

REVIEW OF LITERATURE

TEAM UNDERTAKING REVIEW: Parts A and B – Health Protection Scotland. Part C – Welsh Healthcare Associated Infection Programme (WHAIP).				
CONTACT PERSON: Dawn Hill				
TOPIC: Management of blood and other body fluid spillages				
PRINCIPAL RESEARCH QUESTION/OBJECTIVE: To review the evidence base pertaining to the management of blood and other body fluid spillages.				
METHODOLOGY				
i) Search strategy for identification of studies				
<i>Period of publication</i>	Part A:1966-2004			
	Part B: 2004-2006			
	Part C: 2007-2009			
<i>Strategy key words for Part C</i>	Needlestick injury (Embase) Needlestick injuries (MESH) Sharp\$ injur\$ Occupational exposure (MESH) Accidents, occupational (MESH) Blood and borne and virus\$ Bloodborne and virus\$ Body fluids (MESH) Urine Vomit Feces (Embase) F\$eces Spill* Splash* Spillages (Embase) Detergent\$ Detergents (MESH) Disinfectant\$ Disinfectants (MESH) Disinfection (MESH) Disinfecting & sterilization (CINAHL) Sodium hypochlorate Decontamination (MWSH) Clean\$ Infection control Cross infection Universal precautions (CINAHL) Healthcare personnel (Embase)			
<i>Electronic databases for Part C</i>	MEDLINE	√	British Nursing Index	√
	HMIC	√	EMBASE	√
	CINAHL	√		
	Cochrane Library	√		

<i>Additional Resources for Part C</i>	Biomed Central, National Electronic Library-Infection, National Library for Health Guidelines finder, CDC/NIOSH, Department of Health, Department of Health & Social Services & Public Safety (DHSSPS-NI) Northern Ireland, Health Protection Agency (HPA), Health Protection Scotland (HPS), NPHS Library database & Groupware document database, Scottish Executive Health Dept. (SEHD), WHO, Hospital Infection Society, Infection Prevention Society, Society for Healthcare Epidemiology of America (SHEA), American Journal of Infection Control, Journal of Infection Prevention, BMJ, Infection Control and Hospital Epidemiology, 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>	Minimisation of potential exposure to blood and other body fluids through spillage.
<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 Roe's model for critical appraisal of scientific papers, 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)

Spillages of blood and other body fluids can occur in health and social care settings when health care activities are being undertaken. Occupational exposure to blood and body fluids, such as faeces, vomit, pus, and urine, through spillages poses a potential risk for transmission of infection to those providing care.

Exposure to viruses such as HIV, hepatitis B (HBV) and hepatitis C (HCV) can be the most consequential of transmissions (Lanphear, 1994) and, as such, they are the focus of much of the guidance relating to blood and body fluid spillages. Other infections, including herpes, MRSA and tuberculosis, could potentially be transmitted via exposure to blood or other body fluids although limited literature is available that considers transmission of these infections via spillages. (See literature review relating to occupational exposure management, including sharps, for full details and background).

The safe and effective management of blood and body fluid spillages is essential to minimise the potential risk of infection to health and social care staff.

It became apparent through this review that little primary research exists in relation to the management of blood and body fluid spillages. Instead, the majority of information available is in the form of guidance. As outlined in Hanrahan and Reutter's (1997) thorough review of occupational exposure related literature, the protocols for dealing with such spillages must be in place in order that these can be dealt with quickly and effectively regardless of the setting. This is reiterated in related guidance, for example, in the final standards produced for infection control in adult care homes (2005). Furthermore, responsibility for cleaning spillages must be clearly outlined and all those responsible must undergo appropriate training. These actions are consistent with the recommendations of the NHSScotland HAI Code of Practice (2004). Evidence to support the effectiveness of such actions appears to be limited. Instead these recommendations would appear to be based on general principles of best practice.

As highlighted in the NHS Scotland HAI Code of Practice (2004) and also in UK Health Departments' guidance for healthcare workers (1998), prior to attending to a blood or

body fluid spillage, the individual responsible should don appropriate personal protective equipment (PPE) (e.g. gloves, apron, protective footwear) as the risk of infection is considered high when dealing with a spillage. It is imperative that spillages are dealt with immediately, according to guidance, with the first step being to completely contain the spillage using either disposable cloths impregnated with a recommended disinfectant (e.g. sodium dichloroisocyanurate or sodium hypochlorite) or powder formulations, such as chlorine releasing powder formulations, which also achieve containment of spillage material and offer an effective alternative (Bloomfield et al., 1990). Either of these alternatives can be applied to hard surfaces or soft furnishings that have been exposed to blood and/or body fluid spillages, although soft furnishings may be damaged as a result. However, prior to using any disinfectant, an assessment should be made as to whether any organic matter is visible following a spillage. If so, disposable paper towels should be used to contain the spillage then a general purpose detergent and hot water should be used initially to clean any surface as organic matter can inactivate disinfectants such as sodium hypochlorite. Scientific evidence is limited in respect to these recommendations and needs to be considered.

Evidence was reviewed in relation to the effectiveness of certain disinfectants to inactivate blood borne viruses and findings suggest that sodium dichloroisocyanurate granules or disposable cloths treated with a sodium hypochlorite solution effectively inactivate any viruses present. However, no specific reference is made in the literature to the inactivation of bacteria found in blood or body fluid spillages.

As highlighted in the UK Health Departments' guidance (1998), chlorine-releasing agents, including sodium hypochlorite or sodium dichlorisocyanurate tablets or granules are recommended for general surface disinfection with a concentration of 10,000ppm available chlorine for dealing with blood/body fluid spillages. This approximately represents a 1:10 dilution of household bleach, although the strength of various brands may differ and may deteriorate on storage. Bloomfield et al. (1990) corroborate this recommendation with their findings that sodium hypochlorite or sodium dichlorisocyanurate in a concentration of 10,000ppm is sufficient to kill HIV, for example within 2 minutes, following a blood spillage. Furthermore, a recent study by Chitnis et al. (2004) suggests that satisfactory disinfection of blood and body fluid spillages requires containment with absorbent materials followed by disinfection with hypochlorite. Two to three minutes should then be allowed to elapse before disposing of any used cloths.

According to the UK Health Departments' guidance (1998), care must be taken not to use chlorine releasing agents directly on urine spillages as chlorine gas may be released if using hypochlorite. Similarly, alcohol is not recommended for disinfecting surfaces of equipment or work benches where spillages of blood or body fluids have occurred. It should only be used as a last resort if an alternative is not available. Research is required to further support this recommendation. Further detailed information is available in the literature review on control of the environment.

In the community within patients' homes, water and detergent alone should be used to clean any spillages, according to UK guidance (1998). However, soft furnishings may be damaged. Alternatively, soft furnishings can be wet vacuumed. Every effort must be made to air the room to allow drying.

In all settings, any cloths or equipment used should be disposable or those receptacles which are non-disposable (e.g. buckets) should be cleaned following the clean-up. General cleaning should then follow. A regular cleaning schedule should be in place for this. Given the lack of primary research to support these recommendations, actions would appear to be based on the principles of best practice.

A variety of related guidance documents which were reviewed suggest that after dealing with any spillage, gloves and any other used PPE should be disposed of appropriately and hands should be washed thoroughly. Furthermore, as part of the guidance the suggestion was made that it may be worthwhile considering the possibility of stocking spillage kits, which include disposable gloves, disposable towels, clinical waste bags, sachets of sodium hypochlorite powder, a container for water, a copy of the protocol, specifically made for these purposes.

Within the revised UK guidance for HIV Post Exposure Prophylaxis (PEP) published in February 2004, recommendations are made as to the precautions which should be taken by healthcare staff to protect themselves against injury and risk of infection in the first instance. The importance of the prevention of incidents should be underlined, however, accidents do occur and staff should be appropriately protected for dealing with these. Besides being fully vaccinated against HBV, staff can protect themselves by using PPE when attending to a spillage. In addition, new medical devices are now appearing on the UK market which aim to reduce the possibility of a blood or body fluid spillage, for example, intravenous infusion equipment (Jones & Buchanan, 1999). This case-control study reveals that such safety devices can be effective in reducing the potential for blood or body fluid spillages. Details of the action which should be taken by the healthcare worker in the event of an

	<p>exposure can be found in the literature review relating to occupational exposure management, including sharps injuries.</p> <p>Despite the relatively limited evidence available to support related guidance in this area, the rationale to manage blood and body fluid spillages effectively, thereby reducing the potential for exposure to infection and protecting staff is paramount to the health and safety of all.</p>
<p><i>Part B (2004-2006)</i></p>	<p>This literature review aims to identify, review and critique any scientific studies or guidance, which have been published in the intervening period since the previous literature review, to determine if changes to guidance are required.</p> <p>There were no additional scientific papers or guidance published during the period of the review which specifically covered management of blood and other body fluid spillages. Therefore there are no changes to present guidance recommended.</p>

<p><i>Part C (2007-2009)</i></p>	<p>This literature review aims to identify, review and critique any scientific studies or guidance, which have been published in the intervening period since the previous literature review, to determine if changes to guidance are required.</p> <p>Proposed guidance from the Advisory Committee on Dangerous pathogens (ACDP)/Health and Safety Executive (HSE) (2009) re-iterates the important generic factors in managing a spillage of blood or body fluids.</p> <ul style="list-style-type: none"> • All spills should be made safe as soon as possible after the spillage is discovered. • PPE must be worn. • Local codes of practice should specify procedures (e.g. spill kits) and the disinfectants to be used for dealing with spillage and other forms of contamination. <p>The following points apply regardless of the size of spill:</p> <ul style="list-style-type: none"> • gloves must be worn throughout and should be discarded safely after use • if there is broken glass present, it is essential that the fragments are not gathered up by hand either before or after treatment with disinfectant. Bunches of paper towels or newspaper, pieces of card or a plastic dustpan should be used to remove the fragments to a sharps container without risk of sharps injury. <p>Procedure for small spots of blood or small spills:</p> <ul style="list-style-type: none"> • gloves worn • lesions on exposed skin covered with waterproof dressings • contamination should be wiped up with a paper towel soaked in freshly prepared hypochlorite solution containing 10,000ppm available chlorine • towels should be placed in a clinical waste bag for incineration • hands washed <p>Procedure for larger spills other than urine (unless blood-stained):</p> <ul style="list-style-type: none"> • gloves worn • lesions on exposed skin covered with waterproof dressings • if extensive disposable plastic overshoes or rubber boots may need to be worn • liquid spills should be covered with dichloroisocyanurate granules and left for at least 2 mins before clearing up with paper towels and/or a plastic dustpan • alternatively the spill may be covered with paper towels and the contaminated area gently flooded with hypochlorite solution containing 10,000ppm available chlorine. Again this should be left for at least 2 mins before cleaning up • towels, gloves, disposable over shoes and contaminated clothing should be placed in a waste bag for incineration and hands washed; (rubber gloves may be decontaminated with dilute disinfectant) <p>Finally the area should be washed with water and detergent and detergent, and dried thoroughly.</p>
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- Urine may promote the release of free chlorine from the treated area when hypochlorite or other chlorine-containing compounds are applied. Ventilation will be necessary.

For carpet and upholstery spills:

- where blood or body fluid spills are likely, carpets and soft furnishings should be avoided
- washable chair covers should be considered
- furnishings which can be disinfected and cleaned should be considered
- if contamination does occur, for fixed fittings detergent cleaning followed by steam cleaning should be considered, if the textiles will tolerate this. For curtains or other loose fittings, laundering or dry cleaning followed by hot pressing is effective.
- If contamination is heavy, it may be necessary to incinerate soft furnishings if there are grounds for believing the contaminated material is infectious.

Like most guidelines these apply more in healthcare settings than community settings like a patient's own home.

Guidance from the NPHS on Infection Control for Care Homes (2007) on the management of blood spills covers similar ground. As regards soft furnishings and carpets it recommends washing the area thoroughly with warm water and detergent, and leaving it to dry. Where possible the area can be shampooed, or if appropriate, dry cleaned or steam cleaned.

Two useful references from previous periods not referred to in previous literature searches were found.

The first dates from 1996 and is Department of Health advice for HIV-infected people and their carers. Where they advise that in the event of a spillage of blood or body fluid:

- wear disposable gloves if possible
- use absorbent paper towels to cover the spill
- pour diluted bleach (1 in 10) onto the paper towels and leave it for at least 2 mins before wiping up.
- where it is not reasonable to use bleach (e.g. small spill on carpet or clothing), hot soapy water is a reasonable alternative.

A study published by *Baker et. al* (2004), used a reverse transcriptase polymerase chain reaction assay to study the effectiveness of detergent- and disinfectant-based cleaning regimes typical of those that might be used to decontaminate faecally contaminated surfaces and reduce spread of Norovirus (NV). In order consistently to achieve good hygiene, it was necessary to wipe the surface clean using a cloth soaked in detergent before applying the combined hypochlorite/detergent. They felt that this observation supports the recommendations made in the NV control guidelines (*Chadwick et. al., 2000*) which specify the removal of any solid matter directly into a clinical waste bag, followed by cleaning with detergent and hot water using a disposable cloth and then disinfection with hypochlorite.

<p><u>CONCLUSIONS</u></p> <p><i>Part A (1966-2004)</i></p>	<p>*Occupational exposure to blood and body fluids through spillages poses a potential risk of infection to healthcare workers.</p> <p>*The safe and effective management of such spillages is essential to minimise the potential risk of infection to those providing care.</p> <p>*Review of the literature reveals little primary research is in existence in relation to the management of blood and body fluid spillages. The majority of information available is available in the form of guidance.</p> <p>*The first step to the effective management of spillages is the development and dissemination of protocols for dealing with spillages, detailing responsibility for cleaning spillages, appropriate training and actions to be undertaken.</p> <p>*Guidance indicates that prior to attending to a blood or body fluid spillage, the individual responsible should don appropriate personal protective equipment (PPE) (e.g. gloves, apron, protective footwear).</p> <p>*A sign should be displayed to alert persons to the incident and to ensure the area is made safe for others while management of the spillage is undertaken.</p> <p>*Disinfectant should then be applied immediately to hard surfaces and soft furnishings that have been exposed to blood and/or body fluid spillages.</p>
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	<p>*Evidence would suggest that disinfectant, such as sodium dichloroisocyanurate or sodium hypochlorite, achieves general surface disinfection and inactivates any viruses present with a concentration of 10,000ppm available chlorine for dealing with blood/body fluid spillages.</p> <p>*Guidance suggests that chlorine releasing agents should not be used directly on urine spillages as chlorine gas may be released if using hypochlorite.</p> <p>*Prior to using any disinfectant, an assessment should be made as to whether any organic matter is visible. If so, a general purpose detergent and hot water should be used initially to clean any surface as organic matter can inactivate disinfectant.</p> <p>*In the community within patients' own homes, water and detergent alone can be used to clean any spillages; however, soft furnishings may be damaged. Alternatively, soft furnishings can be wet vacuumed. Every effort must be made to air the room to allow drying.</p> <p>*Any cloths or equipment used should be disposable or those receptacles which are non-disposable (e.g. buckets) should be cleaned. General cleaning should then follow this. A regular cleaning schedule should be in place for this.</p> <p>*After dealing with any spillage, gloves and any other used PPE should be disposed of appropriately and hands should be washed.</p> <p>*Spillage kits, specifically made for these purposes, are available and include towels, clinical waste bags, sachets of sodium hypochlorite powder, a container for water, a copy of the protocol.</p> <p>*The emphasis on the prevention of incidents is highlighted by the literature. It is recognised that accidents do occur and staff should be appropriately protected for dealing with these (e.g. HBV immunisation, use of PPE when attending to a spillage, new safety medical devices - solidifying granules (e.g. for suction jars).</p> <p>*Although relatively limited evidence is available to support guidance in this area, the rationale to manage blood and body fluid spillages effectively thereby reducing the potential for exposure to infection and protecting staff is paramount.</p>
<p>Part B (2004-2006)</p>	<p>There are no additional publications specifically on this subject produced within the period of this annual review of the model policies. Therefore there is no change to guidance recommended</p>

<p><i>Part C (2007-2009)</i></p>	<ul style="list-style-type: none">* There remains a paucity of scientific studies in this area of infection prevention and control. *Updated proposed HSE guidance re-emphasises the conclusions from Part A . *If spills occur on fixed (soft) fittings, detergent cleaning followed by steam cleaning should be considered, if the textiles will tolerate this. *For curtains or other loose fittings, laundering or dry cleaning followed by hot pressing is effective. *If contamination is heavy, it may be necessary to incinerate soft furnishings if there are grounds for believing that the contaminated material is infectious. *In order consistently to achieve good hygiene after a faeces spillage, it is necessary to wipe the surface clean using a cloth soaked in detergent before applying the hypochlorite followed by detergent cleaning.
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RECOMMENDATIONS

Part A (1966-2004)

*The safe and effective management of blood and body fluid spillages is essential to minimise the potential risk of infection to healthcare staff.

*Protocols for dealing with spillages must be in place. Responsibility for cleaning spillages must be clearly outlined and all those responsible must undergo appropriate training.

*Spillages must be dealt with immediately.

*Prior to attending to a blood or body fluid spillage, the individual responsible should don appropriate personal protective equipment (PPE) (e.g. gloves, apron, protective footwear).

*Prior to using any disinfectant, an assessment should be made as to whether any organic matter is visible. If so, a general purpose neutral detergent and hot water should be used initially to clean any surface as organic matter can inactivate disinfectant.

*Following this, a recommended disinfectant should be applied immediately to hard surfaces and soft furnishings that have been exposed to blood and/or body fluid spillages. The spillage should be completely covered with disinfectant, such as sodium dichloroisocyanurate or sodium hypochlorite, to ensure containment. Two to three minutes should be allowed to elapse before disposing of used cloths.

*According to UK guidance, sodium hypochlorite or sodium dichloroisocyanurate tablets or granules are recommended for general surface disinfection with a concentration of 10,000 ppm available chlorine for dealing with blood/body fluid spillages.

*The literature indicates that chlorine releasing agents are effective in inactivating blood borne viruses and those chlorine releasing powder formulations achieve containment of spillage material and offer an effective alternative.

*Chlorine releasing agents should not be used directly on urine spillages as chlorine gas may be released if using hypochlorite.

*Alcohol is not recommended for disinfecting surfaces of equipment or work benches when a blood or body fluid spillage has occurred. It should only be used as a last resort if an alternative is not available.

	<p>*In the community within patients' homes, water and detergent alone should be used to clean any spillages, however, soft furnishings can be damaged.</p> <p>*Alternatively, soft furnishings can be wet vacuumed. Every effort must be made, however, to air the room to allow drying.</p> <p>*After dealing with any spillage, gloves and any other used PPE should be disposed of appropriately and hands should be washed.</p> <p>*Any cloths or equipment used should be disposable or those receptacles which are non-disposable (e.g. buckets) should be cleaned following the clean-up. General cleaning should then follow. A regular cleaning schedule should be in place for this.</p> <p>*It may be worthwhile considering the possibility of stocking spillage kits, specifically made for these purposes.</p> <p>*Healthcare staff should protect themselves against injury and risk of infection by adhering to the above recommendations and by ensuring i) they are immunised against hepatitis B, ii) PPE is used when attending to a spillage.</p> <p>*New safety medical devices are now appearing on the UK market which aim to reduce the possibility of a blood or body fluid spillage (e.g. intravenous infusion equipment and needle-free injection ports). These should be used if available.</p>
Part B (2004-2006)	No change to present guidance recommendations in literature review available 19/09/05.
Part C (2007-2009)	No new recommendations arise as a result of this literature review.
PRACTICAL APPLICATION	As the management of blood or other body fluid spillages 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 management of blood or other body fluid spillages should already be in place.

KEY REFERENCES***Part A (1966-2004)***

Bloomfield SF, Smith-Burchnell CA, Dalgleish AG (1990), Evaluation of hypochlorite-releasing disinfectants against the human immunodeficiency virus (HIV), *Journal of Hospital Infection*, 15(3): 273-278.

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Scottish Executive Health Department (2004), *NHSScotland Code of Practice for the Local Management of Hygiene and Healthcare Associated Infection*, St. Andrew's House, Edinburgh.

UK Health Departments (1998), *Guidance for clinical health care workers: protection against infection with blood borne viruses*, Recommendations of the Expert Advisory Group on AIDS and the Advisory Group on hepatitis, DoH, London.

(See literature review relating to occupational exposure management, including sharps, for additional related references.)

Part B (2004-2006)

No new key references.

Part C (2007-2009)	<p>Health and Safety Executive (2009). Protection against blood-borne infections in the workplace: HIV and Hepatitis [Proposed guidance]. London: HSE.</p> <p>National Public Health Service for Wales (2007) Infection Control Guidelines for Care Homes. The prevention and control of healthcare associated infection in care homes.</p> <p><u>Older references not referred to previously:</u></p> <p>Barker, J., Vipond, I. B., and Bloomfield, S. F. (2004) Effects of cleaning and disinfection in reducing the spread of Norovirus contamination via environmental surfaces. <i>Journal of Hospital Infection</i>.58(1):42-49.</p> <p>Chadwick, P.R., Beards, G., Brown, D. et al. (2000) Management of hospital outbreaks of gastroenteritis due to small round structured viruses. <i>Journal of Hospital Infection</i>. 45: 1-10.</p> <p>Department of Health 1996. Keep safe. Practical everyday advice for HIV-infected people and their carers.</p>
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