Inoculation Injuries and Children in Schools and similar settings: Risk Assessment Guidelines for Health Protection Units

November 2009

Health Protection Agency

7th Floor, Holborn Gate

330 High Holborn

London

WC1V 7PP

www.hpa.org.uk

November 2009

Citation:

Health Protection Agency

Inoculation Injuries and Children in Schools and similar settings: Risk Assessment Guidelines for Health Protection Units, 2009.

Author

Dr Will Welfare

Further Information:

Dr Catherine Quigley

Consultant Regional Epidemiologist

Health Protection Agency North West

DBH House

105 Boundary Street

Liverpool L5 9YJ

Tel: 0151 4825736

Email: Catherine.Quigley@HPA.org.uk

Contents

Inoculation Injuries and Children in Schools and similar settings: Risk Assessment

1. Introduction

This guidance aims to inform and guide the risk assessment by Health Protection Units of inoculation injuries in children occurring within schools or similar settings. An inoculation injury can be defined as “a penetrating wound with an instrument contaminated with the body fluid of another person” (Atenstaedt et al 2007).

This guidance is for children (under 16) in school and community settings. For occupational exposures, refer to the relevant occupational health guidance. For sexual exposures, refer to BASHH guidance http://www.bashh.org/documents/58/58.pdf. For community exposures in adults, refer to HPA North West policy or PCT specific guidance http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1204100459909

2. Risk Assessment

Question	Answer	Action	Action (2)
1. Was this a significant exposure?			
For each recipient: Was this a significant exposure? significant exposure= significant injury (3.1) + high risk material (3.2)	No (low risk material or non significant injury)	Reassure recipient General wound management (3.8.1)	
	Yes	Continue risk assessment	
2. Assess risk from contamination prior to this incident			
Is there a risk from contamination of the instrument prior to this incident?	Potential risk e.g. found needle and syringe	If source known- risk assess and test (3.4,3.5,3.6) If the source is considered high risk, consider appropriate PEP while awaiting results. If source known to be positive- initiate PEP and test for other BBV.	<u>If source positive:</u> Manage as per guidance for BBV (3.8) and general wound management
			<u>If source negative:</u> Continue risk assessment
		If source unknown or no consent- risk assess based on risk of injury and epidemiology of IVDUs locally or other group as appropriate(3.4,3.5,3.6)	Consider: Testing at baseline and follow up (3.7); Accelerated Hepatitis B vaccination (3.8.2) HIV PEP is unlikely to be of benefit General wound management (3.8.1) Continue risk assessment
	No contamination prior to this incident e.g. pencil sharpener or sewing needle	Continue risk assessment	
3. Assess risk from the incident itself (ie between children involved)			
Are any of the source individuals known to be infected with a blood borne virus? (check with GPs,	Yes	Manage as per guidance for BBV (3.8) and general wound management (3.8.1)	
	No	Continue risk assessment	

Question	Answer	Action	Action (2)
laboratories and local paediatric infectious diseases unit)			
Are any of the source individuals in a group at increased risk of BBVs (3.3)	Yes	If any source individual belongs to a group at increased risk: rapid test of all source individuals (to prevent stigmatisation). Consider starting Hepatitis B vaccination while awaiting results (3.8.2)	If positive source- Manage as per guidance for BBV (3.8) and general wound management (3.8.1) If results negative- reassure, general wound management (3.8.1) If refuse testing- risk assessment based on local epidemiology
	No	Continue risk assessment	
4. Determine overall risk assessment			
Consider absolute risk based information outlined in this document (3.4,3.5,3.6) [Risk = risk that source is infected x risk of that injury] Consider risks and costs of action (3.9)			
Is there any reason to suggest that this incident represents increased risk or that the risk of exposure outweigh risk of action? Are there any other reasons to intervene? **NOTE**: Due to the safety profile of Hepatitis B vaccine and the infectivity of hepatitis B, a low threshold for initiating hepatitis B immunisation is recommended.	No	Inform and reassure General wound management (3.8.1)	
	Yes	Consider appropriate and targeted action including testing and follow up (3.7); hepatitis B vaccination (3.8.2). HIV PEP is unlikely to be of benefit in this group General wound management (3.8.1)	

3. Supporting Notes

3.1 Significant and non significant injuries

Significant injuries include (DH 2008)

- percutaneous injury (from needles, instruments, bone fragments, significant bites which break the skin)
- exposure of broken skin (abrasions, cuts, eczema etc)
- exposure of mucous membranes including the eyes
- sexual exposure (not addressed further in this guidance- see BASHH guidance (Fisher et al 2006))

A non-significant injury would be:

- superficial graze not breaking the skin
- exposure to intact undamaged skin
- exposure to sterile or uncontaminated sharps

3.2 High and Low Risk Materials:

High-risk materials (i.e. that with a significant risk of transmission of infection to the recipient) are blood, amniotic fluid, CSF, human breast milk, pericardial fluid, peritoneal fluid, pleural fluid, synovial fluid, unfixed human tissues and organs, exudative or other tissue fluid from burns or skin lesions, vaginal secretions, semen, any other body fluid containing visible blood and saliva in association with dentistry.
Low risk materials (i.e. with no significant risk of transmission of infection to recipient) include urine, vomit, saliva, faeces unless blood is visibly present. (DH 2008)

3.3 Children considered to be an increased risk as sources

- Children born in high prevalence countries
- Children who are part of communities with links to high prevalence countries or known to be at higher risk
- Children of parents known to be infected/ carriers of Hepatitis B, C or HIV.
- Children with parents or grandparents born in high prevalence countries

See key resources (3.10) for sources of further information.

3.4 Summary of Risk assessment Risk assessment based on Process

3.4.1 Overall risk following injury from known infected source (Worst case scenario)

	Estimates of risk of infection following needlestick injury contaminated with blood from infected source	Estimates of risk following mucocutaneous exposures to blood from infected source
Hepatitis B	1 in 3	Evidence of risk but not quantified
Hepatitis C	1 in 30	No reports
HIV	1 in 200	1 in 1000

3.4.2 Overall risk following needlestick type injury with another UK born child of unknown status as the source

	Estimates of risk of infection following needlestick injury contaminated with blood from infected source+	Prevalence* (%)	Overall Risk (= prevalence x risk associated with injury)
Hepatitis B	1 in 3	0.024	1 in 12 500
Hepatitis C	1 in 30	0.032	1 in 94 000
HIV	1 in 200	0.014	1 in 2 143 000

+ This is based on the risk of a hollow bore needle, solid needles will have reduced risk

3.4.3 Overall risk following needlestick injury from Injecting drug user

	Estimates of risk of infection following needlestick injury contaminated with fresh blood from infected source +	Prevalence among injecting drug users in the England, Wales and NI * (%)	Overall Risk (= prevalence x risk associated with injury)
Hepatitis B	1 in 3	2.1	1 in 140
Hepatitis C	1 in 30	41	1 in 70
HIV	1 in 200	1.3	1 in 15 380

* The use of regional figures is recommended. These are available from http://www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb_C/1202115519183
This does not consider the effect of time since contamination. The risks from a found needle and syringe are likely to be lower, but this is difficult to quantify.

3.5 Factors altering risk

Hazard	
Instrument	Increased risk associated with large gauge, hollow bore needles
Contaminant	Contamination with urine, nasal secretions, saliva, sweat or tears if not visibly contaminated with blood are considered to represent a negligible risk of HIV, or hepatitis B or C transmission.
	Contamination with blood, semen, vaginal secretions, rectal secretions, breast milk or any body fluid that is visibly contaminated with blood represent a risk of HIV, hepatitis B and hepatitis C if the source if known to be infected.
	Larger volumes of blood are associated with greater risk
Source	Higher viral loads are associated with increased risk of infection
	The presence of e antigen is associated with increased risk of hepatitis B transmission
	For sources that are children of unknown status, the prevalence of blood borne viruses is generally low. Rates of hepatitis B are higher in children born in endemic countries or from communities with links to such countries
Time	Risk reduces as time since contamination increases. Hepatitis B is more resistant than hepatitis C or HIV.
Injury	Deep percutaneous injuries are associated with increased risk.
	Hepatitis B is more transmissible and transmission may occur with little or no injury
Receptor	Hepatitis B vaccination reduces risk of acquiring HBV from an infected source.

3.6 Risk assessment based on outcomes

From the international literature from 1985 to August 2008, twenty observational studies (of which two were based on overlapping cohorts) following up 3636 people who had sustained non occupational, community inoculation injuries were identified. A total of six resultant infections injuries were reported in these studies: 4 hepatitis C; 1 hepatitis B and 1 HIV. Discarded syringes resulted in three hepatitis C infections and the HBV infection. The HIV infection and the remaining hepatitis C infection resulted from intentional injuries.

Thirteen studies focused on children (of which 2 were based on overlapping cohorts), with a total of 965 subjects. Follow up data was available for 413 children at risk of HIV, with no resultant infections; for 273 children at risk of HCV, with no resultant infections; and 286 children at risk of hepatitis B with one resultant infection. Studies were highly heterogeneous. A total of 164 children took PEP (for needle stick injuries or sexual assault).

In summary, risks from community exposures are generally very low, but are difficult to quantify due to lack of published data. The highest relative risk is probably for hepatitis C.

3.7 Summary of post exposure testing for recipient

Time after exposure*	**Hepatitis B**	**Hepatitis C**		**HIV**
		RNA Testing	Ab testing	Ag/Ab testing
Baseline	Storage			
6 weeks		✓		✓
12 weeks	✓	✓	✓	✓
24 weeks	✓		✓	(✓)

* if HIV PEP was taken, the follow up tests should be 12 weeks after cessation of PEP.

3.8 Interventions

3.8.1 General Wound Management

For all incidents it is important to consider management of the local wound, and appropriate disposal of sharp and clearing any spillage. Risk assessment for tetanus should also be carried out (3.8.5)

3.8.2 Hepatitis B Guidance

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

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

For this table, the following definitions apply: (PHLS Hepatitis Subcommittee 1992)
A significant exposure is one from which HBV transmission may result. It may be:

(i) percutaneous exposure (needlestick or other contaminated sharp object injury, a bite which causes bleeding or other visible skin puncture)

(ii) mucocutaneous exposure to blood (contamination of non-intact skin, conjunctiva or mucous membrane)

(iii) sexual exposure (unprotected sexual intercourse).

Percutaneous exposure is of higher risk than mucocutaneous exposure, and exposure to blood is more serious than exposure to other body fluids. HBV does not cross intact skin. Exposure to vomit, faeces, and sterile or uncontaminated sharp objects poses no risk. Seroconversion after a spitting or urine spraying incident has not been reported. For more information:
http://www.dh.gov.uk/en/Publichealth/Healthprotection/Immunisation/Greenbook/index.htm

3.8.3 Hepatitis C

No prophylaxis available. Treatment of early infection is very effective, so if high risk check for possible early infection 4-6 weeks after exposure by HCV PCR testing

3.8.4 HIV

If HIV post exposure prophylaxis is indicated, initiate a 28 day course of antiretrovirals as soon as possible, ideally within an hour of exposure. PEP is now generally not recommended after 72 hours post-exposure.

The PEP regimen for starter packs for adults has been revised and simplified: Truvada (300mg tenofovir and 200mg emtricitabine (FTC)) once a day plus Kaletra (200mg lopinavir and 50mg ritonavir) twice a day is now recommended. More Information is available from EAGA Guidelines.

http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_088185

For children, consult a paediatrician experienced in treatment of children with HIV. More information on HIV PEP in children is available at http://www.chiva.org.uk/protocols/pep.html

3.8.5 Tetanus Guidance

IMMUNISATION STATUS	**CLEAN WOUND**	**TETANUS-PRONE WOUND****	
	Vaccine	Vaccine	Human tetanus immunoglobulin
Fully immunised, i.e. has received a total of five doses of vaccine at appropriate intervals	None required	None required	Only if high risk+
Primary immunisation complete, boosters incomplete but up to date	None required (unless next dose due soon and convenient to give now)	None required (unless next dose due soon and convenient to give now)	Only if high risk+
Primary immunisation incomplete or boosters not up to date	A reinforcing dose of vaccine and further doses as required to complete the recommended schedule (to ensure future immunity)	A reinforcing dose of vaccine and further doses as required to complete the recommended schedule (to ensure future immunity)	Yes: one dose of human tetanus immunoglobulin in a different site
Not immunised or immunisation status not known or uncertain	An immediate dose of vaccine followed, if records confirm the need, by completion of a full five-dose course to ensure future immunity	An immediate dose of vaccine followed, if records confirm the need, by completion of a full five-dose course to ensure future immunity	Yes: one dose of human tetanus immunoglobulin in a different site

* Tetanus-prone wounds include: wounds or burns that require surgical intervention that is delayed for more than six hours; wounds or burns that show a significant degree of devitalised tissue or a puncture-type injury, particularly where there has been contact with soil or manure; wounds containing foreign bodies; compound fractures; wounds or burns in patients who have systemic sepsis.
+ High risk is regarded as heavy contamination with material likely to contain tetanus spores and/or extensive devitalised tissue.
For more information: http://www.dh.gov.uk/en/Publichealth/Healthprotection/Immunisation/Greenbook/index.htm

3.9 Risks and benefits of interventions

The evidence for HIV PEP is derived from a case control study in which post exposure use of zidovudine was associated 81% reduction in the risk of HIV infection with additional evidence from animal studies, studies looking at post natal antiretrovirals to reduce vertical transmission and some observational studies of non occupational PEP (predominantly looking at sexual exposure). After non occupational exposure in the US, approximately 1 in 5 modified or stopped PEP, predominantly due to side effects. During 1997–2000, a total of 22 severe adverse events in people who had taken nevirapine containing regimens for occupational or nonoccupational postexposure prophylaxis were reported in the US. Current regimes are likely to be safer, but all antiretrovirals carry some risk of adverse reactions.

The evidence for Hepatitis B vaccination and immunoglobulin in the post exposure setting is based on an extrapolation of data from trials aimed at preventing mother to child transmission, in which vaccine alone results in a 70% risk reduction, and vaccine plus immunoglobulin a 90% risk reduction. Hepatitis B vaccines have been found to be safe when administered to infants, children, or adults. HBIG is well tolerated. Very rarely, anaphylactoid reactions occur in individuals with hypogammaglobulinaemia who have IgA antibodies, or those who have had an atypical reaction to blood transfusion.

There is no evidence for effective post exposure prophylaxis to prevent hepatitis C infection.

The risks of psychological harm or social harm from intervention or non intervention in such incidents are often raised. There is very limited research into this area. Anxiety and depression have been associated with needlestick injuries in health care workers and there is some evidence of post traumatic stress disorder in health care workers after needlestick injuries. In those studies involving children where follow up rates were available, overall only 56% attended the last follow up. This may suggest that children and parents do not always have prolonged high levels of concern. Alternative explanations may involve reassurance from earlier testing and challenges in accessing services.

3.10 Key Resources

Atenstaedt R (2006). All Wales Inoculation Injury guidelines for Primary Care. NPHS Wales. http://www2.nphs.wales.nhs.uk:8080/VaccinationsImmunisationProgsDocs.nsf/7c21215d6d0c613e80256f490030c05a/d47969ec4a9de0bf802573790053fcce/$FILE/Innoculation%20Injury%20Guidelines.pdf

Atenstaedt RL, Payne S, Roberts RJ, et al (2007). Needle-stick injuries in primary care in Wales. J Public Health (Oxf). 29(4):434-40.
CDC (2005) Antiretroviral postexposure prophylaxis after sexual, injection-drug use, or other nonoccupational exposure to HIV in the United States: recommendations from the U.S. Department of Health and Human Services. *MMWR* 54(No. RR-2)

Department of Health (2008) HIV post-exposure prophylaxis: Guidance from the UK Chief Medical Officers' Expert Advisory Group on AIDS. London, DH. http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_088185

Lavanchy D (2004). Hepatitis B virus epidemiology, disease burden, treatment, and current and emerging prevention and control measures. Journal of Viral Hepatitis 11:2:97-107. doi: 10.1046/j.1365-2893.2003.00487.x

PHLS Hepatitis Subcommittee (1992). Exposure to hepatitis B virus: guidance on post-exposure prophylaxis. *CDR Review* 2(9):R97
http://www.hpa.org.uk/cdr/archives/CDRreview/1992/cdrr0992.pdf

Ramsey ME (1999). Guidance on the investigation and management of occupational exposure to hepatitis C. *Communic Dis Pub Health*; 2(4).
Salisbury D, Ramsay M and Noakes K (eds) (2006) *Immunisation against Infectious Disease* (the Green Book). London, DH.
http://www.dh.gov.uk/en/Publichealth/Healthprotection/Immunisation/Greenbook/index.htm

Tudor-Williams G. Post-Exposure Prophylaxis (PEP) Guidelines for children exposed to blood-borne viruses. CHIVA. http://www.chiva.org.uk/protocols/pep.html

UNAIDS/WHO/ UNICEF (2008) Epidemiological fact sheets on HIV and AIDS. UNAIDS
http://www.unaids.org/en/KnowledgeCentre/HIVData/Epidemiology/epifactsheets.asp

WHO (2002) Global distribution of hepatitis A, B and C, 2001. *Weekly Epidemiological Record*, 6 www.who.int/docstore/wer/pdf/2002/wer7706.pdf