

# Infection Prevention and Control during care of the deceased

Literature review

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## Key Information

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## Document information

Document information	Description
<b>Description:</b>	This literature review examines the available professional literature on infection prevention and control during the care of the deceased in health and care settings
<b>Purpose:</b>	To inform the National Infection Prevention and Control Manual in order to facilitate the prevention and control of healthcare associated infections in Scottish health and care settings.
<b>Target Audience:</b>	All staff involved in the prevention and control of infection in Scotland.
<b>Update/review schedule:</b>	Updated as new evidence emerges with changes made to recommendations as required.  Review will be formally updated every 3 years with next review in 2026.
<b>Cross reference:</b>	National Infection Prevention and Control Manual
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## Version history

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

Version	Date	Summary of changes
V3.1	April 2023	<p>Updated wording within discussion section and recommendations to provide additional clarity. Additional wording in bold.</p> <p>Page 12 – <b>“According to this guidance</b> embalming should not be carried out on persons known or suspected to have been infected with any Hazard Group 4 Organisms including viral haemorrhagic fever (VHF), <sup>22</sup> or TSE, <sup>21</sup> anthrax, rabies, and invasive streptococcal infection.”</p> <p>Page 15 – “Body bags should also be considered for other pathogens <b>deemed as</b> high consequence infectious diseases (HCIDs).”</p> <p>Page 15 – Sentence added: <b>“It is not clear why HSE have listed invasive streptococcal infection as this is not considered as a high risk pathogen or a HCID.”</b></p> <p>Page 16 – “Hygienic treatment should not be carried out if the deceased is known or suspected to be infected by invasive streptococcal infection, anthrax, rabies or <b>hazard group 4 pathogens including</b> VHF.”</p> <p>“Washing and/or dressing of the deceased should also be avoided when the deceased is known or suspected to be infected by other HCIDs <b>and this should be based on a local risk assessment.</b>”</p> <p>Page 17 – “The viewing of the body should also be avoided when the deceased is suspected or known to be infected with other HCIDs, <b>however a local risk assessment should be undertaken to inform any decision making.</b>”</p> <p>Page 18 – <b>“Variation in hazard group classification of HCIDs exists, with some classed as hazard group 3 or 4, this may</b></p>

Version	Date	Summary of changes
		<p><b>impact the risk assessment and decisions on additional activities in the deceased.”</b></p> <p>The following recommendations were added to provide clarity to existing recommendations:</p> <p>When should the washing and/or dressing of the deceased be avoided?</p> <p>What additional precautions should be applied in suspected or confirmed cases of infection or colonisation with hazard group 4 organisms (including viral haemorrhagic fevers (VHFs)) and other high consequence infectious diseases (HCIDs)?</p> <p><b>“For other HCIDs a local risk assessment should be undertaken to inform any decision making on washing and/or dressing of the deceased”</b></p> <p>When should viewing of the deceased by the bereaved be avoided?</p> <p>What additional precautions should be applied in suspected or confirmed cases of infection or colonisation with hazard group 4 organisms (including viral haemorrhagic fevers (VHFs)) and other high consequence infectious diseases (HCIDs)?</p> <p><b>“For other HCIDs a local risk assessment should be undertaken to inform any decision making on viewing of the deceased.”</b></p> <p>What additional precautions should be applied in suspected or confirmed cases of infection or colonisation with hazard group 4 organisms (including viral haemorrhagic fevers (VHFs)) and other high consequence infectious diseases (HCIDs)?</p> <p><b>“For other HCIDs a local risk assessment should be undertaken to inform any decision making on post-mortem examination.”</b></p> <p>Reference to invasive streptococcal infection has been removed from the recommendations to align with clinical practice.</p>

Version	Date	Summary of changes
V3.0	December 2022	Literature review undertaken following the defined two-person systematic methodology. Research from 2000 onwards included with no significant change to the evidence base or recommendations.
V2.0	September 2018	Literature review updated to align with new HSE guidance: HSG283. Managing infection risks when handling the deceased. Guidance for the mortuary, post-mortem room and funeral premises, and during exhumation. 2018
V1.0	October 2014	New literature review

## Approvals

Version	Date Approved	Name
V3.0	January 2023	National Policy, Guidance and Evidence Working Group

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# 1. Objectives

The aim is to review the extant scientific literature regarding infection prevention and control during care of the deceased in health and care settings to inform evidence-based recommendations for practice. The specific objectives of the review are to determine:

- Are there any legislative requirements regarding the application of infection prevention and control precautions when providing care to the deceased?
- What evidence is there that pathogenic transmission from recently deceased individuals can occur?
- What activities may increase the risk of transmission of infectious agents from deceased individuals?
- When and how should standard infection control precautions (SICPs) be applied by health and care staff when providing care to the deceased?
- When and how should transmission-based precautions (TBPs) be applied by health and care staff when providing care to the deceased?
- When and how should infection risk from a deceased individual be communicated to all those handling the deceased?
- What additional precautions should be taken during activities that may increase the risk of transmission of infectious agents from deceased individuals?
- When should body bags be used for the deceased?
- When should the washing and/or dressing of the deceased be avoided?
- When should viewing of the deceased by the bereaved be avoided?
- What additional precautions should be applied in suspected or confirmed cases of transmissible spongiform encephalopathies (TSEs)?
- What additional precautions should be applied in suspected or confirmed cases of infection or colonisation with hazard group 4 organisms (including viral haemorrhagic fevers (VHFs)) and other high consequence infectious diseases (HCID)?



## 2. Methodology

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

## 3. Discussion

### 3.1 Implications for practice

**Are there any legislative requirements regarding the application of infection prevention and control precautions when providing care to the deceased?**

Six pieces of legislation and one guidance document were identified in the literature.<sup>1, 2, 3, 4, 5, 6</sup> The legislation is considered mandatory for the application of infection prevention and control when handling and providing care to the deceased. As per SIGN methodology, the UK HSE 2018 guidance is rated as SIGN level four evidence.<sup>5</sup>

The [Health and Safety at Work etc Act 1974](#),<sup>1</sup> [Management of Health and Safety at Work Regulations 1999](#),<sup>2</sup> [Control of Substances Hazardous to Health \(COSHH\) Regulations 2002](#),<sup>3</sup> and [The Health and Safety \(Sharp Instruments in Healthcare\) Regulations 2013 \(the 'Sharps Regulations'\)](#)<sup>4</sup> all apply to the risks of infection that may arise from work activities related to handling the deceased.

The Health and Safety at Work etc Act 1974,<sup>1</sup> although not specific to healthcare, states that 'it shall be the duty of every employer to ensure, so far as is reasonably practicable, the health, safety and welfare at work of all his employees.' This includes 'so far as is reasonably practicable as regards any place of work under the employer's control, the maintenance of it in a condition that is safe and without risks to health and the provision and maintenance of means of access to and egress from it that are safe and without such risks'.

The Management of Health and Safety at Work Regulations 1999 provides a broad framework for managing health and safety in the workplace.<sup>2</sup> This extends to a responsibility for employers sharing work premises to co-ordinate and co-operate. Because different professions are involved during the pathway of the deceased, there must be an adequate and appropriate

exchange of information between the people involved at different stages. This information is required to complete a suitable and sufficient risk assessment, leading to the effective control of infection risks from the deceased.<sup>5</sup>

Control of Substances Hazardous to Health (COSHH) Regulations 2002 provides a framework of actions designed to control the risk from a range of hazardous substances, including infectious microorganisms (defined as 'biological agents').<sup>3</sup> COSHH requires employers to consider the hazards to human health associated with work activities, and how exposure to harmful substances (for example microorganisms) can be adequately controlled. COSHH requires employees and any other person working with biological agents in Hazard Groups 2, 3 and 4 to assess the risk of exposure to those biological agents and specifies four containment levels for activities which involve working with biological agents.<sup>5</sup>

All employers are required under COSHH to make sure that risks from sharps injuries are adequately assessed and that appropriate control measures are in place. The Health and Safety (Sharp Instruments in Healthcare) Regulations 2013 (the 'Sharps Regulations') build on the existing law and provide specific detail on requirements that must be taken by healthcare employers and their contractors.<sup>4, 5</sup> This is particularly important during post-mortem where sharps may be used to undertake assessment of the deceased.

Other legislation related to infection prevention and control in the care of the deceased includes the [Public Health Scotland Act 2008](#) which outlines specific legislation on the duty to report certain notifiable diseases and organisms and the 'protection of public from risk arising from bodies'.<sup>6</sup>

### **What evidence is there that pathogenic transmission from recently deceased individuals can occur?**

Seven epidemiological case studies<sup>8-10, 14, 17, 18, 19</sup> and two experimental studies<sup>15, 20</sup> were identified from the literature, providing evidence on the pathogenic transmission for recently deceased individuals. Each study was appraised using the SIGN methodology, with all nine critiqued as SIGN level three evidence.

The infectious organism most frequently reported as being transmitted from deceased individuals is *Mycobacterium tuberculosis*, the causative agent of tuberculosis (TB). Those identified as most at risk of contracting TB from the deceased include embalmers, funeral

directors, and those involved or present during post-mortem examination.<sup>7</sup> Infection is primarily caused by inhalation of infected aerosols, though a rarer 'prosector's wart' has also been identified.<sup>7</sup> There are several reports detailing cases of individuals who contracted TB from deceased individuals.<sup>8-10</sup> Historical evidence indicates a higher TB prevalence among embalmers and pathologists.<sup>11-13</sup>

The bacterium has previously been found to remain viable for prolonged periods of time in the deceased, with one study reporting the isolation of viable *M. tuberculosis* at post-mortem three months after the individual's death.<sup>14</sup> Similarly, an experimental study investigating *M. tuberculosis* survivability in lung biopsy samples found viable *M. tuberculosis* in 13 bodies ranging from 12 to 36 days after death before embalming.<sup>15</sup> Although the risk of infection of the isolated *M. tuberculosis* to those handling the deceased cannot be fully established, the collective evidence on pathogenic transmission from cadavers and the prolonged survival of *M. tuberculosis* in the deceased confirms the need for appropriate TBPs to be utilised when handling the deceased with suspected or confirmed TB.

Blood-borne viruses also present a potential risk to those working with the recently deceased. Only one historical case of a confirmed HIV infection originating from a deceased individual could be found in the literature.<sup>16</sup> This case involved a pathologist who sustained a scalpel wound while performing a post-mortem examination on a patient who had died of AIDS-related illness. The lack of reported cases and current literature on pathogenic transmission of blood borne viruses from the deceased suggests a possible low risk of transmission if correct precautions are adopted.

Other organisms are identified in the literature as having caused infection where a deceased individual was identified as the source include Lassa fever<sup>17, 18</sup> and Nipah virus.<sup>19</sup> Whilst these case studies lacked information on infection control precautions taken, they serve as examples of the potential for pathogenic spread from the deceased, including from pathogenic organisms not endemic in the UK.

No reported cases of pathogenic transmission of SARS-CoV-2 from the deceased were identified in the literature. In a recent study, viable virus was isolated from one lung tissue cell culture 12 hours after death; an additional 15 lung tissue samples reported negative cell cultures from 12 hours up to 78 days from post-mortem indicating no risk of pathogenic transmission.<sup>20</sup> These experimental results could be taken to mean that the risk of transmission is minimal when handling deceased persons with SARS-CoV-2.<sup>20</sup> However, this study had a low

sample size with cause of death varying in each case. Further research in this area is needed to fully understand the risk of pathogenic transmission of SARS-CoV-2 from the deceased.

No reported cases of transmission of transmissible spongiform encephalopathies (TSEs) such as Creutzfeldt-Jakob disease (CJD) from the deceased were identified in the literature. However, it must be noted that due to the long incubation time and difficulty confirming diagnosis, formulation of occupational links would be difficult, and may possibly result in under-reporting. There is evidence that the prions which cause these diseases can remain infectious in tissues for some time after death.<sup>21</sup> As such, TSEs should be considered as a potential risk from the deceased, especially in cases where the brain/nervous tissue is exposed.

**What activities may increase the risk of transmission of infectious agents from deceased individuals and what additional precautions should be taken during activities where the risk of transmission of infectious agents from deceased individuals is increased?**

Two epidemiological case studies<sup>9, 10</sup> and four pieces of guidance<sup>5, 21, 22, 29</sup> were identified in the literature providing evidence on activities that may increase the risk of transmission of infectious agents from the deceased, and the applicable precautions to apply when doing so. Following SIGN methodology, the case reports were graded as SIGN level three evidence and the four guidance documents as SIGN level four evidence.

Any invasive post-mortem examination may pose as an increased risk of infection.

**Embalming** - The embalming procedure can expose the embalmer to potentially infectious blood and bodily fluids. Embalming may also generate infectious aerosols as a result of the high pressure used to disperse the embalming fluid through the arteries. Two cases of transmitted infection from deceased individuals to embalmers have been identified.<sup>9, 10</sup> However, it is not clear whether the increased prevalence is due to increased risk inherent to the procedures or lesser application of infection control precautions. Embalming should only take place if the appropriate controls are in place to protect staff and visitors, these are outlined in the [UK Health and Safety Executive \(HSE\) guidance](#).<sup>5</sup> According to this guidance embalming should not be carried out on persons known or suspected to have been infected with any Hazard Group 4 Organisms including viral haemorrhagic fever (VHF),<sup>22</sup> or TSE,<sup>21</sup> anthrax, rabies, and invasive streptococcal infection.

**Choice of saw** - During post-mortem examination, it may be necessary to perform cutting or sawing procedures on bone or cartilage. All cutting operations, particularly sawing, can produce particles and splashing. The UK HSE advises that mechanical saws may produce aerosols and increase the risk of splashing, though appropriate bone dust collection by vacuum will minimise this risk.<sup>5</sup> Manual handsaws provide an alternative, though they increase the likelihood of accidental injury and so cut-resistant gloves are recommended for this procedure.<sup>5</sup> If an oscillating saw is used it should be properly fitted with an air extraction hood during use.<sup>5</sup>

### **When and how should standard infection control precautions (SICPs) be applied by health and care staff when providing care to the deceased?**

One guidance document provided by the UK HSE in 2018 was identified from the literature forming the recommendations on the correct application of SICPs and TBPs (transmission based precautions) when providing care to the deceased.<sup>5</sup> SICPs as described in the NIPCM should be applied during care after death as during life, by all staff, in all care settings, at all times, for all patients whether infection is known to be present or not. After death, individuals may still carry infectious organisms and even those individuals who are not known to be infected may have been asymptomatic carriers or their symptoms may have been masked by other disease. When handling the deceased, SICPs are considered the minimum protective measures to be used. These should be determined by an assessment of risk to the individual and should include the task, level of interaction and/or the anticipated level of exposure to blood and/or other body fluids.

### **When and how should transmission based precautions (TBPs) be applied by health and care staff when providing care to the deceased?**

When the deceased is known or suspected to be infected, additional precautions will be necessary, these are known as TBPs. As during life, TBPs as described in the NIPCM should be applied in addition to SICPs during care after death, when the deceased individual is suspected or known to be colonised or infected by an infectious agent/disease. Guidance from the UK HSE details the application of TBPs to key infections in the deceased according to the most likely route of transmission for the causative organism.<sup>5</sup> The UK HSE defines transmission routes according to the historical trichotomy of contact, droplet or airborne and provides these

for a select list of key organisms known to present an increased risk of infection in appendix 1 of the guidance.<sup>5</sup>

Additional precautions, such as extra protective clothing, which should be applied during tasks which increase the risk of transmission such as post-mortem examinations, are detailed in the [HSE guidance: Managing Infection Risks When Handling the Deceased.](#)<sup>5</sup>

### **When and how should infection risk from a deceased individual be communicated to all those handling the deceased?**

One piece of guidance from the UK HSE was identified from the literature to inform the recommendations on communication when handling the deceased.<sup>5</sup> Information on the infection status of the deceased should be sought and communicated at each stage of the pathway. A hazard notification sheet (provided by HSE)<sup>5</sup> or similar document should be used to provide information to aid those who will handle the deceased. This should include whether the patient presents an infection risk. Where the deceased has requested that information surrounding their health remains confidential but there is a known or suspected infection risk, sufficient information to reduce the risk of transmission should be provided; this should include the mode of transmission of the organism. A local assessment should be performed to assess the risk of infection and whether this risk can be managed adequately. Where the deceased are not properly identified or their infection status is unknown, they should be labelled and treated as an increased infection risk. This risk assessment may be adjusted if additional information becomes available.

### **When should body bags be used for the deceased?**

Three guidance documents<sup>5, 21, 22</sup> contributed towards the evidence on body bag use for the deceased. In accordance with SIGN methodology, the guidance documents were considered as SIGN level four evidence.

It is important to note that placing a body in a body bag is not without disadvantages. Deceased individuals placed in body bags cool more slowly, accelerating the decomposition process.<sup>23</sup> This can be an issue for those to whom the body may be given for disposal, for example funeral directors, and may preclude the possibility of viewing of the body by the bereaved.<sup>23</sup> Irish

guidance advises that all bodies should be placed in a body bag.<sup>24</sup> The UK HSE advises that a body bag should be used where there is 'a known high risk of infection or where the risk is not known and there is leakage of body fluids'.<sup>5</sup> Body bag requirements for specific organisms are provided in appendix 1 of the UK HSE guidance.<sup>5</sup> As per the guidance, body bags should be used in all cases where there is leakage of body fluids, regardless of known infectious status.<sup>5</sup> Additionally, in the case of advanced decomposition or trauma, multiple body bags may be necessary.<sup>5</sup>

Guidance from the UK Advisory Committee on Dangerous Pathogens (ACDP) provides details of necessary procedures for management of deceased individuals known or suspected to have been infected by pathogenic agents responsible for viral haemorrhagic fevers (VHFs) including Ebola, Lassa etc.<sup>22</sup> This includes advice to use double body bags for deceased individuals known or suspected to have had VHF and storing the deceased in a sealed coffin.<sup>22</sup> Body bags should also be considered for other pathogens deemed as high consequence infectious diseases (HCIDs). Current UK HSE guidance states that a body bag is required if there is a known or suspected infection of TB, Middle East respiratory syndrome (MERS), Severe Acute Respiratory Syndrome (SARS) (non-SARS-CoV-2), invasive streptococcal infection, anthrax, VHF and TSE.<sup>21</sup> In these cases, procedures and handling of the deceased should be minimised.<sup>5</sup> It is not clear why HSE have listed invasive streptococcal infection as this is not considered as a high risk pathogen or a HCID.

### **When should the washing and/or dressing of the deceased be avoided?**

Three guidance documents<sup>5, 21, 22</sup> and one epidemiological case report<sup>19</sup> were identified from the literature to inform the evidence on washing and/or dressing of the deceased. In accordance with SIGN methodology, the guidance documents were considered SIGN level four evidence and the case report level three.

The washing and dressing of a body (also known as 'hygienic preparation') may be performed by a number of people: healthcare workers (where it is described as 'last offices'), anatomical pathology technologists, funeral staff (where it is known as 'first offices') or family/religious officials. The process can be undertaken to improve the appearance and odour of the body for viewing by the bereaved or for ritual purposes in certain religious and cultural traditions.

Only one case of potential transmission of Nipah virus during hygienic preparation could be identified in the literature, however information on the precautions applied when undertaking this were ambiguous and transmission via other routes could not be ruled out.<sup>19</sup> UK HSE guidance states that those undertaking washing of the body should be informed of any infectious risks and advised of the appropriate precautions to take for example personal protective equipment (PPE).<sup>5</sup> Hygienic treatment should not be carried out if the deceased is known or suspected to be infected by invasive streptococcal infection, anthrax, rabies or hazard group 4 pathogens including VHFs.<sup>5</sup> Washing and/or dressing of the deceased should also be avoided when the deceased is known or suspected to be infected by other HCIDs and this should be based on a local risk assessment.<sup>22</sup>

The UK Department of Health guidance on TSEs states that if an autopsy has been performed, dressing of the body, and washing of the hair may be performed by relatives under the supervision of mortuary staff or a funeral director, using standard infection control precautions to minimise risk.<sup>21</sup>

### **When should viewing of the deceased by the bereaved be avoided?**

Three UK developed guidance documents were identified in the literature to inform the evidence on when viewing of the deceased should be avoided.<sup>5, 21, 22</sup> In accordance with SIGN methodology the guidance documents were considered SIGN level four evidence.

With the possible exceptions of neonatal fatalities, stillborn or terminated foetuses,<sup>25, 26</sup> the general consensus in the literature is that viewing of the recently deceased by the bereaved is psychologically beneficial to the grieving process,<sup>25, 27</sup> though very little systematic evidence is available. As such, viewing should not be restricted without good reason. UK HSE guidance includes recommendations for individuals viewing the recently deceased.<sup>5</sup> Microorganisms for which viewing should be restricted and precautions to minimise risk of transmission can be found in appendix 1 of the UK HSE guidance,<sup>5</sup> viewing is only restricted for Anthrax and VHFs.<sup>5</sup> The Department of Health<sup>21</sup> guidance on TSEs states that viewing should be allowed and that 'superficial contact, such as touching or kissing the face, need not be discouraged, even if a post-mortem examination has been conducted'.<sup>5</sup>

Where there has been physical contact with the deceased during viewing, staff should encourage thorough hand-washing afterwards.<sup>5</sup> UK HSE guidance advises that where there is a



significant risk of infection from touching or kissing the body, the bereaved should be informed of this and discouraged from doing so.<sup>5</sup> The body should not be viewed when the deceased is suspected or known to be infected with anthrax or VHF.<sup>5, 22</sup> The viewing of the body should also be avoided when the deceased is suspected or known to be infected with other HCIDs, however a local risk assessment should be undertaken to inform any decision making.

### **What additional precautions should be applied in suspected or confirmed cases of transmissible spongiform encephalopathies (TSEs)?**

Two UK developed guidance documents were identified to inform the recommendations on additional precautions relating to suspected or confirmed cases of TSE.<sup>5, 21</sup> Following SIGN methodology, all guidance documents were critiqued as SIGN level four evidence.

Since the identification of variant Creutzfeldt-Jakob disease (vCJD) in the mid-1990s, there has been concern over transmission. TSEs are rare, fatal diseases affecting the central nervous system and they are thought to be caused by infectious proteins (prions) which do not share the same characteristics as bacteria or viruses.<sup>21</sup> There are no reported cases of TSE transmission from a deceased individual, though evidence shows that the prions responsible for CJD may remain infectious after death and so there remains a risk.<sup>28</sup> The UK HSE recommends that post-mortem examination of individuals known or suspected of having TSE infection should be 'carried out in such a way as to minimise contamination of the working environment'.<sup>5</sup> For example, when opening the skull with use of a bone-saw, the head and neck should be enclosed in a large plastic bag with the saw introduced through a hole in the bag.<sup>5</sup> This hole may then be sealed with tape.<sup>5</sup> Furthermore, UK HSE and the Department of Health (DH) states that the post-mortem examination should be performed within an open body bag with absorbent wadding so that contaminated fluids can be captured.<sup>5, 21</sup> Any soiled wadding should be removed and replaced following post-mortem. Soiled wadding should be incinerated.<sup>5, 21</sup> Where possible, single-use instruments should be used and incinerated after use. If single-use instruments are not available, a set of dedicated instruments should be used for known, suspected or at-risk cases.<sup>5, 21</sup> Embalming should not be performed in cases suspected or confirmed to have TSE.<sup>5, 21</sup>

The ACDP TSE subgroup produced guidance in 2012 for working with CJD '[Minimise transmission risk of CJD and vCJD in healthcare settings](#)'.<sup>21</sup> This guidance provides

instructions for equipment decontamination for when CJD is not diagnosed until after a post-mortem examination has taken place.<sup>21</sup>

**What additional precautions should be applied in suspected or confirmed cases of infection or colonisation with hazard group 4 organisms (including viral haemorrhagic fevers (VHFs)) and other high consequence infectious diseases (HCIDs)?**

The ACDP classifies pathogenic organisms according to three factors: the likelihood that the organism will cause disease in humans; the likelihood that the organism will spread to the community; and the availability of prophylaxis or treatment.<sup>29</sup> Organisms are classified as group 4 according to the following criteria: causes severe human disease and is a serious hazard to employees; it is likely to spread to the community and there is usually no effective prophylaxis or treatment available.<sup>29</sup> Group four organisms of particular concern are the viral haemorrhagic fevers (VHFs) such as Ebola, Marburg and Crimean-Congo haemorrhagic fever (CCHF). Variation in hazard group classification of HCIDs exists, with some classed as hazard group 3 or 4, this may impact the risk assessment and decisions on additional activities with the deceased.

The UK HSE and ACDP advise that viewing by the bereaved, hygienic preparation, embalming and post-mortem examination should not be carried out on bodies known or suspected to be infected with a group 4 organism.<sup>5, 22</sup> If the body is suspected of being infected with a VHF, sampling should be undertaken to confirm or exclude the diagnosis. It is not necessary to transport the body to specialist facilities for sampling to obtain a diagnosis – transporting a potentially infectious patient presents an unnecessary additional risk. Appropriate specialists should be consulted to ascertain the amount of sampling which is necessary in the interest of public health.<sup>22</sup> As with a living patient suspected of VHF infection, IPC precautions apply, and appropriate PPE should be worn at all times as discussed in ACDP guidance.<sup>22</sup>

Guidance from the ACDP provides details of necessary procedures for management of deceased individuals known or suspected to have been infected by pathogenic agents responsible for VHFs (including Ebola, Lassa etc.).<sup>22</sup> This includes advice to double-bag deceased individuals who have been infected by VHFs who were not cared for in an isolator and storing the deceased in a sealed coffin.<sup>22</sup> Post-mortems should not be carried out in cases of known or suspected VHF.<sup>5, 22</sup>

## 3.2 Implications for research

The vast majority of evidence for this review is derived from guidance by the UK HSE. The HSE guidance itself relies on 'a review of scientific knowledge' as well as expert feedback from stakeholders and therefore is considered expert opinion. It would be advantageous to have a more robust evidence base; however, obtaining such evidence is unlikely as this is primarily from case reports on pathogenic transmission from the deceased, where it can be difficult to establish the true route of transmission. Underreporting may also occur. The lack of detail on the infection control precautions applied in these case reports minimises the ability to assess the effectiveness of them in practice and impacts the applicability of the findings to Scottish health and care settings.

Experimental studies available in the literature were varying in quality, and although in some cases viable virus or bacteria was identified from the deceased, this does not give a definitive indication on the real risk of transmission to the individual handling the body. The evidence base also lacks primary research on the risks associated with the various post-mortem procedures in the deceased, future research assessing the application of infection control precautions in these scenarios would be beneficial. However, the feasibility and ethical considerations of undertaking research in the deceased may have impacted the lack of published studies since 2000.

## 4. Recommendations

This review makes the following recommendations based on an assessment of the extant scientific literature on infection prevention and control during the care of the deceased.

### **Are there any legislative requirements regarding the application of infection prevention and control precautions when providing care to the deceased?**

The Health and Safety at Work etc Act (1974), Management of Health and Safety at Work Regulations (1999) and Control of Substances Hazardous to Health (2002) regulations legislate that employers must provide a place of work that is safe and without risk to health.

#### **(Mandatory)**

Employers and employees must ensure the appropriate risk assessments are undertaken and recorded to effectively control the risk of exposure from the deceased. This must be

communicated to all professionals involved in the pathway (for example healthcare worker to mortuary staff to funeral directors).

**(Mandatory)**

Employers and employees must correctly report of any notifiable diseases and organisms identified during caring for the deceased under the Public Health Scotland Act 2008.

**(Mandatory)**

**What activities may increase the risk of transmission of infectious agents from deceased individuals**

Activities that are thought to increase the risk of transmission of infectious agents from the deceased include:

- techniques which cause liquid dispersion or splashing
- processes that may generate airborne particles, for example use of mechanical oscillating saws
- use of instruments which may cause injury, for example sharps, manual saws etc
- embalming (exposure to sharps and potentially large volumes of blood and body fluids)

**(Category C)**

**When and how should standard infection control precautions (SICPs) be applied by health and care staff when providing care to the deceased?**

SICPs as described in the National Infection Prevention and Control Manual (NIPCM) should be applied during care after death, as during life, by all staff, in all care settings, at all times, for all patients whether infection is known to be present or not. These should be determined by an assessment of risk to the individual and should include the task, level of interaction and/or the anticipated level of exposure to blood and/or other body fluids.

**(Category C)**

## **When and how should transmission-based precautions (TBPs) be applied by health and care staff when providing care to the deceased?**

As during life, TBPs should be applied in addition to SICPs during care after death, when the deceased individual is suspected or known to be colonised or infected by an infectious agent/disease.

### **(Category C)**

If an infection risk becomes apparent during a post-mortem procedure, (for example discovery of tuberculosis lesions) appropriate TBPs should be applied immediately and occupational exposure risk assessed.

### **(Category C)**

## **When and how should infection risk from a deceased individual be communicated to all those handling the deceased?**

Information on the infection status of the deceased should be sought and communicated at each stage of handling and risk assessments performed. The hazard notification sheet provided by the Health and Safety Executive (or similar local document) should be used to provide information on infection risk to those who will handle the deceased. This should include the risk of infection, the route of transmission and relevant TBPs.

Where the deceased are not properly identified, and their infection status is unknown, precautionary principles should be applied to prevent occupational exposure and they should be labelled and treated as an increased infection risk.

Where the deceased has requested that information surrounding their health remains confidential but there is a known or suspected infection risk, sufficient information should be provided, such as route of transmission, however disclosure of the infectious agent is not always necessary.

### **(Category C)**

## **When should body bags be used for the deceased?**

A body bag should be used whenever there is leakage or high probability of leakage of body fluids regardless of infectious status, for example conditions such as hepatitis A and E or haemolytic uraemic syndrome may increase the likelihood of leakage of body fluids.

In the case of advanced decomposition or trauma, multiple body bags may be necessary.

### **(Category C)**

A body bag should be used for individuals known or suspected to have been infected with any of the following key infectious agents or illnesses: tuberculosis (TB), Middle East Respiratory Syndrome (MERS), Severe Acute Respiratory Syndrome (SARS) (non-SARS-CoV-2) anthrax, transmissible spongiform encephalopathies (TSEs) including Creutzfeldt-Jakob Disease (CJD), Hazard Group 4 organisms\* such as viral haemorrhagic fevers (VHFs) or other high consequence infectious disease (HCID). In cases of VHFs a double body bag should be used.

### **(Category C)**

\*See ACDP approved list of biological agents.

## **When should the washing and/or dressing of the deceased be avoided?**

Those undertaking washing and/or dressing of the deceased (also known as 'hygienic preparation') should be informed of any infectious risks and advised of the appropriate precautions to take for example personal protective equipment (PPE).

### **(Category C)**

Washing and/or dressing should not be carried out when the deceased is known or suspected to have been infected by any of the following key infectious agents: Hazard Group 4 organisms\*, anthrax, and rabies.

For other HCIDs a local risk assessment should be undertaken to inform any decision making on washing and/or dressing of the deceased.

### **(Category C)**

## **When should viewing of the deceased by the bereaved be avoided?**

Those viewing the body should be informed of any infection risk from touching or kissing the deceased and should be discouraged from doing so if the risks are considered significant. This does not mean that the organism of infection must be named, for example if this is against the wishes of the deceased. If there has been physical contact with the deceased, hand hygiene should be performed afterwards.

### **(Category C)**

Viewing of the deceased should be avoided when the deceased is known or suspected to have been infected by Hazard Group 4 organisms\*, specifically those causing VHFs (including Ebola, Lassa etc.) and anthrax.

For other HCIDs a local risk assessment should be undertaken to inform any decision making on viewing of the deceased.

### **(Category C)**

\* See ACDP approved list of biological agents.

## **What additional precautions should be applied in suspected or confirmed cases of transmissible spongiform encephalopathies (TSEs)?**

Post-mortem examination of deceased individuals known or suspected to have been infected by TSE-causing agents should be carried out in such a way as to minimise contamination of the working environment. If opening the skull with a (dedicated) bone-saw, the head and neck should be enclosed in a large plastic bag with the saw introduced through a hole in the bag. Post-mortem examination should be carried out with the body inside a body bag with absorbent wadding alongside the body but within the bag, to collect body fluids. Following post-mortem examination, any soiled wadding should be removed and, if necessary, replaced with clean wadding. Soiled wadding should be incinerated.

### **(Category C)**

Where possible, single-use instruments should be used and incinerated after use. Alternatively, a set of dedicated instruments should be used for known, suspected or at-risk cases.

**(Category C)**

Where CJD is not diagnosed until after a post-mortem examination has taken place, all equipment should be decontaminated following the ACDP TSE guidance.

**(Category C)**

Embalming should not be performed in cases suspected or confirmed to have TSE.

**(Category C)**

**What additional precautions should be applied in suspected or confirmed cases of infection or colonisation with hazard group 4 organisms (including viral haemorrhagic fevers (VHFs)) and other high consequence infectious diseases (HCIDs)?**

Viewing of the deceased by the bereaved should be avoided when the deceased is known or suspected to have been infected by hazard group 4 organisms\*.

For other HCIDs a local risk assessment should be undertaken to inform any decision making on viewing of the deceased.

**(Category C)**

Washing and/or dressing of the deceased should not be allowed when the deceased is known or suspected to have been infected by hazard group 4 organisms\*.

For other HCIDs a local risk assessment should be undertaken to inform any decision making on washing and/or dressing of the deceased.

**(Category C)**

In the case of VHFs including Ebola, Lassa etc, staff should place the deceased in a double body bag with absorbent material placed between each bag and the bag sealed and the outer surface disinfected with 1000 ppm av. chlorine or other appropriate disinfectant. The body bag



should be sealed, labelled as high-risk of infection and then placed in a robust coffin, which will need to have sealed joints.\*\* It should then be kept in a separate and identified cold store unit to await prompt cremation or burial.

**(Category C)**

Post-mortem examination should not be performed when the deceased is known or suspected of having been infected by hazard group 4 organisms\*.

For other HCIDs a local risk assessment should be undertaken to inform any decision making on post-mortem examination.

**(Category C)**

Appropriate PPE must be worn at all times as detailed in ACDP Guidance.

**(Category C)**

If it is suspected, but not confirmed, that a deceased individual has been infected by group 4 organisms\*, blood sampling should be undertaken to confirm or exclude this diagnosis. This sampling should be undertaken in the mortuary by a competent person.

**(Category C)**

\* See ACDP approved list of biological agents.

\*\* A sealed coffin is a coffin with all the joints sealed to prevent loss of fluids. A silicon sealant is often used. Hermetically sealed coffins are airtight and have a zinc lining. However, hermetically sealed coffins can only be used for burial as they cannot be cremated.

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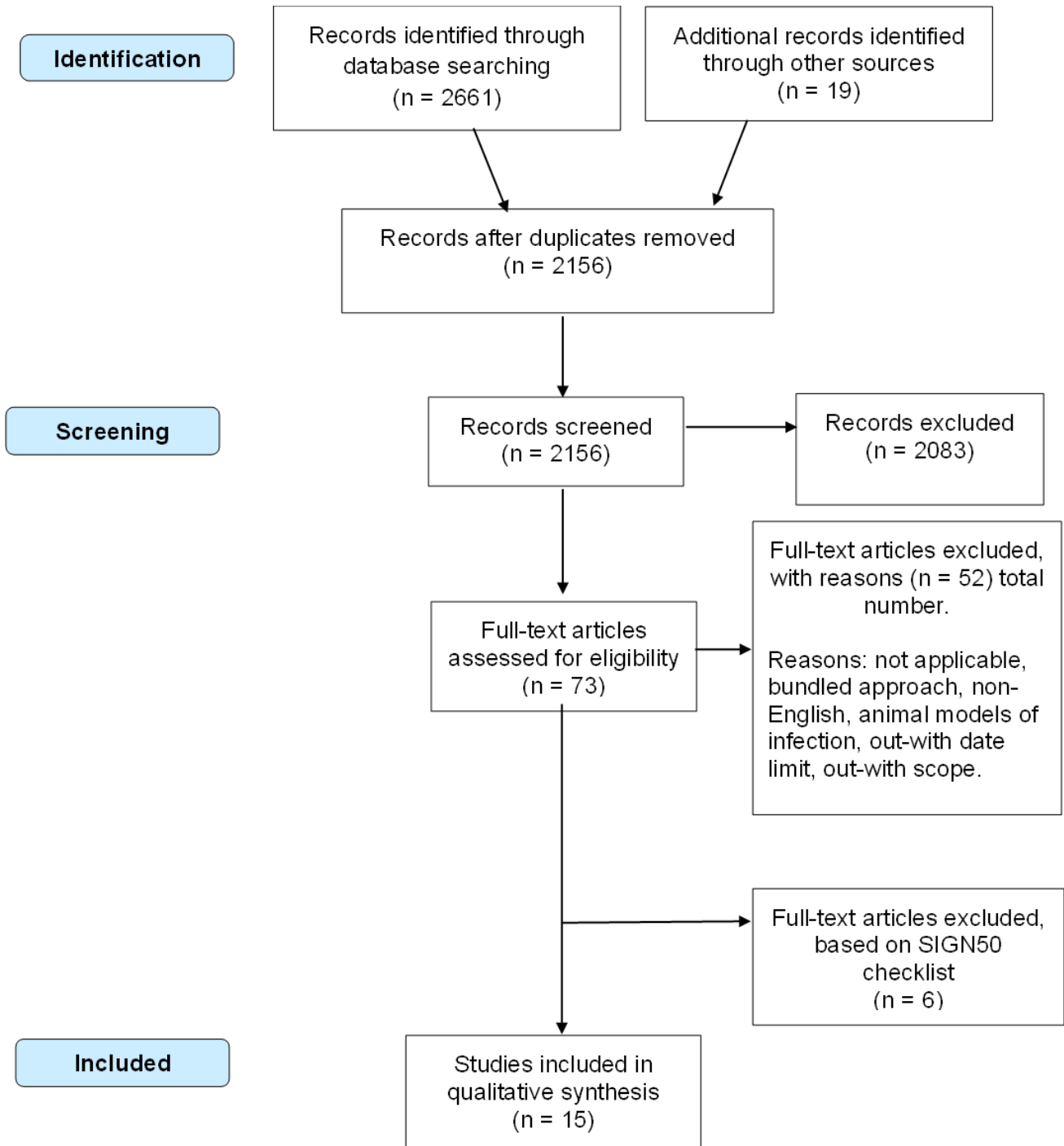
## Appendices

### Appendix 1: Grades of recommendation

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

## Appendix 2: Prisma Flow Diagram

PRISMA Flow Diagram of the evidence identified during the 1<sup>st</sup> of January 2000 and 26<sup>th</sup> of June 2022. For more details on the search strategy, see [National Infection Prevention and Control Manual: Development Process](#).



## Appendix 3: Search Strategy

Ovid MEDLINE(R) ALL <2000 to current>

- 1 exp Cadaver/
- 2 cadaver\*.ti,ab.
- 3 decedent\*.ti,ab.
- 4 deceased\*.ti,ab.
- 5 last offices.ti,ab.
- 6 hygienic preparation\*.ti,ab.
- 7 exp Funeral Rites/
- 8 funer\*.ti,ab.
- 9 (care adj3 (after death or post-death or following death)).ti,ab.
- 10 Mortuary Practice/
- 11 mortuar\*.ti,ab.
- 12 mortem\*.ti,ab.
- 13 embalm\*.ti,ab.
- 14 ((body or cadaver) adj1 bag\*).ti,ab.
- 15 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14
- 16 Infections/ or cross infection/
- 17 \*Infection Control/
- 18 (infect\* adj2 (prevention or control)).ti,ab.
- 19 IPC.ti,ab.
- 20 exp Disease Transmission, Infectious/
- 21 (disease\* adj2 transmi\*).ti,ab.
- 22 16 or 17 or 18 or 19 or 20 or 21
- 23 15 and 22
- 24 limit 23 to english language

Embase

1. exp Cadaver/
2. cadaver\*.ti,ab.
3. decedent\*.ti,ab.
4. deceased\*.ti,ab.
5. last offices.ti,ab.
6. hygienic preparation\*.ti,ab.

7. exp posthumous care/
8. funer\*.ti,ab.
9. (care adj3 (after death or post-death or following death)).ti,ab.
10. mortuar\*.ti,ab.
11. mortem\*.ti,ab.
12. embalm\*.ti,ab.
13. ((body or cadaver) adj1 bag\*).ti,ab.
14. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13
15. infection/ or cross infection/
16. \*Infection Control/
17. (infect\* adj2 (prevention or control)).ti,ab.
18. IPC.ti,ab.
19. exp Disease Transmission/
20. (disease\* adj2 transmi\*).ti,ab.
21. 15 or 16 or 17 or 18 or 19 or 20
22. (14 and 21) not conference\*.so,pt.
23. limit 22 to english language
24. limit 23 to yr="2000 -Current"

#### CINAHL

- S1 (MH "Cadaver+")
- S2 TI cadaver\* OR AB cadaver\*
- S3 TI decedent\* OR ABdecedent\*
- S4 TI deceased\* OR ABdeceased\*
- S5 TI last offices OR AB last offices
- S6 TI hygienic preparation\* OR AB hygienic preparation\*
- S7 (MH "Burial Practices")
- S8 TI funer\* OR AB funer\*
- S9 TI (care N3 (after death or post-death or following death)) OR AB (care N3 (after death or post-death or following death))
- S10 (MH "Postmortem Care")
- S11 TI mortuar\* OR AB mortuar\*
- S12 TI mortem\* OR AB mortem\*
- S13 TI embalm\* OR AB embalm\*
- S14 TI ((body or cadaver) N1 bag\*) OR AB ((body or cadaver) N1 bag\*)



S15 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12  
OR S13 OR S14

S16 (MH "Infection Control+")

S18 TI (infect\* N2 (prevention or control)) OR AB (infect\* N2 (prevention or control))

S19 TI IPC OR AB IPC

S20 (MH "Disease Transmission+")

S21 TI (disease\* N2 transmi\*) OR AB (disease\* N2 transmi\*)

S22 S16 OR S17 OR S18 OR S19 OR S20 OR S21

S23 S15 AND S22

S24 S15 AND S22

Narrow by Language: - English