health care worker need not cease performing exposure prone procedures while awaiting the results of HIV serology, due to the exceptionally low risk of transmitting the virus to a patient during a surgical procedure. However, in the event of a health care worker seroconverting, any exposure prone surgery should cease.

APPENDIX 3: MANAGEMENT OF HEALTHCARE WORKER EXPOSED TO HEPATITIS B^{2,41}

Where the donor is known to be hepatitis B surface antigen positive, hepatitis B vaccine and / or hepatitis B immunoglobulin may be administered depending on the nature of the exposure and the recipient's hepatitis B surface antibody level. If the recipient is unsure of their level, testing can be performed on the blood sample already taken from them.

The details of the vaccination schedule can be found in Chapter 18 of the Department of Health's "Green Book" at:

http://www.dh.gov.uk/PolicyAndGuidance/HealthAndSocialCareTopics/GreenBook/GreenBookGeneralInformation/GreenBookGeneralArticle/fs/en?CONTENT_ID=4097254&chk=isTfGX



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Non-immune healthcare workers who have been exposed to hepatitis B, whether or not they have received prophylaxis, should be followed up with repeat blood tests to check whether they have in fact acquired hepatitis B and also to demonstrate a response to vaccine. To this effect, blood should be taken 6 months after the incident and tested for hepatitis B core antibody and surface antibody.

APPENDIX 4: Management of healthcare worker exposed to Hepatitis C^{16,41}

There is no prophylaxis available for exposure to hepatitis C. The injured health-care worker should have baseline HCV antibody and viral RNA testing, and if the source is known to be infected with HCV, the recipient should be followed up with repeat blood tests at 6 (HCV RNA), 12 (HCV RNA and antibodies) and 24 (HCV antibodies) weeks after the

incident. If the status of the source is unknown, a designated doctor should perform a risk assessment and serological testing. If seroconversion of the health-care worker occurs, they should be referred to a specialist with expertise in managing hepatitis C so that early anti-viral therapy may be considered.



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