NHS National Services Scotland

Safe disposal of waste literature review

Considered Judgement Form

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ARHAI Scotland

Antimicrobial Resistance and Healthcare Associated Infection

Version history

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V1.0	March 2025	New document

Approvals

Version	Date Approved	Group/Individual
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Summary of Recommendations (R) and Good Practice Points (GPP)

Research Question 1: Are there any legislative requirements for the handling and disposal of waste for infection prevention and control purposes?

R1.1	**Legislation which governs the safe management and disposal of waste must be adhered to for waste disposal in Scottish health and care settings as detailed in Appendix 4 of the literature review.**

Research Question 2: What are the categories of waste in health and care settings?

R2.1	**Waste categorisation in health and care settings is determined by legislation. This legislation has been detailed and interpreted in Scottish Health Technical Note 03-01 (SHTN 03-01), which must be followed by NHSScotland health and care services.**
GPP2.1	**Waste generated from healthcare activities should undergo clinical assessment for risk of infection prior to disposal.**

Research Question 3: How and when should waste be segregated in health and care settings?

R3.1	**Healthcare waste should be segregated at source across all health and care settings in Scotland.**
GPP3.1	**The colour-coded segregation system described in SHTN 03-01 should be used to classify waste in Scottish health and care settings.**
GPP3.2	**Waste which has been improperly segregated at time of disposal should not be re-handled. The affected bag or container should be disposed of according to the most hazardous waste classification within it.**

Research Question 4: Are there specific standards for different waste receptacles in health and care settings?

GPP4.1	**Colour-coded receptacles should be obtained from National Services Scotland (NSS) National Procurement. In NHSScotland, clinical teams should undertake local risk assessment in relation to waste classification and volume of waste produced to determine waste receptacle suitability for that specific care area.**

GPP4.2	**Sack holders for healthcare waste should have a hands-free and/or foot pedal operated lid.**
GPP4.3	**Healthcare waste receptacles (including plastic waste bags and sharps containers) procured for use in Scottish health and care settings should be compliant with the relevant industry standards (BS EN ISO 23907-1:2019 and BS EN ISO 23907-2:2019 for sharps containers).**
R4.1	**Packaging for clinical and special (hazardous) waste being transported out with the health or care setting must comply with UN standards for the transportation of dangerous goods as described in SHTN 03-01.**
R4.2	**Clearly marked and secure containers for sharps disposal must be available for use in health and care settings where sharps are used.**

Research Question 5: Where should waste receptacles be placed in health and care settings?

GPP5.1	**All waste receptacles for use at the point of care in health and care settings should be placed as close to the point of waste production as possible. Local risk assessment should be undertaken to determine placement of all waste receptacles for use at the point of care in health and care settings.**
R5.1	**Sharps containers must be located close to areas where sharps are used.**

Research Question 6: How should different waste bags/receptacles be filled and sealed in health and care settings?

GPP6.1	**Healthcare waste bags should not be overfilled and should be securely sealed when filled to three-quarters capacity. Replacement waste bags should be made available.**
GPP6.2	**Sharps containers should not be overfilled and should be securely sealed when filled to the fill line or two thirds capacity. Replacement sharps containers should be made available.**
GPP6.3	**Healthcare waste bags should be securely sealed using a preferred technique (for example a swan neck) and a plastic tie or tape closure.**
GPP6.4	**Sharps containers should be sealed according to manufacturer's instructions.**

R6.1	**Healthcare waste being sealed for onward transportation offsite must comply with packaging requirements contained within transportation legislation as described in SHTN 03-01.**

Research Question 7: How should special (hazardous) waste (including sharps, blood and body fluids) be handled in health and care settings?

GPP7.1	**Waste bags should not be compressed.**
GPP7.2	**Clinical and infectious waste receptacles should not be re-opened once they are sealed.**
GPP7.3	**After handling waste in health and care settings, hand hygiene should be performed.**
R7.1	**Liquid waste must not be disposed of in landfill. Body fluids may be disposed of via the foul sewer (toilet or macerator). Where risk assessment determines disposal via foul sewer (including macerator) unsafe or impractical, liquid waste or solidified liquid waste should be placed in a rigid leak-resistant receptacle for disposal. Liquid waste should not be disposed of down a hand hygiene sink.**
GPP7.4	**Compliant paper-based macerator products containing liquid waste should be placed in the macerator in their entirety minimising the risk of splash and spray. Where liquid waste is being disposed of via the foul sewer and where compatible macerator products are not available for use, it should be poured slowly at a low level to minimise the risk of contamination via splash and spray. Suitable PPE should be worn based on the level of perceived risk or anticipated exposure. If contamination of the environment occurs, this should be managed as soon as is reasonably practicable as per local decontamination policy and in line with the NIPCM literature reviews on Safe management of care equipment and Safe management of the care environment.**
R7.2	**Sharps should not be disposed of into waste bags. Safe systems of work beyond disposal to prevent sharps and inoculation injuries are described in the NIPCM literature review on Management of Occupational Exposure to Blood Borne Viruses.**
GPP7.5	**Sharps containers should not be re-opened once sealed.**
R7.3	**Staff who handle special (hazardous) waste in health and care settings should have immediate access to an appropriate selection of PPE. A risk assessment should be undertaken to determine which items of PPE are required.**

Research Question 8: How should non-hazardous waste be handled in health and care settings?

GPP8.1	**When handling non-hazardous waste such as offensive/hygiene waste, PPE should be worn based on risk assessment considering any anticipated exposure to blood and body fluids.**

Research Question 9: How should waste be labelled or tagged in health and care settings?

R9.1	**Healthcare waste must be appropriately labelled and marked as per legislation which is summarised in SHTN 03-01.**
GPP9.1	**Healthcare waste may be labelled using written labels, numbered tags, tape or pre-printed labels.**

Research Question 10: How should waste be transported in health and care settings?

GPP10.1	**When transporting waste receptacles around the health and care setting:** **Receptacles should be handled with care and held away from the body.** **Bags should only be handled by the neck and must not be dragged or thrown.**
GPP10.2	**Special (hazardous) waste should not be left unattended whilst being transported in a health and care setting.**
GPP10.3	**Damaged waste bags containing infectious clinical waste should be placed within a new, intact receptacle/bag.**
GPP10.4	**Trolleys, carts or any other containers used to transport waste in health and care settings should be easy to clean. Containers for transporting waste should be able to hold any liquid waste spills should they occur, for example enclosed with drainage and plug.**
GPP10.5	**Trolleys, carts or any other containers used for transporting waste must be kept clean and be included in cleaning schedules. Transport containers should be steam-cleaned or disinfected regularly as per SHTN 03-01 guidance.**
GPP10.6	**Different waste streams being transported from intermediate to bulk storage should remain segregated and not be collected in the same trolley, cart or container in health and care settings.**

GPP10.7	**Waste bags should be transported from intermediate to bulk storage in trolleys, carts or containers for that intended purpose, rather than carried by hand.**
GPP10.8	**When transporting healthcare waste in a secondary trolley, cart or container from intermediate to bulk storage, staff should ensure that these are loaded safely and not over filled.**
GPP10.9	**Waste collections from intermediate and bulk storage should be scheduled, accounting for quantity of waste produced, to prevent accumulation of waste in storage areas. Time between waste collections should be as short as reasonably practicable.**
GPP10.10	**Waste being transported from intermediate storage from multiple care areas within the same facility to bulk storage should not be transported through clinical areas where possible. Identified routes should be used specifically for the purpose of waste transportation.**
R10.1	**Staff transporting waste in health and care settings must be provided with appropriate PPE. The items of PPE required should be determined by risk assessment.**
R10.2	**Consignment notes should be provided with special (hazardous) waste being transported out-with the health or care setting, with requirements detailed in SHTN 03-01.**

Research Question 11: How should waste be stored prior to uplift for disposal in health and care settings?

R11.1	**Healthcare waste must be stored securely. Waste should not be allowed to accumulate in corridors, within care areas, or other publicly accessible areas.**
GPP11.1	**Waste storage room capacity should take into consideration the quantity and type of waste produced. Waste storage rooms should be large enough to accommodate segregation of waste streams and for staff to be able to enter and move around.**
GPP11.2	**Local arrangements should be in place to manage and store unpredicted increases in volume of waste such as that associated with outbreak or contingency events, or when scheduled waste collection is not able to be carried out. Special (hazardous) waste should not be stored outside.**
GPP11.3	**Intermediate and bulk storage should be secure and inaccessible to the public. Wheeled storage containers should be locked at all times except when being filled by staff.**

GPP11.4	**Requirements for bulk storage areas in health and care settings should be applied as described in SHTN 03-01.**
GPP11.5	**Specific storage requirements (i.e. refrigeration) for infectious clinical waste should be applied as described in SHTN 03-01.**

Research Question 12: How should waste spillages be managed?

GPP12.1	**Spillages of waste should be cleaned up as soon as reasonably practicable.**
GPP12.2	**SHTN 03-01 should be followed regarding requirements for workplace-specific procedures for handling waste spills.**
GPP12.3	**When a waste spill occurs, assessment of infection risk should be undertaken to ensure necessary IPC measures are implemented.**
GPP12.4	**Spilled waste and any absorbent materials used to soak up this waste should be disposed of as infectious clinical waste. Where the waste spill has been risk assessed as non-hazardous, for example uncontaminated food or drink spillage, then absorbent material may be disposed of via non-hazardous waste stream.**
GPP12.5	**Sharps waste spills should not be picked up by hand.**
GPP12.6	**Training should be provided to those handling waste spills, and prompts such as posters may be used detailing spill procedures.**
GPP12.7	**Kits to manage waste spills should be available in healthcare facilities and in all vehicles carrying healthcare waste. Spill kits may include items to contain the spill, equipment for cleaning up spilled waste and appropriate PPE. Local Board risk assessment should be undertaken to determine what specific items are required.**
GPP12.8	**In the event of a waste spillage, the responsible person (trained staff) should manage spillages of blood/body fluids specifically by following Infection Control Precautions as outlined in the NIPCM, refer to Appendix 9 for the flowchart.**
R12.1	**Occupational exposure events involving waste spills must be reported to the Health & Safety Executive under Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013.**

Research Question 1: Are there any legislative requirements for the handling and disposal of waste for infection prevention and control purposes?

A Quality of Evidence

1.1 How reliable is the body of evidence?

(see SIGN 50, section 5.3.1, 5.3.4)

Comment here on the quantity of evidence available on this topic and its methodological quality. Please include citations and evidence levels.

If there is no available evidence to answer the key question, go to section B.

Comments	Evidence level
There were nine pieces of evidence included to answer this research question, including four SIGN50 Level 4, expert opinion guidance documents,[1-4] one Scottish Government directorate letter (DL)[5] and four pieces of legislation[6-9] which are 'Mandatory'. Expert opinion guidance has potential bias given little detail is provided regarding how recommendations were formulated, it is not stated that systematic methods were used to identify supporting evidence and it is not always clear where expert opinion has taken precedence over scientific evidence. It is therefore considered low quality evidence. DL(2021)38 describes policy that is mandatory for all of NHSScotland. No primary evidence was included to answer this research question.	4 x SIGN50 Level 4 - expert opinion 5 x SIGN50 'Mandatory'

1.2 Is the evidence consistent in its conclusions?

(see SIGN 50, section 5.3.2)

Comment here on the degree of consistency demonstrated by the evidence. Where there are conflicting results, indicate how the judgement was formed as to the overall direction of the evidence.

Comments

The Scottish Health Technical Note 03-01 (SHTN 03-01) 'NHSScotland waste management guidance' describes the role of "UK-wide guidance" in identifying legislation and regulation.[2] SHTN 03-01 and HTM 07-01 guidance (both graded SIGN50 level 4) are generally consistent in terms of legislation and regulation identified as being applicable to managing and disposing of waste in Scottish health and care settings.[2, 3]
 	
As legislations are published independently of each other, consistency could not be assessed for the following legislation, guidance supporting compliance with legislation and mandatory policy:
 	
• SHTN 03-01 (SIGN50 level 4) states that waste and health and safety legislation governs special (hazardous) waste handling in Scottish health and care settings,[2] with the following legislations placing a Duty of Care on waste producers:
  ◦ Environmental Protection Act 1990[6]
  ◦ Waste (Scotland) Regulations 2012[8]
  ◦ Environmental Protection (Duty of Care) (Scotland) Regulations 2014[9]
• The Scottish Government produced a code of practice, graded SIGN50 level 4, which supports compliance with Duty of Care.[4]
• The mandatory Control of Substances Hazardous to Health Regulations 2002, and SIGN50 level 4 guidance for which is provided by HSE[1, 7]
• The mandatory DL defines a framework for NHSScotland services regarding sustainability in response to the climate emergency. Regarding waste management, targets for 2025 are described.[5]

1.3 Is the evidence applicable to Scottish health and care settings?

(see SIGN 50, section 5.3.3)

For example, do the studies include interventions, comparators or outcomes that are common to Scottish health and care settings?

Comments
The UK waste management guidance included for this research question is directly applicable to Scottish waste producing health and care settings.[2, 3] HTM 07-01 states where Scottish legislation diverges from English legislation.[3] Control of Substances Hazardous to Health (COSHH) legislation[7] and supporting guidance[1] included is directly applicable to UK employers. Remaining legislation and guidance supporting compliance is directly applicable to waste producers in Scotland[4, 8, 9] and the rest of the UK.[6] Furthermore, the DL included is directly applicable to NHSScotland services.[5]

1.4 Are the studies generalisable to the target population?

Comment here on sample size and methods of sample selection. Is the sample representative of the specific population/group of interest? Generalisability is only relevant to primary research studies.

Comments
No primary studies were included for this research question, so factors determining generalisability such as sample size and methods do not apply.

1.5 Are there concerns about publication bias?

(see SIGN 50, section 5.3.5)

Comment here on whether there is a risk in the evidence base that studies have been selectively published based on their results (and thus a risk that results from published studies are systematically different from unpublished evidence).

Comments
Publication bias is not a concern for evidence included for this research question.

B: Evidence to Decision

1.6 Recommendations

What Recommendations or Good Practice Points are appropriate based on this evidence?

Note the following terminology:

- **"must"** implies that the health and care setting must implement the recommended approach and is used where a recommendation has been directly lifted from legislation or mandatory guidance
- **"should"** implies that the health and care setting "should" implement the recommended approach unless a clear and compelling rationale for an alternative approach is present
- **"should consider"** implies that the health and care setting should consider implementing the recommended approach

Recommendation	Grading
R1.1 Legislation which governs the safe management and disposal of waste must be adhered to for waste disposal in Scottish health and care settings as detailed in Appendix 4 of the literature review.	Recommendation

1.7 Balancing benefits and harms

Comment here on the potential impact of the Recommendation or Good Practice Point on service users, visitors and staff. Benefits and harms include considerations beyond IPC.

Benefits

List the favourable changes in outcome that would likely occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about pros.

Benefits
R1.1 Adherence to current legislation and regulations facilitates compliance with associated corporate and social governance responsibilities, including the legal requirements of health and safety and waste management.

Risks and harms

List the adverse events or other unfavourable outcomes that may occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about cons.

Risks and harms
R1.1 No risks or harms identified.

Benefit-Harm assessment

Classify as “benefit outweighs harm” (or vice versa) or a “balance of benefit and harm.” Description of this balance can be from the individual service user/staff/visitor perspective, the societal perspective, or both. Recommendations and Good Practice Points are possible when clear benefit is not offset by important harms, costs or adverse events (or vice versa).

Benefit-Harm assessment
R1.1 Only benefits identified.

1.8 Feasibility

Is the Recommendation or Good Practice Point implementable in the Scottish context?

Describe (if applicable) financial implications, opportunity costs, material or human resource requirements, facility needs, sustainability issues, human factors etc., that may be associated with following a Recommendation or Good Practice Point. State clearly if information on feasibility is lacking.

Feasibility
R1.1 Compliance with mandatory legislation and policy may require human resource to plan and implement effectively.

Feasibility
R1.1 Financial investment and human resource may be required to implement and achieve policy aims around sustainability.

1.9 Expert Opinion

Summarise the expert opinion used in creating the Recommendation or Good Practice Point. If none were involved, state “none”. Translating evidence into action often involves expert opinion where evidence is insufficient. Clearly outlining that expert opinion helps users understand their influence on interpreting objective evidence. Expert opinion may also be required where there is no evidence available.

Expert opinion
R1.1 There is legislation that governs safe management and disposal of waste (see Appendix 4), therefore no expert opinion is required.

1.10 Value judgements

Summarise value judgements used in creating the Recommendation or Good Practice Point. If none were involved, state “none”. Translating evidence into action often involves value judgements, which include guiding principles, ethical considerations, or other beliefs and priorities. Clearly outlining value judgements helps users understand their influence on interpreting objective evidence.

Value judgements
R1.1 No value judgements to note.

1.11 Intentional vagueness

State reasons for any intentional vagueness in the Recommendation or Good Practice Point. If none was intended, state “none”. Recommendations and Good Practice Points should be clear and specific, but if there is a decision to be vague, acknowledging the reasoning clearly promotes transparency. Reasons for vagueness may include inadequate evidence; inability to achieve consensus regarding evidence quality, anticipated benefits/harms, or interpretation of evidence; legal considerations; economic reasons; ethical/religious reasons.

Intentional vagueness
R1.1 Legislative requirements have been signposted in Appendix 4 and not described in detail as these may change or be updated, and it is employer responsibility to identify and follow up-to-date legislation.

1.12 Exceptions

List situations or circumstances in which the Recommendation or Good Practice Point should not be applied.

Exceptions
R1.1 No exceptions to note.

1.13 Recommendations for research

List any aspects of the question that require further research.

Recommendations for research
No recommendations for research to note.

Research Question 2: What are the categories of waste in health and care settings?

A Quality of Evidence

2.1 How reliable is the body of evidence?

(see SIGN 50, section 5.3.1, 5.3.4)

Comment here on the quantity of evidence available on this topic and its methodological quality. Please include citations and evidence levels.

If there is no available evidence to answer the key question, go to section B.

Comments	Evidence level
28 documents were included to answer this research question. Three guidance documents were graded AGREE: 'Recommend with Modifications', these documents carried out systematic reviews to identify evidence but lacked some methodological detail.[10-12] 11 guidance documents were graded as SIGN50 Level 4, expert opinion.[2, 3, 13-21] Expert opinion guidance has potential bias given little detail is provided regarding how recommendations were formulated, and it is not always clear where expert opinion has taken precedence over scientific evidence. It is therefore considered low quality evidence. 14 legislative documents were included which are 'Mandatory'.[6, 8, 9, 22-32] No primary evidence was included to answer this research question.	3 x AGREE: 'Recommend with Modifications' 11 x SIGN50 Level 4 – expert opinion 14 x SIGN50 'Mandatory'

2.2 Is the evidence consistent in its conclusions?

(see SIGN 50, section 5.3.2)

Comment here on the degree of consistency demonstrated by the evidence. Where there are conflicting results, indicate how the judgement was formed as to the overall direction of the evidence.

Comments
Three documents (graded SIGN50 level 4) consistently define healthcare waste as all waste produced from healthcare activities.[2, 3, 21] “Main categories” of waste are described by the WHO (SIGN50 level4, AGREE ‘recommend with modifications’).[12, 21] UK guidance (graded SIGN50 level 4) does not describe “main categories” in the same way, but much of the terminology aligns with WHO guidance.[2, 3, 21] Sharps terminology is defined, consistent with the mandatory Health and Safety (Sharp Instruments in Healthcare) Regulations 2013.[32] Standards New Zealand (SIGN50 level 4) defines a waste stream as a selection of waste from single or multiple categories, which is managed according to the hazards of those categories.[20] SHTN 03-01 (SIGN50 level 4) lists waste streams consistent with this definition.[2] As such, SIGN50 level 4 guidance from the UK and elsewhere consistently recognises the difference between categories of waste and waste streams.[2, 3, 20] **Special (hazardous) waste** “Hazardous waste” is consistently defined in European and UK legislation as waste with hazardous characteristics.[2, 24, 29, 30] SIGN50 level 4 guidance supporting compliance with waste legislation states that this definition is not specific to healthcare waste.[15] The legislative definition of "special waste”[26, 28] is described in SHTN 03-01 (SIGN50 level 4) as the same as “hazardous waste”.[2] **Clinical waste** Clinical waste is defined in the Controlled Waste Regulations 1992 as waste consisting of hazardous materials such as blood and body fluids, pharmaceuticals, swabs or dressings and sharps which may be hazardous to those who encounter

Comments
them, if not rendered safe, and waste from healthcare activities that has the potential to cause infection.[31] This definition is consistent with UK guidance, including epic3 guidance graded AGREE 'recommend with modifications'.[2, 3, 10] SHTN 03-01 (SIGN50 level 4) adds that this definition includes waste that requires special handling and disposal, is a type of healthcare waste and includes infectious waste.[2] The use of this term varies across international guidance. **Infectious clinical waste** The term "infectious" is defined in European legislation,[24] with consistency in three SIGN50 level 4 expert opinion documents.[2, 20, 21] SHTN 03-01 added that waste can be clinical and infectious.[2] There was inconsistency in SIGN50 level 4 evidence regarding how infectivity of waste is determined: • waste with risk of infection is hazardous, but it is not clear how infectivity is determined[16] • waste infectivity should be determined by clinical risk assessment[2, 3] • The term "infectious waste" is used interchangeably with "biomedical waste" in Canadian Guidance.[19] Meanwhile, CDC guidance use the term "regulated medical waste" due to legislative requirements for handling and disposal.[18] **Non-hazardous waste** Two SIGN50 level 4 documents define non-hazardous waste, which differ slightly but do not contradict each other: • waste that does not have hazardous properties[21] • waste that does not conform to hazardous and controlled waste definitions[20] Whereas SHTN 03-01 provides examples of non-hazardous waste that comply with these definitions.[2] Offensive waste is an additional non-hazardous waste category recognised in SIGN50 level 4 expert opinion guidance in the UK as non-infectious waste with potential to cause offense to those who come into contact with it.[2, 3, 14] Offensive waste is also termed "human hygiene" or "sanpro" waste in SHTN 03-01 and is a

Comments
category within the European Waste Catalogue.[2] SHTN 03-01 specifies that risk assessment should determine infection risk before disposing of waste as offensive/hygiene waste, and states that appropriately segregated offensive waste is not considered clinical, hazardous or special.[2] **Legislative requirements for categories of waste** The consistency of mandatory legislation determining categories of waste in Scottish health and care settings and supporting SIGN50 level 4 guidance has not been assessed. SHTN 03-01 specifies the following legislative requirements in Scotland:[2] • The Waste (Scotland) Regulations 2012 implements the European Union (EU) Waste Framework Directive (2008/98/EC), assigning codes to different categories of hazardous waste, established by European Commission decision 2000/532/EC.[2, 8, 24, 27] • European Waste Catalogue codes are a requirement under the Duty of Care under the Environmental Protection Act 1990[6] and the Environmental Protection Act (Duty of Care) 2014,[9] The Landfill (Scotland) Regulations 2003[25] and Special Waste Amendment (Scotland) Regulations 2004.[26] • WM3 provides technical guidance on using European Waste Catalogue codes in the UK.[15] • SEPA provide guidance on using European Waste Catalogue codes for coding waste[13] • Categories of hazardous substances are also governed by the Carriage of Dangerous Goods Regulations 2009 implementing the 'Agreement concerning the International Carriage of Dangerous Goods by Road' (ADR)[2, 22, 23] SIGN50 level 4 guidance by the WHO states that waste categories internationally are determined by legislation.[11, 21]

2.3 Is the evidence applicable to Scottish health and care settings?

(see SIGN 50, section 5.3.3)

For example, do the studies include interventions, comparators or outcomes that are common to Scottish health and care settings?

Comments
Scottish guidance included is directly applicable to Scottish health and care settings.[2, 13, 14] UK guidance is applicable except where Scottish legislation diverges.[3, 10, 15-17] WHO guidance is applicable internationally to settings with differing levels of resource, which may limit direct applicability to high resource Scottish settings.[11, 12, 21] Applicability of guidance from the US,[18] Canada[19] and a standards document which aims to support compliance with New Zealand regulations and best practice[20] is not clear given the role of national legislation in determining categories used in health and care settings. Fourteen legislative documents were included, eight of which are applicable to Scotland including UK legislation,[6, 8, 9, 22, 25, 26, 28, 31, 32] one to England specifically,[30] and one to England, Wales and Northern Ireland.[29] The remaining three legislations included are for EU countries and member states,[24, 27] and "competent authorities" under the ADR.[23] While the Health and Safety (Sharp Instruments in Healthcare) Regulations 2013 is directly applicable to sharps disposal in health and care settings,[32] the remainder of the legislation included for this research question is not specific to health and care settings but is relevant in determining waste categories generated within these settings.

2.4 Are the studies generalisable to the target population?

Comment here on sample size and methods of sample selection. Is the sample representative of the specific population/group of interest? Generalisability is only relevant to primary research studies.

Comments
No primary studies were included for this research question, so factors determining generalisability such as sample size and methods do not apply.

2.5 Are there concerns about publication bias?

(see SIGN 50, section 5.3.5)

Comment here on whether there is a risk in the evidence base that studies have been selectively published based on their results (and thus a risk that results from published studies are systematically different from unpublished evidence).

Comments
Publication bias is not of concern for evidence included for this research question.

B: Evidence to Decision

2.6 Recommendations

What Recommendations or Good Practice Points are appropriate based on this evidence?

Note the following terminology:

- **"must"** implies that the health and care setting must implement the recommended approach and is used where a recommendation has been directly lifted from legislation or mandatory guidance
- **"should"** implies that the health and care setting "should" implement the recommended approach unless a clear and compelling rationale for an alternative approach is present
- **"should consider"** implies that the health and care setting should consider implementing the recommended approach

Recommendation	Grading
R2.1 Waste categorisation in health and care settings is determined by legislation. This legislation has been detailed and interpreted in Scottish Health Technical Note 03-01 (SHTN 03-01), which must be followed by NHSScotland health and care services.	Recommendation

Recommendation	Grading
GPP2.1 Waste generated from healthcare activities should undergo clinical assessment for risk of infection prior to disposal.	Good Practice Point

2.7 Balancing benefits and harms

Comment here on the potential impact of the Recommendation or Good Practice Point on service users, visitors and staff. Benefits and harms include considerations beyond IPC.

Benefits

List the favourable changes in outcome that would likely occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about pros.

Benefits
R2.1 Adherence with waste categorisation described in SHTN 03-01 supports compliance with relevant legislation and regulations and therefore associated corporate and social governance responsibilities, including legal requirements for health and safety and waste management. GPP2.1 Clinical risk assessment to determine infectivity of waste as per SHTN 03-01 will support correct segregation of special (hazardous) and non-hazardous waste items.

Risks and harms

List the adverse events or other unfavourable outcomes that may occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about cons.

Risks and harms
R2.1 No risks or harms identified. GPP2.1 Clinical risk assessment of infectivity of waste as per SHTN 03-01 is subjective, which could result in some waste items being incorrectly segregated.

Benefit-Harm assessment

Classify as “benefit outweighs harm” (or vice versa) or a “balance of benefit and harm.” Description of this balance can be from the individual service user/staff/visitor perspective, the societal perspective, or both. Recommendations or Good Practice Points are possible when clear benefit is not offset by important harms, costs or adverse events (or vice versa).

Benefit-Harm assessment
R2.1 Only benefits identified. GPP2.1 Benefits outweigh harms.

2.8 Feasibility

Is the Recommendation or Good Practice Point implementable in the Scottish context?

Describe (if applicable) financial implications, opportunity costs, material or human resource requirements, facility needs, sustainability issues, human factors etc., that may be associated with following a Recommendation or Good Practice Point. State clearly if information on feasibility is lacking.

Feasibility
R2.1 and GPP2.1 Human resource for education, training and audit may be required to support the implementation of safe waste management practice within health and care settings.

2.9 Expert Opinion

Summarise the expert opinion used in creating the Recommendation or Good Practice Point. If none were involved, state “none”. Translating evidence into action often involves expert opinion where evidence is insufficient. Clearly outlining that expert opinion helps users understand their influence on interpreting objective evidence. Expert opinion may also be required where there is no evidence available.

Expert opinion
R2.1 There is legislation that governs waste categories in health and care settings,[6, 8, 9, 22-27] therefore no expert opinion is required.

GPP2.1 Clinical risk assessment of waste items before disposal is established practice. Therefore, it is the expert opinion of ARHAI Scotland and its stakeholders that clinical risk assessment should be applied to determine infectivity of waste as advised in extant expert opinion guidance, including SHTN 03-01.[2, 3]

2.10 Value judgements

Summarise value judgements used in creating the Recommendation or Good Practice Point. If none were involved, state “none”. Translating evidence into action often involves value judgements, which include guiding principles, ethical considerations, or other beliefs and priorities. Clearly outlining value judgements helps users understand their influence on interpreting objective evidence.

Value judgements
R2.1 and GPP2.1 No value judgements to note.

2.11 Intentional vagueness

State reasons for any intentional vagueness in the Recommendation or Good Practice Point. If none was intended, state “none”. Recommendations and Good Practice Points should be clear and specific, but if there is a decision to be vague, acknowledging the reasoning clearly promotes transparency. Reasons for vagueness may include inadequate evidence; inability to achieve consensus regarding evidence quality, anticipated benefits/harms, or interpretation of evidence; legal considerations; economic reasons; ethical/religious reasons.

Intentional vagueness
R2.1 and GPP2.1 No intentional vagueness to note.

2.12 Exceptions

List situations or circumstances in which the Recommendation or Good Practice Point should not be applied.

Exceptions
R2.1 and GPP2.1 No exceptions to note.

2.13 Recommendations for research

List any aspects of the question that require further research.

Recommendations for research
No recommendations for research to note.

Research Question 3: How and when should waste be segregated in health and care settings?

A Quality of Evidence

3.1 How reliable is the body of evidence?

(see SIGN 50, section 5.3.1, 5.3.4)

Comment here on the quantity of evidence available on this topic and its methodological quality. Please include citations and evidence levels.

If there is no available evidence to answer the key question, go to section B.

Comments	Evidence level
There were 16 documents included to answer this research question. One guidance document was graded as AGREE: 'Recommend with Modifications' due to systematic methods used to inform recommendations but some methodological detail missing such as search strategies and inclusion/exclusion criteria.[12] 10 guidance documents were graded as SIGN50 Level 4, expert opinion.[2, 3, 20, 21, 33-38] Expert opinion guidance has potential bias given little detail is provided regarding how recommendations were formulated, and it is not always clear where expert opinion has taken precedence over scientific evidence. It is therefore considered low quality evidence. Four legislative documents and one DL were graded as 'Mandatory'.[5, 22, 25, 28, 39] No primary evidence was included to answer this research question.	1 x AGREE: 'Recommend with Modifications' 10 x SIGN50 Level 4 – expert opinion 5 x SIGN50 'Mandatory'

3.2 Is the evidence consistent in its conclusions?

(see SIGN 50, section 5.3.2)

Comment here on the degree of consistency demonstrated by the evidence. Where there are conflicting results, indicate how the judgement was formed as to the overall direction of the evidence.

Comments

Five included guidance are consistent regarding segregation of waste by hazard in health and care settings.[2, 3, 20, 21, 33] However, guidance documents differed regarding the following:

- Two SIGN50 level 4 guidance and a guideline graded AGREE 'recommend with modifications' advise segregation according to how waste will be managed[3, 12, 20]
- Two SIGN50 level 4 documents advise segregation by disposal route[2, 21]

The WHO (SIGN50 level 4) was the only organisation to recommend a "three-bin" segregation system as a minimum.[21]

Meanwhile, there was consistency in three SIGN50 level 4 guidance regarding further segregation of sharps versus non-sharps according to hazardous properties[2, 3, 20] Two SIGN60 level 4 guidance advise that improperly segregated waste should not be re-handled but treated according to the most hazardous waste type in the receptacle.[2, 21]

The consistency of mandatory legislation specified in SHTN 03-01 determining segregation of special (hazardous) waste in Scottish health and care settings has not been assessed:[2]

- The Special Waste Regulations 1996 (as amended) prohibits mixing of hazardous and non-hazardous wastes[28]
- Segregation of hazardous substances for transport is governed by The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009[22]
- The Landfill Regulations 2003, implementing EU Council Directive 1999/31/EC, prohibits landfill of infectious waste[25, 39]

Comments
SHTN 03-01 is signposted as it provides specific requirements for segregation for compliance with Scottish legislation.[2] DL(2021) 38 requires targets for NHSScotland bodies reducing healthcare waste including improving waste segregation.[5] Legislative requirements for elsewhere in the UK are described in HTM 07-01.[3] Six SIGN50 level 4 expert opinion guidance documents and a guideline graded AGREE 'recommend with modifications' are consistent in emphasising the importance of segregating waste at source in health and care settings.[2, 12, 20, 21, 35, 37, 38] In addition, there was consistency in expert opinion guidance on the following recommendations: • waste should be segregated throughout the waste management process[2, 20, 36] • signage, education and training should be provided to staff to support waste segregation[2, 3, 21] There is consistency in six SIGN50 level 4 expert opinion guidance recommending colour coded segregated waste streams in health and care settings.[2, 3, 21, 33-35] UK guidance specifies that colour coding is to support correct segregation:[2, 3] • SHTN 03-01 provides the mandatory colour-coded segregation system for Scottish waste producing NHSScotland services.[2] • HTM 07-01 details a similar colour-coded segregation system that is applicable in England and Wales.[3] Colour coding of waste streams in care homes and adult social care is recommended in two SIGN50 level 4 expert opinion guidance using elements of the NHS England system.[33, 36] The WHO (SIGN50 level 4) describe a colour-coded segregation system for use when national legislation is not available.[21]

3.3 Is the evidence applicable to Scottish health and care settings?

(see SIGN 50, section 5.3.3)

For example, do the studies include interventions, comparators or outcomes that are common to Scottish health and care settings?

Comments
Scottish guidance is directly applicable to Scottish health and care settings[2] and UK guidance included is applicable except where Scottish legislation diverges.[3, 33-36] WHO guidance is applicable internationally to settings with differing levels of resource, which may limit direct applicability to high resource Scottish settings.[12, 21] However, the applicability of guidance from Canada,[37] Australia,[38] and New Zealand standards[20] is not clear given the role of national legislation in determining the required waste segregation in health and care settings. The legislation included to answer this research question is not health and care setting specific but is directly applicable to how waste should be segregated in Scottish health and care settings.[22, 25, 28, 39] Furthermore, the DL included is directly applicable to NHSScotland services.[5]

3.4 Are the studies generalisable to the target population?

Comment here on sample size and methods of sample selection. Is the sample representative of the specific population/group of interest? Generalisability is only relevant to primary research studies.

Comments
No primary studies were included for this research question, so factors determining generalisability such as sample size and methods do not apply.

3.5 Are there concerns about publication bias?

(see SIGN 50, section 5.3.5)

Comment here on whether there is a risk in the evidence base that studies have been selectively published based on their results (and thus a risk that results from published studies are systematically different from unpublished evidence).

Comments
Publication bias is not of concern for evidence included for this research question.

B: Evidence to Decision

3.6 Recommendations

What Recommendations or Good Practice Points are appropriate based on this evidence?

Note the following terminology:

- **"must"** implies that the health and care setting must implement the recommended approach and is used where a recommendation has been directly lifted from legislation or mandatory guidance
- **"should"** implies that the health and care setting "should" implement the recommended approach unless a clear and compelling rationale for an alternative approach is present
- **"should consider"** implies that the health and care setting should consider implementing the recommended approach

Recommendation	Grading
R3.1 Healthcare waste should be segregated at source across all health and care settings in Scotland.	Recommendation
GPP3.1 The colour-coded segregation system described in SHTN 03-01 should be used to classify waste in Scottish health and care settings.	Good Practice Point
GPP3.2 Waste which has been improperly segregated at time of disposal should not be re-handled. The affected bag or container should be disposed of according to the most hazardous waste classification within it.	Good Practice Point

3.7 Balancing benefits and harms

Comment here on the potential impact of the Recommendation or Good Practice Point on service users, visitors and staff. Benefits and harms include considerations beyond IPC.

Benefits

List the favourable changes in outcome that would likely occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about pros.

Benefits
R3.1 Segregation of healthcare waste at source is established practice and minimises the risk of healthcare environment contamination and exposure to patients, service users, staff and visitors. GPP3.1 Colour-coded waste management in health and care settings supports correct handling, storage and disposal of waste, and therefore minimises the risk of infection. GPP3.1 Use of the colour-coding system complies with that agreed with the waste contractor for NHSScotland. GPP3.2 Disposing of the contents of a waste receptacle according to the most hazardous waste classification, ensures that items are disposed of safely and minimises the risk of infection as waste is not re-handled.

Risks and harms

List the adverse events or other unfavourable outcomes that may occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about cons.

Risks and harms
R3.1, GPP3.1 and GPP3.2 No risks or harms identified.

Benefit-Harm assessment

Classify as “benefit outweighs harm” (or vice versa) or a “balance of benefit and harm.” Description of this balance can be from the individual service user/staff/visitor perspective, the societal perspective, or both. Recommendations or Good Practice Points are possible when clear benefit is not offset by important harms, costs or adverse events (or vice versa).

Benefit-Harm assessment
R3.1, GPP3.1 and GPP3.2 Only benefits identified.

3.8 Feasibility

Is the Recommendation or Good Practice Point implementable in the Scottish context?

Describe (if applicable) financial implications, opportunity costs, material or human resource requirements, facility needs, sustainability issues, human factors etc., that may be associated with following a Recommendation or Good Practice Point. State clearly if information on feasibility is lacking.

Feasibility
R3.1, GPP3.1 and GPP3.2 Human resource for education, training and audit will be required to support the implementation of safe waste management practice within health and care settings. However, for most settings these practices are already established. GPP3.1 Appropriate signage should be provided to support waste segregation. Procurement of this signage will have financial implications. GPP3.2 Segregation and treatment of waste items as special (hazardous) waste which would otherwise be disposed of as non-hazardous waste or recycled will have financial and sustainability implications.

3.9 Expert Opinion

Summarise the expert opinion used in creating the Recommendation or Good Practice Point. If none were involved, state “none”. Translating evidence into action often involves expert opinion where evidence is insufficient. Clearly outlining that

expert opinion helps users understand their influence on interpreting objective evidence. Expert opinion may also be required where there is no evidence available.

Expert opinion
R3.1 ARHAI Scotland supports six expert opinion guidance documents, including SHTN 03-01,[2, 20, 21, 35, 37, 38] and one guidance document graded as AGREE: 'Recommend with Modifications'[12] advising segregation of healthcare waste at source. This Recommendation is graded as such due to consistency of the evidence base and benefit-harm assessment. GPP3.1 ARHAI Scotland supports the colour-coded segregation system as described in SHTN 03-01,[2] and supports application of appropriate training, education and signage to support this segregation as per expert opinion guidance, including SHTN 03-01.[2, 3, 21] GPP3.2 ARHAI Scotland supports expert opinion guidance, including SHTN 03-01, which recommends disposing of the contents of a waste receptacle according to the most hazardous waste type within that receptacle.[2, 21] This ensures that hazardous items are handled appropriately and minimises the risk of infection to staff, service users and visitors, thus supporting safe waste management. It is the expert opinion of ARHAI Scotland and its stakeholders that, in most circumstances, re-handling an improperly segregated item of waste from a receptacle would pose greater risk of harm and/or exposure to infectious agents than disposal of the entire waste stream according to the most hazardous item within the receptacle.

3.10 Value judgements

Summarise value judgements used in creating the Recommendation or Good Practice Point. If none were involved, state "none". Translating evidence into action often involves value judgements, which include guiding principles, ethical considerations, or other beliefs and priorities. Clearly outlining value judgements helps users understand their influence on interpreting objective evidence.

Value judgements
R3.1, GPP3.1 and GPP3.2 No value judgements to note.

3.11 Intentional vagueness

State reasons for any intentional vagueness in the Recommendation or Good Practice Point. If none was intended, state “none”. Recommendations and Good Practice Points should be clear and specific, but if there is a decision to be vague, acknowledging the reasoning clearly promotes transparency. Reasons for vagueness may include inadequate evidence; inability to achieve consensus regarding evidence quality, anticipated benefits/harms, or interpretation of evidence; legal considerations; economic reasons; ethical/ religious reasons.

Intentional vagueness
R3.1, GPP3.1 and GPP3.2 No intentional vagueness to note.

3.12 Exceptions

List situations or circumstances in which the Recommendation or Good Practice Point should not be applied.

Exceptions
R3.1 and GPP3.1 No exceptions to note. GPP3.2 There may be circumstances where re-handling is unavoidable, for example where sharps have been inappropriately disposed of into a clinical waste bag. In such circumstances, local risk assessment will apply to determine whether retrieval of the incorrectly segregated sharp is required.

3.13 Recommendations for research

List any aspects of the question that require further research.

Recommendations for research
No recommendations for research to note.

Research Question 4: Are there specific standards for different waste receptacles in health and care settings?

A Quality of Evidence

4.1 How reliable is the body of evidence?

(see SIGN 50, section 5.3.1, 5.3.4)

Comment here on the quantity of evidence available on this topic and its methodological quality. Please include citations and evidence levels.

If there is no available evidence to answer the key question, go to section B.

Comments	Evidence level
32 pieces of evidence were included to answer this research question.[2, 3, 7, 11, 19-21, 33, 36, 38, 40-54] One primary research study was graded as SIGN50 Level 3.[45] One guidance document was graded AGREE: 'Recommend' because of rigorous systematic reviews and detailed methodology used to identify evidence to support recommendations.[55] One guidance document was graded AGREE: 'Recommend with Modifications' which carried out systematic reviews to identify methods but lacked some methodological detail.[11] 23 documents were graded SIGN50 level 4, expert opinion,[2, 3, 18-21, 33, 34, 36, 38, 42-44, 46-54, 56] which has potential bias given little detail is provided regarding how recommendations were formulated, and it is not always clear where expert opinion has taken precedence over scientific evidence. It is therefore considered low quality evidence.	1 x AGREE: 'Recommend' 1 x AGREE: 'Recommend with Modifications' 1 x SIGN50 Level 3 23 x SIGN50 Level 4 – expert opinion 6 x SIGN50 'Mandatory'

Comments	Evidence level
Six legislative documents were graded as 'Mandatory'.[7, 23, 32, 40, 41, 57]	

4.2 Is the evidence consistent in its conclusions?

(see SIGN 50, section 5.3.2)

Comment here on the degree of consistency demonstrated by the evidence. Where there are conflicting results, indicate how the judgement was formed as to the overall direction of the evidence.

Comments
Waste bins or containers Five SIGN50 level 4 expert opinion guidance documents and a guideline graded AGREE 'recommend with modifications' are consistent in recommending that waste bins in health and care settings should have a hands-free and/or foot pedal lid mechanism.[11, 19, 21, 33, 52, 54] Only two of these were setting-specific: • isolation rooms for patients with epidemic- or pandemic-prone acute respiratory illness (AGREE 'recommend with modifications')[11] • facilities for surgical procedures in acute hospitals (SIGN50 level 4)[52] Primary evidence graded SIGN50 Level 3 supported this recommendation.[45] Three SIGN50 level 4 expert opinion documents consistently recommend colour-coded waste receptacles to support waste segregation.[3, 20, 21] However, there was a lack of consistency in two SIGN50 level 4 guidance documents regarding the following: • the body of the waste bin does not need to be colour-coded, so long as bag, lid and label are[3] • waste containers and bags for the same waste stream should not be different colours[21] There is a degree of consistency in SIGN50 level 4 expert opinion guidance regarding the following additional characteristics for waste receptacles: • size according to quantity of waste produced[3, 21, 54]

Comments

- easy to clean[20, 54]
- leak-proof[21] or leak resistant[20]
- Ebola and Marburg waste receptacles should be leak-proof and rigid[46, 47]

SHTN 03-01 (SIGN50 level 4) is signposted for specifications for non-infectious waste receptacles[2]

Waste bags

One SIGN50 level 4 guidance document by the WHO describes specific standards which plastic waste bags should comply with ISO 7765 2004[21] which has been published as two SIGN50 level 4 British Standards.[42, 44]

There is consistency in SIGN50 level 4 expert opinion evidence that waste bags should be made of plastic (n=5)[3, 20, 21, 33, 36] and be strong (n=3).[18, 20, 21]

There is consistency in three SIGN50 level 4 guidance documents specifying that waste bags for infectious and pathological waste should be leakproof[19, 21] or leak resistant.[18] Additional recommendations were made in expert opinion guidance for high consequence infectious disease (HCID) waste bags, with two SIGN50 level 4 guidance documents specifying large capacity and requiring labels,[47, 48] but lack of consistency regarding thickness[47] and mechanical resistance.[48]

Three UK SIGN50 level 4 guidance documents are consistent in stating that waste receptacles and packaging should comply with the ADR.[2, 3, 23] SHTN 03-01 (SIGN50 level 4) specifies that even small quantities of infectious clinical waste require UN-type approved packaging, and that receptacles should meet fire safety requirements,[2] with SHTM 83 fire-code guidance signposted (SIGN50 level 4).[51]

Sharps containers

It is consistently recommended in six SIGN50 level 4 guidance documents and one guideline graded AGREE ‘recommend’ that sharps containers should comply with BS EN ISO 23907-1 for single-use (meaning “to be filled only once”) and BS EN ISO 23907-2 for reusable sharps containers, both graded as SIGN50 level 4.[34, 38, 43, 49, 55, 56]

Comments
These British Standards ensure puncture- and leak-resistance of sharps containers,[43, 56] consistent with guidance from the UK and out-with.[18, 19, 21, 50, 53] There is consistency in a guideline graded AGREE: 'Recommend' and one SIGN50 level 4 expert opinion guidance on the following legislative requirements, which are graded as mandatory:[49, 55] • Health and Safety at Work Act 1974[57] • Management of Health and Safety at Work Regulations 1999[41] • Personal Protective Equipment Regulations (as amended)[40] • Control of Substances Hazardous to Health Regulations 2002[7] SIGN50 level 4 guidance by the RCN which was published in 2023[49] also signposts to the following mandatory legislation: • Health and Safety (Sharps Instruments in Healthcare) Regulations 2013[32] Consistency of legislative requirements has not been assessed.

4.3 Is the evidence applicable to Scottish health and care settings?

(see SIGN 50, section 5.3.3)

For example, do the studies include interventions, comparators or outcomes that are common to Scottish health and care settings?

Comments
UK expert opinion guidance[2, 3, 33, 34, 36, 49-52, 54, 55] and British Standards[42-44, 56] included are directly applicable to Scottish health and care settings. WHO guidance is applicable internationally to settings with differing levels of resource which may limit direct applicability to high resource Scottish settings.[11, 21] However, applicability of guidance from the US,[18, 46, 47, 53] Canada,[19] the EU/EAA,[48] and a standard from New Zealand[20] is not clear given the role of national legislation in waste management in health and care settings. Furthermore, the primary evidence study was set in a German hospital, so may have limited applicability to Scottish health and care settings depending on each

Comments
countries legislation, and therefore subsequent differences in waste management policy.[45] Health and Safety (Sharp Instruments in Healthcare) Regulations 2013 is directly applicable to Scottish health and care settings.[32] The remaining legislation is not specific to health and care settings but is applicable to waste producers and in settings where people work with hazardous substances.[7, 23, 40, 41, 57]

4.4 Are the studies generalisable to the target population?

Comment here on sample size and methods of sample selection. Is the sample representative of the specific population/group of interest? Generalisability is only relevant to primary research studies.

Comments
The primary study included may have limited generalisability due to sampling in surgical, internal medicine (diabetic) and ICU wards. However, selection of these three wards was intended to capture differences in waste types and volume.[45] Compliance to proper segregation was not reported,[45] so it is not clear if the air samples were also representative of non-infectious waste streams.

4.5 Are there concerns about publication bias?

(see SIGN 50, section 5.3.5)

Comment here on whether there is a risk in the evidence base that studies have been selectively published based on their results (and thus a risk that results from published studies are systematically different from unpublished evidence).

Comments
There may be a risk of publication bias, as primary research did not find significant differences in contamination with different lids or closing mechanisms may not have been published.

B: Evidence to Decision

4.6 Recommendations

What Recommendations or Good Practice Points are appropriate based on this evidence?

Note the following terminology:

- **"must"** implies that the health and care setting must implement the recommended approach and is used where a recommendation has been directly lifted from legislation or mandatory guidance
- **"should"** implies that the health and care setting "should" implement the recommended approach unless a clear and compelling rationale for an alternative approach is present
- **"should consider"** implies that the health and care setting should consider implementing the recommended approach

Recommendation	Grading
GPP4.1 Colour-coded receptacles should be obtained from National Services Scotland (NSS) National Procurement. In NHSScotland, clinical teams should undertake local risk assessment in relation to waste classification and volume of waste produced to determine waste receptacle suitability for that specific care area.	Good Practice Point
GPP4.2 Sack holders for healthcare waste should have a hands-free and/or foot pedal operated lid.	Good Practice Point
GPP4.3 Healthcare waste receptacles (including plastic waste bags and sharps containers) procured for use in Scottish health and care settings should be compliant with the relevant industry standards (BS EN ISO 23907-1:2019 and BS EN ISO 23907-2:2019 for sharps containers).	Good Practice Point

Recommendation	Grading
R4.1 Packaging for clinical and special (hazardous) waste being transported out with the health or care setting must comply with UN standards for the transportation of dangerous goods as described in SHTN 03-01.	Recommendation
R4.2 Clearly marked and secure containers for sharps disposal must be available for use in health and care settings where sharps are used.	Recommendation

4.7 Balancing benefits and harms

Comment here on the potential impact of the Recommendation or Good Practice Point on service users, visitors and staff. Benefits and harms include considerations beyond IPC.

Benefits

List the favourable changes in outcome that would likely occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about pros.

Benefits
GPP4.1 Colour-coded receptacles obtained from NSS National Procurement supports compliance with NHSScotland colour-coded segregation and ensures that colours are consistent with the NHSScotland colour-coded waste segregation system. GPP4.1 Allowing clinical teams to determine suitability of waste receptacles, bags and containers supports local risk assessment and contribute towards sustainability targets. GPP4.2 Sack holders with hands-free and/or foot pedal operated lids remove the need to touch the lid with potentially contaminated hands whilst disposing of waste and therefore may reduce the risk of contamination of the outer lid. GPP4.3 Adherence to industry standards supports standardisation when purchasing sack holders, plastic waste bags and sharps containers.

Benefits
GPP4.3 Adherence to industry standards supports the quality of sack holders, plastic waste bags and sharps containers. GPP4.3 Adherence to industry standards may support user confidence when disposing of and handling waste in health and care settings. GPP4.3 Adherence to industry standards may minimise the risk of possible adverse events when disposing of and handling waste in health and care settings. R4.1 Adherence with UN standards for the transportation of dangerous goods as per SHTN 03-01 supports compliance with associated corporate and social governance responsibilities, including legal requirements for health and safety and waste management. R4.2 Adherence to current legislation and regulations facilitates compliance with associated corporate and social governance responsibilities, including legal requirements for health and safety and waste management.

Risks and harms

List the adverse events or other unfavourable outcomes that may occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about cons.

Risks and harms
GPP4.1, GPP4.2, GPP4.3, R4.1 and R4.2 No risks or harms identified.

Benefit-Harm assessment

Classify as “benefit outweighs harm” (or vice versa) or a “balance of benefit and harm.” Description of this balance can be from the individual service user/staff/visitor perspective, the societal perspective, or both. Recommendations or Good Practice Points are possible when clear benefit is not offset by important harms, costs or adverse events (or vice versa).

Benefit-Harm assessment
GPP4.1, GPP4.2, GPP4.3, R4.1 and R4.2 Only benefits identified.

4.8 Feasibility

Is the Recommendation or Good Practice Point implementable in the Scottish context?

Describe (if applicable) financial implications, opportunity costs, material or human resource requirements, facility needs, sustainability issues, human factors etc., that may be associated with following a Recommendation or Good Practice Point. State clearly if information on feasibility is lacking.

Feasibility
GPP4.1 and GPP4.3 Human resource may be required to consider the suitability of receptables at Board level. GPP4.1, GPP4.2, GPP4.3, R4.1 and R4.2 There may be financial implications relating to the procurement of suitable, compliant receptables.

4.9 Expert Opinion

Summarise the expert opinion used in creating the Recommendation or Good Practice Point. If none were involved, state “none”. Translating evidence into action often involves expert opinion where evidence is insufficient. Clearly outlining that expert opinion helps users understand their influence on interpreting objective evidence. Expert opinion may also be required where there is no evidence available.

Expert opinion
GPP4.1 and GPP4.3 ARHAI Scotland agree with expert opinion guidance,[3, 20, 21, 34, 38, 49, 55] including SHTN 03-01,[2] that boards should comply with relevant standards and colour coding of waste receptacles. Defined processes will help support practice for correct segregation and the same management of waste which may help minimise the risk of infection related harm to patients, service users, staff and visitors. GPP4.2 Although expert opinion guidance consistently recommends using healthcare waste receptacles with hands-free and/or foot pedal operated lids,[11, 19, 21, 33, 52, 54] there was insufficient evidence regarding which waste receptacles required this mechanism. It is the expert opinion of ARHAI Scotland and its stakeholders that all sack holders be hands-free and/or have foot pedal operated lids, as sharps containers and medicinal disposal receptacles would not require this

Expert opinion
mechanism. Sack holders with hands-free and/or foot pedal operated lids may reduce the risk of outer lid surface contamination which in-turn may minimise the risk of infection transmission to patients, service users, staff and visitors.[45] R4.1 There is legislation for transportation of waste[23] which is interpreted in SHTN 03-01[2] therefore there is no additional expert opinion to note. R4.2 The Health and Safety (Sharp Instruments in Healthcare) Regulations 2013 require that written instructions and clearly marked and secure containers are provided in areas where sharps are used.[32] Therefore, there is sufficient evidence to support this recommendation, no expert opinion to note.

4.10 Value judgements

Summarise value judgements used in creating the Recommendation or Good Practice Point. If none were involved, state “none”. Translating evidence into action often involves value judgements, which include guiding principles, ethical considerations, or other beliefs and priorities. Clearly outlining value judgements helps users understand their influence on interpreting objective evidence.

Value judgements
GPP4.1, GPP4.2, GPP4.3, R4.1 and R4.2 No value judgements to note.

4.11 Intentional vagueness

State reasons for any intentional vagueness in the Recommendation or Good Practice Point. If none was intended, state “none”. Recommendations and Good Practice Points should be clear and specific, but if there is a decision to be vague, acknowledging the reasoning clearly promotes transparency. Reasons for vagueness may include inadequate evidence; inability to achieve consensus regarding evidence quality, anticipated benefits/harms, or interpretation of evidence; legal considerations; economic reasons; ethical/religious reasons.

Intentional vagueness
GPP4.1 Evaluation of receptacle suitability is intentionally vague to enable local risk assessment and decision making based on service needs in order to implement safe waste management practice.

Intentional vagueness
GPP4.3 Relevant standards for waste receptacles and plastic waste bags are intentionally vague as they are not signposted within NHSScotland and other expert opinion guidance. GPP4.2, R4.1 and R4.2 No intentional vagueness to note.

4.12 Exceptions

List situations or circumstances in which the Recommendation or Good Practice Point should not be applied.

Exceptions
GPP4.1 Private and local authority care organisations should contact companies directly to procure required waste receptacles. GPP4.2, GPP4.3, R4.1 and R4.2 No exceptions to note.

4.13 Recommendations for research

List any aspects of the question that require further research.

Recommendations for research
While one study was included which investigated air contamination with different waste container lids or openings,[45] further research into the efficacy of such characteristics of waste receptacles, waste bags and sharps containers in preventing cross-contamination in health and care settings may be beneficial. While British Standards exist for waste receptacles, except for sharps containers, extant guidance does not specify which are applicable to waste receptacles used in health and care settings.

Research Question 5: Where should waste receptacles be placed in health and care settings?

A Quality of Evidence

5.1 How reliable is the body of evidence?

(see SIGN 50, section 5.3.1, 5.3.4)

Comment here on the quantity of evidence available on this topic and its methodological quality. Please include citations and evidence levels.

If there is no available evidence to answer the key question, go to section B.

Comments	Evidence level
In total, 21 pieces of evidence were included to address waste receptacle placement in health and care settings. Two guidance documents were graded as AGREE: 'Recommend with Modifications' [11, 12] as systematic reviews were used to identify evidence supporting recommendations but some methodological detail was lacking. One guidance document was graded as AGREE: 'Recommend' because of rigorous systematic reviews and detailed methodology used to identify evidence to support recommendations.[55] 17 guidance documents are graded as SIGN50 Level 4, expert opinion[2, 18, 19, 21, 33, 34, 37, 38, 47-49, 51, 54, 58-61] due to potential bias and given little detail is provided regarding how recommendations were formulated, it is not always clear where expert opinion has taken precedence over scientific evidence. It is therefore considered low quality evidence. One piece of legislation was graded as 'Mandatory'.[58]	2x AGREE: 'Recommend with Modifications' 1x AGREE: 'Recommend' 17x SIGN50 Level 4 – expert opinion 1x SIGN50 'Mandatory'

Comments	Evidence level
No primary evidence was included to answer this research question.	

5.2 Is the evidence consistent in its conclusions?

(see SIGN 50, section 5.3.2)

Comment here on the degree of consistency demonstrated by the evidence. Where there are conflicting results, indicate how the judgement was formed as to the overall direction of the evidence.

Comments
Waste receptacle placement There was consistency in the guidance for the following points: • five SIGN50 level 4 guidance documents state that waste receptacles should be placed close to point of waste production[2, 19, 21, 54, 60] to reduce waste handling and transportation [21, 54] • three SIGN50 level 4 expert opinion guidance documents and one guideline graded AGREE 'recommend' state that waste containers are placed in isolation rooms for patients with a HCID[12, 37, 47, 48] and one guideline graded AGREE 'recommend with modifications' state that containers are placed in isolation rooms for patients with an acute respiratory infection[11] There was lack of consistency on the following in SIGN50 level 4 guidance: • waste bins should be placed within five metres of the point of waste production in primary care[61] • healthcare waste receptacles are not publicly accessible[60] • infectious waste containers should not be placed in publicly accessible areas, hazardous and non-hazardous waste containers should be placed close to each other, similar sized receptacles should be placed next to each other, special (hazardous) infectious waste receptacles are not publicly accessible and waste containers attached to mobile trolleys[21] Further, SIGN50 level 4 guidance by Health Facilities Scotland (HFS) states that in Scotland, placement of "loaded" receptacles should comply with fire regulations.[51]

Comments
Sharps container placement There was consistency in the evidence regarding the following: • seven SIGN50 level 4 guidance documents and one guideline graded AGREE 'recommend with modifications' state that sharps containers should be kept available at point of sharps waste production[11, 18, 19, 21, 33, 34, 38, 49] • two SIGN50 level 4 guidance documents and one guideline graded AGREE 'recommend' state that sharps containers should be placed in a safe place, inaccessible to the public and out of reach of children[34, 38, 55] • two SIGN50 level 4 guidance documents state that placement of sharps containers at eye level, within arm's reach[34, 49] There was lack of consistency on the following in SIGN50 level 4 guidance: • above knee height, below shoulder height, not placed on the floor, windowsill or above the shoulder[59] • placement on mobile trolleys[21] **Legislative requirements** Due to the nature of the evidence, consistency of mandatory legislation and corresponding SIGN50 level 4 guidance has not been assessed: • Health and Safety (Sharp Instruments in Healthcare) Regulations 2013, guidance for which is provided by HSE[32, 58]

5.3 Is the evidence applicable to Scottish health and care settings?

(see SIGN 50, section 5.3.3)

For example, do the studies include interventions, comparators or outcomes that are common to Scottish health and care settings?

Comments
10 guidance documents were published in the UK and so are applicable in Scotland.[2, 33, 34, 49, 51, 54, 55, 58-60] Five guidance documents were published by the WHO so are applicable internationally to settings with differing levels of resource,

Comments
which may limit direct applicability to high resource Scottish settings.[11, 12, 21, 61] Applicability of evidence from the US,[18, 47] Canada,[19, 37] Australia,[38] and the EU/EAA[48] is not clear given the role of national legislation in waste management. Most guidance was targeted towards health and care settings,[2, 11, 12, 18, 19, 21, 34, 37, 38, 47-49, 51, 54, 55, 58-61] except for guidance by the UK DHSC which was targeted towards adult social care.[33] Health and Safety (Sharp Instruments in Healthcare) Regulations 2013 and guidance supporting compliance are directly applicable to sharps disposal in health and care settings.[32, 58]

5.4 Are the studies generalisable to the target population?

Comment here on sample size and methods of sample selection. Is the sample representative of the specific population/group of interest? Generalisability is only relevant to primary research studies.

Comments
No primary studies were included for this research question, so factors determining generalisability such as sample size and methods do not apply.

5.5 Are there concerns about publication bias?

(see SIGN 50, section 5.3.5)

Comment here on whether there is a risk in the evidence base that studies have been selectively published based on their results (and thus a risk that results from published studies are systematically different from unpublished evidence).

Comments
Publication bias is not of concern for evidence included for this research question.

B: Evidence to Decision

5.6 Recommendations

What Recommendations or Good Practice Points are appropriate based on this evidence?

Note the following terminology:

- **"must"** implies that the health and care setting must implement the recommended approach and is used where a recommendation has been directly lifted from legislation or mandatory guidance
- **"should"** implies that the health and care setting "should" implement the recommended approach unless a clear and compelling rationale for an alternative approach is present
- **"should consider"** implies that the health and care setting should consider implementing the recommended approach

Recommendation	Grading
GPP5.1 All waste receptacles for use at the point of care in health and care settings should be placed as close to the point of waste production as possible. Local risk assessment should be undertaken to determine placement of all waste receptacles for use at the point of care in health and care settings.	Good Practice Point
R5.1 Sharps containers must be located close to areas where sharps are used.	Recommendation

5.7 Balancing benefits and harms

Comment here on the potential impact of the Recommendation or Good Practice Point on service users, visitors and staff. Benefits and harms include considerations beyond IPC.

Benefits

List the favourable changes in outcome that would likely occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about pros.

Benefits
GPP5.1 Placing waste receptacles close to the point of waste production promotes efficiency, correct waste segregation and safe practice, and reduces the amount of time that patients, service users, staff and visitors are exposed to potentially infectious waste. GPP5.1 Undertaking local risk assessment to determine the placement of healthcare waste receptacles allows for consideration of clinical activities and user requirements. R5.1 Adherence to current legislation and regulations facilitates compliance with associated corporate and social governance responsibilities, including legal requirements for health and safety and waste management. R5.1 Placement of sharps containers close to areas where sharps are used supports correct segregation and ensures that sharps waste is not transported unsafely through the care area which may reduce the risk of exposure and/or injury.

Risks and harms

List the adverse events or other unfavourable outcomes that may occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about cons.

Risks and harms
GPP5.1 and R5.1 No risks or harms identified.

Benefit-Harm assessment

Classify as “benefit outweighs harm” (or vice versa) or a “balance of benefit and harm.” Description of this balance can be from the individual service user/staff/visitor perspective, the societal perspective, or both. Recommendations or Good Practice

Points are possible when clear benefit is not offset by important harms, costs or adverse events (or vice versa).

Benefit-Harm assessment
GPP5.1 and R5.1 Only benefits identified.

5.8 Feasibility

Is the Recommendation or Good Practice Point implementable in the Scottish context?

Describe (if applicable) financial implications, opportunity costs, material or human resource requirements, facility needs, sustainability issues, human factors etc., that may be associated with following a Recommendation or Good Practice Point. State clearly if information on feasibility is lacking.

Feasibility
GPP5.1 Placement of receptacles close to the point of waste production will depend on the lay out and amount of space available within a specific setting. GPP5.1 and R5.1 Human resource for risk assessment and audit will be required to support the implementation of safe waste management practice within health and care settings. However, for most settings these practices are already established.

5.9 Expert Opinion

Summarise the expert opinion used in creating the Recommendation or Good Practice Point. If none were involved, state “none”. Translating evidence into action often involves expert opinion where evidence is insufficient. Clearly outlining that expert opinion helps users understand their influence on interpreting objective evidence. Expert opinion may also be required where there is no evidence available.

Expert opinion
GPP5.1 ARHAI Scotland and its stakeholders support expert opinion guidance stating that waste receptacles should be placed as close to the point of waste production as possible,[2, 19, 21, 54, 60] as a means of supporting safe waste segregation and staff efficiency. While expert opinion guidance suggests that healthcare and infectious waste receptacles are not accessible to the public,[21, 60]

Expert opinion
there is a larger body of evidence supporting placement close to point of waste production. Therefore, it is the expert opinion of ARHAI Scotland and its stakeholders that local risk assessment should be undertaken to determine the placement of healthcare waste receptacles, taking into consideration the importance of waste segregation, service and user need and risk, whilst ensuring they are close to the point of waste production. Waste storage containers within the waste hold however, should always be secure and inaccessible to the public. R5.1 It is a legislative requirement that sharps disposal containers are "located close to areas where sharps are used at work" under the Health and Safety (Sharp Instruments) in Healthcare Regulations (2013).[32] Therefore, there is sufficient evidence to support this recommendation, no expert opinion to note.

5.10 Value judgements

Summarise value judgements used in creating the Recommendation or Good Practice Point. If none were involved, state "none". Translating evidence into action often involves value judgements, which include guiding principles, ethical considerations, or other beliefs and priorities. Clearly outlining value judgements helps users understand their influence on interpreting objective evidence.

Value judgements
GPP5.1 and R5.1 No value judgements to note.

5.11 Intentional vagueness

State reasons for any intentional vagueness in the Recommendation or Good Practice Point. If none was intended, state "none". Recommendations and Good Practice Points should be clear and specific, but if there is a decision to be vague, acknowledging the reasoning clearly promotes transparency. Reasons for vagueness may include inadequate evidence; inability to achieve consensus regarding evidence quality, anticipated benefits/harms, or interpretation of evidence; legal considerations; economic reasons; ethical/religious reasons.

Intentional vagueness
GPP5.1 and R5.1 No intentional vagueness to note.

5.12 Exceptions

List situations or circumstances in which the Recommendation or Good Practice Point should not be applied.

Exceptions
GPP5.1 and R5.1 No exceptions to note.

5.13 Recommendations for research

List any aspects of the question that require further research.

Recommendations for research
Recommendations made in extant guidance on receptacle placement do not seem to be based on primary evidence. Therefore, research into optimal placement of waste receptacles for correct segregation and minimising cross contamination may be beneficial.

Research Question 6: How should different waste receptacles be filled and sealed in health and care settings?

A Quality of Evidence

6.1 How reliable is the body of evidence?

(see SIGN 50, section 5.3.1, 5.3.4)

Comment here on the quantity of evidence available on this topic and its methodological quality. Please include citations and evidence levels.

If there is no available evidence to answer the key question, go to section B.

Comments	Evidence level
Sixteen documents were included to answer this research question. Fifteen guidance documents were graded as SIGN50 Level 4, expert opinion. [2, 3, 20, 21, 33-38, 47, 49, 53, 62, 63] Expert opinion guidance has potential bias given little detail is provided regarding how recommendations were formulated, and it is not always clear where expert opinion has taken precedence over scientific evidence. It is therefore considered low quality evidence. One legislative document is graded as 'Mandatory'.[23] No primary evidence was included to answer this research question.	15 x SIGN50 Level 4 – expert opinion 1 x SIGN50 'Mandatory'

6.2 Is the evidence consistent in its conclusions?

(see SIGN 50, section 5.3.2)

Comment here on the degree of consistency demonstrated by the evidence. Where there are conflicting results, indicate how the judgement was formed as to the overall direction of the evidence.

Comments

Filling bags/receptacles

Eight SIGN50 level 4 guidance documents addressed waste bag capacity before being sealed, specifying maximum volume:

- two-thirds[3, 20, 37, 47]
- three-quarters, including NHSScotland best practice guidance[2, 21, 33, 36]

There was a lack of consistency in detail provided in the seven SIGN50 level 4 guidance documents that addressed how full sharps containers should be before being sealed:

- when filled to the fill line[33-35, 38]
- two-thirds[34, 47]
- three-quarters[53]
- guidance by the RCN differentiates between sealing single-use sharps containers when three-quarters full and for reusable sharps containers, sealing when the overfill protection mechanism is activated[49]

Sealing bags/receptacles

Sealing of waste bags or receptacles is not defined in the included evidence. There is some degree of consistency in the nine SIGN50 level 4 expert opinion guidance documents that addressed how waste bags or receptacles should be sealed:

- swan neck knot[3, 36] or goose neck knot[47]
- not an overhand knot[36]
- using plastic ties[2, 3, 21, 36]
- using plastic ties in addition to a swan neck knot[3, 36]
- a method where the waste bag will not be punctured or torn, and will remain leak-resistant[47]
- staples should not be used[20, 21]
- ensuring replacement bags or containers are available to replace sealed receptacles[21]

Comments
• sharps containers should be closed according to manufacturer's instructions[53] However, two SIGN50 level 4 guidance documents address consideration of ligature risk of fixtures, fittings and other items made available in patient care areas.[62, 63] **Legislative requirements** Two SIGN50 level 4 expert opinion guidance documents reference packaging requirements for healthcare waste that is being transported off-site.[2, 3] These requirements are provided within the ADR which is mandatory legislation.[2, 3, 23]

6.3 Is the evidence applicable to Scottish health and care settings?

(see SIGN 50, section 5.3.3)

For example, do the studies include interventions, comparators or outcomes that are common to Scottish health and care settings?

Comments
UK expert opinion guidance included is directly applicable to Scottish health and care settings.[2, 3, 33-36, 49, 62, 63] WHO guidance is applicable internationally to settings with differing levels of resource which may limit direct applicability to high resource Scottish settings.[21] However, applicability of guidance from the US,[47, 53] Canada, [37] Australia,[38] and a standard from New Zealand[20] is not clear given the role of national legislation in waste management in health and care settings. The legislation included for this research question is not specific to health and care settings but it does describe packaging instructions for the transportation of dangerous goods.[23] Therefore, it is applicable to the packaging of healthcare waste.

6.4 Are the studies generalisable to the target population?

Comment here on sample size and methods of sample selection. Is the sample representative of the specific population/group of interest? Generalisability is only relevant to primary research studies.

Comments
No primary studies were included for this research question, so factors determining generalisability such as sample size and methods do not apply.

6.5 Are there concerns about publication bias?

(see SIGN 50, section 5.3.5)

Comment here on whether there is a risk in the evidence base that studies have been selectively published based on their results (and thus a risk that results from published studies are systematically different from unpublished evidence).

Comments
Publication bias is not of concern for evidence included for this research question.

B: Evidence to Decision

6.6 Recommendations

What Recommendations or Good Practice Points are appropriate based on this evidence?

Note the following terminology:

- **"must"** implies that the health and care setting must implement the recommended approach and is used where a recommendation has been directly lifted from legislation or mandatory guidance
- **"should"** implies that the health and care setting "should" implement the recommended approach unless a clear and compelling rationale for an alternative approach is present
- **"should consider"** implies that the health and care setting should consider implementing the recommended approach

Recommendation	Grading
GPP6.1 Healthcare waste bags should not be overfilled and should be securely sealed when filled to three-	Good Practice Point

Recommendation	Grading
quarters capacity. Replacement waste bags should be made available.	
GPP6.2 Sharps containers should not be overfilled and should be securely sealed when filled to the fill line or two thirds capacity. Replacement sharps containers should be made available.	Good Practice Point
GPP6.3 Healthcare waste bags should be securely sealed using a preferred technique (for example a swan neck) and a plastic tie or tape closure.	Good Practice Point
GPP6.4 Sharps containers should be sealed according to manufacturer's instructions.	Good Practice Point
R6.1 Healthcare waste being sealed for onward transportation offsite must comply with packaging requirements contained within transportation legislation as described in SHTN 03-01.	Recommendation

6.7 Balancing benefits and harms

Comment here on the potential impact of the Recommendation or Good Practice Point on service users, visitors and staff. Benefits and harms include considerations beyond IPC.

Benefits

List the favourable changes in outcome that would likely occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about pros.

Benefits
GPP6.1 Ensuring that waste bags are not overfilled is established practice and may help reduce the risk of waste spills. Only filling to three-quarters capacity will help prevent overfilling and ensure that the waste bag can be securely sealed. GPP6.1 Replacing sealed waste bags supports correct segregation and disposal of waste at the point of production and ensures that waste is not transported

Benefits
unnecessarily through the care area which may reduce the risk of exposure to potentially infectious or hazardous waste. GPP6.2 Filling sharps containers to the fill line or to two-thirds capacity is established practice and prevents over-filling of containers which then cannot be securely sealed. GPP6.2 Filling sharps containers to the fill line or to two-thirds capacity reduces the risk of protruding sharps. GPP6.2 Replacing sealed sharps containers supports correct segregation and disposal of waste at the point of production and ensures that sharps waste is not transported unnecessarily through the care area which may reduce the risk of exposure to potentially infectious or hazardous waste. GPP6.3 Securely sealing healthcare waste bags using a knot and plastic tie or tape is established practice and may reduce the risk of spillage when waste is being transported and stored, and therefore may reduce risk of exposure to potentially infectious or hazardous waste. GPP6.4 Following manufacturer's instructions on sealing sharps containers supports safe closure of that specific receptacle. R6.1 Adherence with SHTN 03-01 facilitates compliance with associated corporate and social governance responsibilities, including legal requirements for health and safety and waste management.

Risks and harms

List the adverse events or other unfavourable outcomes that may occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about cons.

Risks and harms
GPP6.1 Ligature risk – certain mental health services may wish to undertake a local risk assessment around service users' access to plastic waste bags and bin liners considering any risks associated, and in line with local safeguarding policies.

Risks and harms
GPP6.2, GPP6.3, GPP6.4 and R6.1 No risks or harms identified.

Benefit-Harm assessment

Classify as “benefit outweighs harm” (or vice versa) or a “balance of benefit and harm.” Description of this balance can be from the individual service user/staff/visitor perspective, the societal perspective, or both. Recommendations or Good Practice Points are possible when clear benefit is not offset by important harms, costs or adverse events (or vice versa).

Benefit-Harm assessment
GPP6.1 In some circumstances providing a plastic waste bag to support the segregation of waste may outweigh the benefit and present a ligature risk for patients with certain mental health conditions. GPP6.2, GPP6.3, GPP6.4 and R6.1 Only benefits identified.

6.8 Feasibility

Is the Recommendation or Good Practice Point implementable in the Scottish context?

Describe (if applicable) financial implications, opportunity costs, material or human resource requirements, facility needs, sustainability issues, human factors etc., that may be associated with following a Recommendation or Good Practice Point. State clearly if information on feasibility is lacking.

Feasibility
GPP6.1 and 2 Facilities will be required within health and care settings for storage and access to replacement waste bags and containers. GPP6.1, GPP6.2, GPP6.3, GPP6.4 and R6.1 Human resource for education, training and audit will be required to support the implementation of safe waste management practice within health and care settings. However, for most settings these practices are already established.

6.9 Expert Opinion

Summarise the expert opinion used in creating the Recommendation or Good Practice Point. If none were involved, state “none”. Translating evidence into action often involves expert opinion where evidence is insufficient. Clearly outlining that expert opinion helps users understand their influence on interpreting objective evidence. Expert opinion may also be required where there is no evidence available.

Expert opinion
GPP6.1 ARHAI Scotland and its stakeholders support expert opinion guidance, including SHTN 03-01, that waste bags should not be filled over three-quarters capacity before being sealed.[2, 21, 33, 36] Furthermore, ARHAI Scotland and its stakeholders support guidance stating that replacement waste bags should be made available[21] to support correct segregation of waste and therefore minimising the risk of exposure to potentially harmful or infectious agents. GPP6.2 ARHAI Scotland and its stakeholders support guidance graded as expert opinion[33, 34, 38, 49, 53] and AGREE: ‘Recommend’[35] advising that sharps containers should be sealed when filled to the fill line. Evidence was not consistent when specifying maximum capacity of sharps containers, so where a sharps container does not have a fill line or other safety mechanism, ARHAI Scotland and its stakeholders support expert opinion guidance advising that sharps containers are not filled beyond two-thirds capacity.[34, 47] Although the evidence did not explicitly state that replacement sharps containers should be made available in the clinical environment, it is the expert opinion of ARHAI Scotland and its stakeholders that replacement containers are readily available to support correct waste segregation, therefore minimising the risk of exposure to potentially harmful or infectious agents. GPP6.3 From the evidence, it is not clear if swan neck ties are used to seal waste bags in addition to plastic ties or tape. Although tape was not mentioned as a method of sealing a waste bag in the literature, it is understood that in some NHSScotland Health Boards this is established practice. It is the expert opinion of ARHAI Scotland and its stakeholders that a swan neck and either a plastic tie or tape are required to securely seal the bag. GPP6.4 ARHAI Scotland and its stakeholders support expert opinion guidance stating that sharps containers should be closed according to manufacturer’s

Expert opinion
instructions,[53] as the most effective method for sealing sharps containers will differ depending on which container is in use and the manufacturer. R6.1 ARHAI Scotland and its stakeholders support interpretation of packaging requirements for waste being transported offsite described in SHTN 03-01.[2] Sufficient evidence to support this recommendation, no expert opinion to note.

6.10 Value judgements

Summarise value judgements used in creating the Recommendation or Good Practice Point. If none were involved, state “none”. Translating evidence into action often involves value judgements, which include guiding principles, ethical considerations, or other beliefs and priorities. Clearly outlining value judgements helps users understand their influence on interpreting objective evidence.

Value judgements
GPP6.1, GPP6.2, GPP6.3, GPP6.4 and R6.1 No value judgements to note.

6.11 Intentional vagueness

State reasons for any intentional vagueness in the Recommendation or Good Practice Point. If none was intended, state “none”. Recommendations or Good Practice Points should be clear and specific, but if there is a decision to be vague, acknowledging the reasoning clearly promotes transparency. Reasons for vagueness may include inadequate evidence; inability to achieve consensus regarding evidence quality, anticipated benefits/harms, or interpretation of evidence; legal considerations; economic reasons; ethical/ religious reasons.

Intentional vagueness
GPP6.1, GPP6.2, GPP6.3, GPP6.4 and R6.1 No intentional vagueness to note.

6.12 Exceptions

List situations or circumstances in which the Recommendation or Good Practice Point should not be applied.

Exceptions
GPP6.1 For settings where harm may outweigh benefit, risk assessment should be undertaken to ensure safe systems of work. GPP6.2, GPP6.3, GPP6.4 and R6.1 No exceptions to note.

6.13 Recommendations for research

List any aspects of the question that require further research.

Recommendations for research
Further research into effective methods of filling and sealing waste receptacles in health and care settings to ensure a sufficient seal and prevent leakage may be beneficial. Such research may have implications for IPC, as it could inform efficient ways of sealing receptacles which avoids contamination of the outside of the waste receptacle and/or the health or care environment and minimise the risk of exposure to staff.

Research Question 7: How should special (hazardous) waste (including sharps, blood and body fluids) be handled in health and care settings?

A Quality of Evidence

7.1 How reliable is the body of evidence?

(see SIGN 50, section 5.3.1, 5.3.4)

Comment here on the quantity of evidence available on this topic and its methodological quality. Please include citations and evidence levels.

If there is no available evidence to answer the key question, go to section B.

Comments	Evidence level
In total, 28 pieces of evidence were included to answer this research question. One guidance document was graded as AGREE: 'Recommend' because of rigorous systematic reviews and detailed methodology used to identify evidence to support recommendations.[55] Two guidance documents were graded AGREE: 'Recommend with Modifications',[10, 11] as systematic reviews were used to identify evidence supporting recommendations but some methodological detail was lacking. 19 guidance documents graded SIGN50 Level 4, expert opinion were included.[1-3, 18, 20, 21, 33, 34, 37, 47, 48, 50, 53, 58, 59, 64-67] Expert opinion guidance has potential bias given little detail is provided regarding how recommendations were formulated, and it is not always clear where expert opinion has taken precedence over scientific evidence. It is therefore considered low quality evidence.	1 x AGREE: 'Recommend' 2 x AGREE: 'Recommend with Modifications' 19 x SIGN50 Level 4 – Expert opinion 6 x SIGN50 'Mandatory'

Comments	Evidence level
Six pieces of legislation are graded as 'Mandatory'.[7, 25, 32, 39, 57, 68] No primary evidence was included to answer this research question.	

7.2 Is the evidence consistent in its conclusions?

(see SIGN 50, section 5.3.2)

Comment here on the degree of consistency demonstrated by the evidence. Where there are conflicting results, indicate how the judgement was formed as to the overall direction of the evidence.

Comments
Infectious waste There was consistency in SIGN50 level 4 expert opinion guidance regarding the following: • bags containing infectious waste should not be compressed or compacted[3, 20, 37] • waste containers should not be re-opened after they are sealed[3, 37, 47] • the number of personnel handling Ebola and Marburg waste should be limited[37, 47] • the outside of waste bags containing Ebola or Marburg waste should be disinfected[37, 47, 64] • immunisation should be offered to those handling healthcare waste[2, 20, 21] The following points in SIGN50 level 4 expert opinion guidance regarding handling infectious waste differed in terms of level of detail and scope: • infectious waste should always be treated as if contaminated with a variety of pathogens, given difficulty determining actual infectivity in practice[21] • hazardous waste should not be compacted, but controlled waste like sanitary waste and used personal protective equipment (PPE) can be compacted so long as liquid is contained and properly disposed of[20]

Comments

- Ebola waste should be handled in the affected patients' surroundings and in the area where PPE is doffed[37]
- hand hygiene should be carried out following handling HCID waste[48]
- dispose of viral haemorrhagic fever waste with minimal "agitation"[18]
- additional precautions may be required to dispose of waste from patients with rare diseases to minimise aerosol production[18]

SHTN 03-01 (SIGN50 level 4) describes how infectious waste is disposed of to comply with legislation and signposts to relevant mandatory legislation,[2] consistency of which was not assessed:

- Landfill (Scotland) Regulations (2003)[25]

Two UK SIGN50 level 4 guidance documents are consistent in their definitions of hazardous waste that has been "rendered safe":

- infectious waste has reduced number of infectious organisms, anatomical waste is no longer recognisable, sharps are unrecognisable and unusable and chemical components of medicinal waste are destroyed[2, 3]
- waste can be handled without additional precautions once rendered safe[2, 3]

Liquid waste

Six SIGN50 level 4 guidance documents and one guideline graded AGREE 'recommend with modifications' were included that advise that hazardous liquid waste could be disposed of into the toilet:[3, 11, 18, 21, 37, 47, 48]

- waste from patients with epidemic- or pandemic-prone respiratory illness[11]
- waste produced from patients with a HCID,[48] EVD and/or MVD[37, 47]

There was consistency in SIGN50 level 4 guidance regarding the following additional points for managing HCID patient liquid waste:

- liquid waste should be disposed of into the toilet in patient rooms, pouring at a low level to avoid splash,[47] with the lid closed to flush, cleaning the toilet afterwards[37, 47]
- only ECDC recommended disposal using tissues or nappies[48]
- liquid waste not disposed of down the toilet should be solidified[37, 47]

Comments
SHTN 03-01 (SIGN50 level 4) describes mandatory legislative requirements in Scotland governing liquid waste disposal,[2] consistency of which has not been assessed due to the nature of the evidence: • Landfill (Scotland) Regulations (2003)[25] implementing EU Landfill Directive (1999/31/EC)[39] **Sharps waste** SIGN50 level 4 WHO guidance states that sharps pose the greatest infection risk.[21] A NICE guideline graded AGREE 'recommend' signposts to the following mandatory legislative requirement, consistency of which has not been assessed: • The Health and Safety (Sharp Instruments in Healthcare) Regulations 2013,[32] which implements European Directive 2010/32/EU[68] • HSE guidance (SIGN50 level 4) supports compliance with this legislation[58] Five SIGN50 level 4 expert opinion guidance documents and one guideline graded AGREE 'recommend' are consistent with legislation stating that sharps should not be re-sheathed, bent or disassembled for disposal.[10, 18, 21, 33, 34, 55] There was a lack of consistency regarding the following recommendations: • one SIGN50 level 4 guidance document states that sharps should not be compressed to fit into a sharps container[59] • one guideline graded AGREE 'recommend' states that recapping or disassembling sharps is sometimes required, so sharps safety devices should be used[55] • one SIGN50 level 4 guidance document states that sharps containers should be carried by the handle, not supported underneath[21] • one SIGN50 guidance document states that sharps containers should not be re-opened once sealed[53] • two SIGN50 expert opinion guidance documents state that sharps waste from EVD patients should be placed in a second, leak- and puncture-resistant container[37] or biohazard bag[47]

Comments

There was consistency in the evidence regarding the following:

- two SIGN50 level 4 guidance documents state that sharps should not be placed in waste bags[33, 50]
- one SIGN50 level 4 guidance document and one guideline graded AGREE 'recommend' state that only sharps should be disposed of in sharps containers[2, 55]
- one guideline graded AGREE 'recommend' and one guideline graded AGREE 'recommend with modifications' state that sharps containers should be temporarily closed when not in use[10, 55]

Additional mandatory legislation regarding safe sharps disposal is signposted by SIGN50 level 4 expert opinion guidance,[2, 34] the consistency of which has not been assessed due to the nature of the evidence:

- Health and Safety at Work Act 1974[57]
- COSHH 2002[7]

HTM 07-01 (SIGN50 level 4) describes when sharps are considered hazardous under English legislation. SHTN 03-01 (SIGN50 level 4) does not provide this level of detail, but does provide guidance on the segregation of sharps.[2, 3]

PPE

Scottish best practice guidance (SIGN50 level 4) describes a mandatory legislative requirement for PPE to be provided to those handling waste, consistency of which has not been assessed due to the nature of the evidence:

- COSHH 2002[2, 7] with SIGN50 level 4 guidance supporting compliance[1]

Three SIGN50 level 4 expert opinion guidance documents state that PPE worn when handling waste should be dependent on risk:

- determined by risk assessment[2]
- according to task[20, 21]

Comments

Four SIGN50 level 4 guidance documents state that PPE for handling waste in health and care settings should be "appropriate".[3, 37, 47, 66] These documents differed by topic focus:

- safe management of all waste produced in health and care settings[3]
- respiratory viral infection waste[66]
- EVD waste[37]
- EVD waste before it has been inactivated[47]

Two SIGN50 level 4 expert opinion guidance documents provide examples of PPE that could be worn, but do not make specific recommendations.[2, 21] WHO guidance provides the additional recommendation of wearing gloves as minimum protection against body fluids.[21]

Four SIGN50 level 4 expert opinion guidance documents made recommendations on PPE bundles to be worn when handling infectious waste. However, there is a lack of consistency:

- medical mask, eye protection (visor or goggles) gloves and gown for COVID-19 waste[65]
- inner gloves below heavy-duty outer gloves and long sleeves/extended cuffs for handling HCID waste. It is also stated that an impermeable apron and rubber boots may be "useful"[48]
- for occupational exposure to Ebola waste: dedicated clothes like uniform, scrubs, shoes; heavy-duty and puncture-resistant nitrile gloves and eye and face protection like shield and goggles. Where exposure risk is high, face mask, fluid resistant gown, coveralls and boot covers that cover lower leg[67]
- for occupational exposure to Ebola waste where the waste container may be opened or waste is being handled directly: gown, coveralls and boot covers should be impermeable, disposable N95 respiratory should be worn in place of face mask, or elastomeric or powered air purifying respirator if exposure risk is high[67]

7.3 Is the evidence applicable to Scottish health and care settings?

(see SIGN 50, section 5.3.3)

For example, do the studies include interventions, comparators or outcomes that are common to Scottish health and care settings?

Comments
10 guidance documents are included that are applicable to the UK,[1-3, 10, 33, 34, 50, 55, 58, 59] one of which are specific to Scotland.[2] Of these, most are applicable to health and care settings,[2, 3, 10, 34, 50, 55, 59] whereas one is specific to adult social care.[33] One guidance document describes compliance with legislation, one of which is specific to health and care settings.[58] Guidance documents published by the WHO are applicable internationally to settings with differing levels of resource which may limit direct applicability to high resource Scottish settings.[11, 21] Five guidance documents were published in the US,[18, 47, 53, 64, 67] one standard for New Zealand,[20] three were published by the ECDC which are applicable in the EU/EAA,[48, 65, 66] the applicability of which are not clear given the role of national legislation in waste management policy. Of the six pieces of legislation included, three are UK legislations,[7, 32, 57] one is Scottish legislation,[25] and two are legislations for EU member states.[39, 68]

7.4 Are the studies generalisable to the target population?

Comment here on sample size and methods of sample selection. Is the sample representative of the specific population/group of interest? Generalisability is only relevant to primary research studies.

Comments
No primary studies were included for this research question, so factors determining generalisability such as sample size and methods do not apply.

7.5 Are there concerns about publication bias?

(see SIGN 50, section 5.3.5)

Comment here on whether there is a risk in the evidence base that studies have been selectively published based on their results (and thus a risk that results from published studies are systematically different from unpublished evidence).

Comments
Publication bias is not of concern for evidence included for this research question.

B: Evidence to Decision

7.6 Recommendation(s)

What Recommendation(s) or Good Practice Point(s) are appropriate based on this evidence?

Note the following terminology:

- **"must"** implies that the health and care setting must implement the recommended approach and is used where a recommendation has been directly lifted from legislation or mandatory guidance
- **"should"** implies that the health and care setting "should" implement the recommended approach unless a clear and compelling rationale for an alternative approach is present
- **"should consider"** implies that the health and care setting should consider implementing the recommended approach

Recommendation	Grading
GPP7.1 Waste bags should not be compressed in health and care settings.	Good Practice Point
GPP7.2 Clinical and infectious waste receptacles should not be re-opened once they are sealed.	Good Practice Point
GPP7.3 After handling waste in health and care settings, hand hygiene should be performed.	Good Practice Point

Recommendation	Grading
R7.1 Liquid waste must not be disposed of in landfill. Body fluids may be disposed of via the foul sewer (toilet or macerator). Where risk assessment determines disposal via foul sewer (including macerator) unsafe or impractical, liquid waste or solidified liquid waste should be placed in a rigid leak-resistant receptacle for disposal. Liquid waste should not be disposed of down a hand hygiene sink.	Recommendation
GPP7.4 Compliant paper based macerator products containing liquid waste should be placed in the macerator in their entirety minimising the risk of splash and spray. Where liquid waste is being disposed of via the foul sewer and where compatible macerator products are not available for use, it should be poured slowly at a low level to minimise the risk of contamination via splash and spray. Suitable PPE should be worn based on the level of perceived risk or anticipated exposure. If contamination of the environment occurs, this should be managed as soon as is reasonably practicable as per local decontamination policy and in line with the **NIPCM literature reviews on Safe management of care equipment and Safe management of the care environment.**	Good Practice Point
R7.2 Sharps should not be disposed of into waste bags. Safe systems of work beyond disposal to prevent sharps and inoculation injuries are described in the **NIPCM literature review on Management of Occupational Exposure to Blood Borne Viruses.**	Recommendation
GPP7.5 Sharps containers should not be re-opened once sealed.	Good Practice Point

Recommendation	Grading
R7.3 Staff who handle special (hazardous) waste in health and care settings should have immediate access to an appropriate selection of PPE. A risk assessment should be undertaken to determine which items of PPE are required.	Recommendation

7.7 Balancing benefits and harms

Comment here on the potential impact of the Recommendation or Good Practice Point on service users, visitors and staff. Benefits and harms include considerations beyond IPC.

Benefits

List the favourable changes in outcome that would likely occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about pros.

Benefits
R7.1, R7.2 and R7.3 Adherence to current legislation and regulations facilitates compliance with associated corporate and social governance responsibilities, including legal requirements for health and safety and waste management. R7.1 Disposal of liquid waste via the foul sewer (toilet or macerator) reduces the volume of waste that requires to be solidified, handled, transported and consigned for clinical waste disposal. GPP7.1 Ensuring waste bags are not compressed may reduce the risk of waste spills, potential contamination of the storage waste containers, vehicles, environment and/or healthcare worker exposure to potentially infectious or harmful agents. GPP7.2 Avoiding the re-opening of sealed waste containers may minimise the risk of waste spills, environmental contamination and/or staff, service user and visitor exposure to potentially infectious or harmful agents.

Benefits
GPP7.3 Performing hand hygiene after handling infectious clinical waste may reduce the risk of cross-contamination of infectious agents to patients, service users, staff, visitors and the environment. GPP7.4 Careful disposal of liquid waste and the use of appropriate PPE minimises risk of staff exposure to potentially infectious and/or harmful agent. GPP7.4 Timely cleaning and disinfection of the environment following any spillage minimises the risk of patient, service user, staff and visitor exposure to potentially infectious and/or harmful agents. GPP7.5 Ensuring sharps containers remain sealed may reduce the risk of exposure to used sharps, and therefore reduces the risk of staff exposure to potentially infectious or harmful agents and sharps injury. R7.3 Undertaking a risk assessment to determine which items of PPE are required when handling special (hazardous) waste, may reduce the risk of improper or incorrect use of PPE items thus, saving resource.

Risks and harms

List the adverse events or other unfavourable outcomes that may occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about cons.

Risks and Harms
GPP7.1, GPP7.2, GPP7.3, GPP7.4, GPP7.5, R7.1, R7.2 and R7.3 No risks or harms identified.

Benefit-Harm assessment

Classify as “benefit outweighs harm” (or vice versa) or a “balance of benefit and harm.” Description of this balance can be from the individual service user/staff/visitor perspective, the societal perspective, or both. Recommendations or Good Practice Points are possible when clear benefit is not offset by important harms, costs or adverse events (or vice versa).

Benefit-Harm assessment
GPP7.1, GPP7.2, GPP7.3, GPP7.4, GPP7.5, RR7.1, R7.2 and R7.3 Only benefits identified.

7.8 Feasibility

Is the Recommendation or Good Practice Point implementable in the Scottish context?

Describe (if applicable) financial implications, opportunity costs, material or human resource requirements, facility needs, sustainability issues, human factors etc., that may be associated with following a Recommendation or Good Practice Point. State clearly if information on feasibility is lacking.

Feasibility
GPP7.1 Sufficient storage space will be required to manage and store waste sundries and healthcare waste safely. There may be human resource and/or financial implications should the frequency of waste collection need to be increased. R7.1 Procurement of rigid leak-resistant containers may incur additional financial cost. R7.1 Health and care settings will require sufficient storage capacity for empty and used liquid waste receptacles. GPP7.1, GPP7.2, GPP7.3, GPP7.4, GPP7.5, R7.2 and R7.3 Human resource for education, training and audit will be required to support the implementation of safe waste management practice within health and care settings. However, for most settings these practices are already established.

7.9 Expert Opinion

Summarise the expert opinion used in creating the Recommendation or Good Practice Point. If none were involved, state “none”. Translating evidence into action often involves expert opinion where evidence is insufficient. Clearly outlining that expert opinion helps users understand their influence on interpreting objective evidence. Expert opinion may also be required where there is no evidence available.

Expert opinion

GPP7.1 ARHAI Scotland supports expert opinion guidance advising against compressing infectious clinical waste bags[3, 20, 37] to reduce the risk of waste spills and cross-contamination of the environment and/or staff exposure to potentially infectious or harmful agents. However, it is ARHAI Scotland and Working Group expert opinion that no waste bags should be compressed in health and care settings.

GPP7.2 ARHAI Scotland supports expert opinion guidance advising against re-opening clinical and infectious waste containers[3, 37, 47] as a means of avoiding risk of exposure to infectious agents contained within these receptacles.

GPP7.3 Although expert opinion guidance on handling infectious waste only specifies undertaking hand hygiene following the handling of high consequence infectious disease waste,[48] it is the expert opinion of ARHAI Scotland and its stakeholders that hand hygiene should be performed after handling all healthcare waste to minimise the risk of cross-contamination of potentially infectious or harmful agents which may be present in any healthcare waste stream.

R7.1 Mandatory legislation states that liquid waste must not be disposed of via landfill.[25] It is the expert opinion of ARHAI Scotland and its stakeholders that risk assessment should be undertaken to determine suitability of liquid waste such as vomit and urine for disposal via foul sewer, consistent with what is advised in SHTN 03-01.[2] ARHAI Scotland and its stakeholders support SHTN 03-01 advising that solidified liquid waste should be disposed of in a rigid leak-resistant container as per waste contractor requirements.[2]

GPP7.4 ARHAI Scotland and its stakeholders support expert opinion stating that liquid waste may be disposed of into the toilet[3, 11, 18, 21, 37, 47, 48] and SHTN 03-01 advising disposal of liquid waste via foul sewer[2] Evidence included which addresses precautions was specific to HCID liquid waste disposal.[37, 47] It is the expert opinion of ARHAI Scotland and its stakeholders that any liquid waste not contained within a paper based macerator product that is risk assessed as appropriate to be disposed of via foul sewer should be poured slowly at a low level (where possible) to minimise the risk of splash, with suitable PPE worn.

Expert opinion
R7.2 It is a legislative requirement that sharps are disposed of safely in secure containers under the Health and Safety (Sharp Instruments) in Healthcare Regulations (2013).[32] Expert opinion guidance advises against disposal of sharps in waste bags[33, 59] and it is the expert opinion of ARHAI Scotland and its stakeholders that adherence with this and recommendations made in the NIPCM Occupational Exposure review support compliance with safe sharps disposal, therefore this has been graded a recommendation. GPP7.5 Congruent with expert opinion guidance,[53] it is ARHAI expert opinion that sealed sharps containers should not be re-opened to minimise the risk of injury and cross-contamination from used sharps. R7.3 There is sufficient evidence supporting PPE to be worn by staff when handling special (hazardous) waste including COSHH regulations which is graded as Mandatory,[7] and Level 4 guidance supporting risk assessment to determine level of PPE required for handling special (hazardous) waste, including HSE guidance supporting compliance with COSHH and SHTN 03-01.[1, 2, 7, 20, 21] It is ARHAI expert opinion that appropriate PPE may include disposable gloves or apron, and if splashing/spray is likely to occur other additional PPE should be worn (e.g. eye and face protection).

7.10 Value judgements

Summarise value judgements used in creating the Recommendation or Good Practice Point. If none were involved, state “none”. Translating evidence into action often involves value judgements, which include guiding principles, ethical considerations, or other beliefs and priorities. Clearly outlining value judgements helps users understand their influence on interpreting objective evidence.

Value judgements
GPP7.1, GPP7.2, GPP7.3, GPP7.4, GPP7.5, RR7.1, R7.2 and R7.3 No value judgements to note.

7.11 Intentional vagueness

State reasons for any intentional vagueness in the Recommendation or Good Practice Point. If none was intended, state “none”. Recommendations and Good

Practice Points should be clear and specific, but if there is a decision to be vague, acknowledging the reasoning clearly promotes transparency. Reasons for vagueness may include inadequate evidence; inability to achieve consensus regarding evidence quality, anticipated benefits/harms, or interpretation of evidence; legal considerations; economic reasons; ethical/ religious reasons.

Intentional vagueness
GPP7.1, GPP7.2, GPP7.3, GPP7.4, GPP7.5, RR7.1, R7.2 and R7.3 No intentional vagueness to note.

7.12 Exceptions

List situations or circumstances in which the Recommendation or Good Practice Point should not be applied.

Exceptions
GPP7.2 There may be circumstances where re-opening sealed waste bags is unavoidable e.g. where sharps have been inappropriately disposed of and, in such circumstances, local risk assessment will apply. GPP7.1, GPP7.3, GPP7.4, GPP7.5, R7.1, R7.2 and R7.3 No exceptions to note.

7.13 Recommendations for research

List any aspects of the question that require further research.

Recommendations for research
There is limited existing primary evidence into infectious waste handling, as there may be ethical concerns regarding this research. Future research may investigate efficacy of current waste management practice in preventing cross-contamination of the environment and the person handling the waste, such as safe methods of pouring liquid waste. There are logistical concerns in linking outbreaks to improper handling of infectious clinical waste.

Research Question 8: How should non-hazardous waste be handled in health and care settings?

A Quality of Evidence

8.1 How reliable is the body of evidence?

(see SIGN 50, section 5.3.1, 5.3.4)

Comment here on the quantity of evidence available on this topic and its methodological quality. Please include citations and evidence levels.

If there is no available evidence to answer the key question, go to section B.

Comments	Evidence level
Six pieces of evidence were included that addressed handling of non-hazardous waste. Five guidance documents were graded SIGN50 Level 4, expert opinion,[2-4, 20, 21] which has potential bias given little detail is provided regarding how recommendations were formulated, it is not stated that systematic methods were used to identify supporting evidence and it is not always clear where expert opinion has taken precedence over scientific evidence. It is therefore considered low quality evidence. One document was legislation graded as 'Mandatory'.[25] No primary evidence was included to answer this research question.	5 x SIGN50 Level 4 – expert opinion 1 x SIGN50 'Mandatory'

8.2 Is the evidence consistent in its conclusions?

(see SIGN 50, section 5.3.2)

Comment here on the degree of consistency demonstrated by the evidence. Where there are conflicting results, indicate how the judgement was formed as to the overall direction of the evidence.

Comments
WHO guidance (SIGN50 level 4) states that most healthcare waste is included under the non-hazardous category.[21] There was a lack of consistency in SIGN50 level 4 expert opinion guidance on recommendations for offensive waste: • classed as non-hazardous unless from an infected patient[3] • non-hazardous waste can be compacted[20] • should not be compacted unless permitted by a specific licence or permit[2] • ensure PPE and clothes are clean after handling[3] • absorb liquid offensive waste into a cloth before disposal as an alternative to solidifier[3] • hand hygiene should be carried out following handling offensive waste[3] HTM 07-01 (SIGN50 level 4) states that liquid offensive waste should not be disposed of as landfill[3] to comply with The Landfill Regulations 2003 (graded mandatory).[25] However, this was not stated in SHTN 03-01 (SIGN50 level 4).[2] The consistency of SIGN50 level 4 guidance on requirements for compliance with mandatory legislation for managing non-hazardous waste has not been assessed:[2, 4] • Scottish Government Duty of Care Code of Practice details waste producers' legal obligations regarding non-hazardous waste[4]

8.3 Is the evidence applicable to Scottish health and care settings?

(see SIGN 50, section 5.3.3)

For example, do the studies include interventions, comparators or outcomes that are common to Scottish health and care settings?

Comments
Two UK expert opinion guidance documents included are directly applicable to Scottish health and care settings.[2, 3] WHO guidance is applicable internationally to settings with differing levels of resource which may limit direct applicability to high resource Scottish settings.[21] However, applicability of the standard from New

Comments
Zealand[20] is not clear given the role of national legislation in waste management in health and care settings. The legislation and guidance for compliance with legislation were not specific to health and care settings but are applicable to waste producers in Scotland.[4, 25]

8.4 Are the studies generalisable to the target population?

Comment here on sample size and methods of sample selection. Is the sample representative of the specific population/group of interest? Generalisability is only relevant to primary research studies.

Comments
No primary studies were included for this research question, so factors determining generalisability such as sample size and methods do not apply.

8.5 Are there concerns about publication bias?

(see SIGN 50, section 5.3.5)

Comment here on whether there is a risk in the evidence base that studies have been selectively published based on their results (and thus a risk that results from published studies are systematically different from unpublished evidence).

Comments
Publication bias is not of concern for evidence included for this research question.

B: Evidence to Decision

8.6 Recommendations

What Recommendations or Good Practice Points are appropriate based on this evidence?

Note the following terminology:

- **"must"** implies that the health and care setting must implement the recommended approach and is used where a recommendation has been directly lifted from legislation or mandatory guidance

- **"should"** implies that the health and care setting "should" implement the recommended approach unless a clear and compelling rationale for an alternative approach is present
- **"should consider"** implies that the health and care setting should consider implementing the recommended approach

Recommendation	Grading
GPP8.1 When handling non-hazardous waste such as offensive/hygiene waste, PPE should be worn based on risk assessment considering any anticipated exposure to blood and body fluids.	Good Practice Point

8.7 Balancing benefits and harms

Comment here on the potential impact of the Recommendation or Good Practice Point on service users, visitors and staff. Benefits and harms include considerations beyond IPC.

Benefits

List the favourable changes in outcome that would likely occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about pros.

Benefits
GPP8.1 Wearing PPE when handling offensive/hygiene waste may minimise the risk of staff uniform contamination and exposure.

Risks and harms

List the adverse events or other unfavourable outcomes that may occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about cons.

Risks and harms
GPP8.1 No risks or harms identified.

Benefit-Harm assessment

Classify as “benefit outweighs harm” (or vice versa) or a “balance of benefit and harm.” Description of this balance can be from the individual service user/staff/visitor perspective, the societal perspective, or both. Recommendations or Good Practice Points are possible when clear benefit is not offset by important harms, costs or adverse events (or vice versa).

Benefit-Harm assessment
GPP8.1 Only benefits identified.

8.8 Feasibility

Is the Recommendation or Good Practice Point implementable in the Scottish context?

Describe (if applicable) financial implications, opportunity costs, material or human resource requirements, facility needs, sustainability issues, human factors etc., that may be associated with following a Recommendation or Good Practice Point. State clearly if information on feasibility is lacking.

Feasibility
GPP8.1 Human resource for education, training and audit may be required to support the implementation of safe waste management practice within health and care settings.

8.9 Expert Opinion

Summarise the expert opinion used in creating the Recommendation or Good Practice Point. If none were involved, state “none”. Translating evidence into action often involves expert opinion where evidence is insufficient. Clearly outlining that expert opinion helps users understand their influence on interpreting objective evidence. Expert opinion may also be required where there is no evidence available.

Expert opinion
GPP8.1 Due to lack of evidence regarding PPE requirements for handling non-hazardous waste, such as offensive/hygiene waste, it is the expert opinion of ARHAI Scotland and its stakeholders that a risk assessment that considers any

Expert opinion
anticipated exposure to blood and body fluids should be undertaken by staff to determine the level of PPE required when handling non-hazardous waste.

8.10 Value judgements

Summarise value judgements used in creating the Recommendation or Good Practice Point. If none were involved, state “none”. Translating evidence into action often involves value judgements, which include guiding principles, ethical considerations, or other beliefs and priorities. Clearly outlining value judgements helps users understand their influence on interpreting objective evidence.

Value judgements
GPP8.1 No value judgements to note.

8.11 Intentional vagueness

State reasons for any intentional vagueness in the Recommendation or Good Practice Point. If none was intended, state “none”. Recommendations and Good Practice Points should be clear and specific, but if there is a decision to be vague, acknowledging the reasoning clearly promotes transparency. Reasons for vagueness may include inadequate evidence; inability to achieve consensus regarding evidence quality, anticipated benefits/harms, or interpretation of evidence; legal considerations; economic reasons; ethical/ religious reasons.

Intentional vagueness
GPP8.1 No intentional vagueness to note.

8.12 Exceptions

List situations or circumstances in which the Recommendation or Good Practice Point should not be applied.

Exceptions
GPP8.1 No exceptions to note.

8.13 Recommendations for research

List any aspects of the question that require further research.

Recommendations for research
No recommendations for research to note.

Research Question 9: How should waste be labelled or tagged in health and care settings?

A Quality of Evidence

9.1 How reliable is the body of evidence?

(see SIGN 50, section 5.3.1, 5.3.4)

Comment here on the quantity of evidence available on this topic and its methodological quality. Please include citations and evidence levels.

If there is no available evidence to answer the key question, go to section B.

Comments	Evidence level
In total, 15 documents were included to answer this research question. 12 guidance documents were graded as SIGN50 Level 4, expert opinion.[2-4, 20, 21, 34, 36, 37, 48, 54, 56, 60] Expert opinion guidance has potential bias given little detail is provided regarding how recommendations were formulated, it is not stated that systematic methods were used to identify supporting evidence and it is not always clear where expert opinion has taken precedence over scientific evidence. It is therefore considered low quality evidence. Three legislative documents were included which are graded as 'Mandatory'.[9, 22, 69] No primary evidence was included to answer this research question.	12 x SIGN50 Level 4 – expert opinion 3 x SIGN50 'Mandatory'

9.2 Is the evidence consistent in its conclusions?

(see SIGN 50, section 5.3.2)

Comment here on the degree of consistency demonstrated by the evidence. Where there are conflicting results, indicate how the judgement was formed as to the overall direction of the evidence.

Comments

Labelling of healthcare waste is consistently recommended in six SIGN50 level 4 guidance documents.[2, 20, 21, 37, 48, 60]

Labelling of sharps containers was recommended by two SIGN50 level 4 expert opinion guidance documents,[34, 48] and described in one SIGN50 level 4 British Standard for single-use sharps containers.[56]

The one guidance document included which was for care homes (SIGN50 level 4) specifies that clinical or hazardous waste should be labelled.[36]

Alternatives to written labels described in three SIGN50 level 4 guidance documents include permanent marker, numbered tags, tape,[2] and pre-printed labels.[2, 3, 21]

Two SIGN50 level 4 expert opinion guidance documents state that temporary labels on receptacle lids could hinder effective cleaning.[54, 60]

There was some degree of consistency in four SIGN50 level 4 guidance documents regarding the following detail required on receptacle labels:

- waste source[2, 3, 20, 21]
- waste type[2, 20, 21]
- date and time container was sealed[21]
- name of person filling out label[21]

Recommendations on when containers should be labelled were not made consistently throughout the SIGN50 level 4 expert opinion guidance:

- after the receptacle is sealed[21]
- staff should be provided with labelled sacks[2]
- date of assembly and date of disposal for sharps containers[34]

There was a lack of consistency regarding labelling requirements for hazardous or infectious waste in SIGN50 level 4 expert opinion guidance:

- detailed description[3]
- international hazard symbol[21]
- specific wording provided for high consequence infectious disease waste[37, 48]

Comments
Three SIGN50 level 4 expert opinion guidance documents describe labelling requirements under mandatory UK and Scottish legislation, consistency of which has not been assessed due to the nature of the evidence:[2-4] • Environmental Protection (Duty of Care) (Scotland) Regulations 2014[9] • Pollution Prevention and Control (PPC) Scotland Regulations 2012[69] • The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009[22]

9.3 Is the evidence applicable to Scottish health and care settings?

(see SIGN 50, section 5.3.3)

For example, do the studies include interventions, comparators or outcomes that are common to Scottish health and care settings?

Comments
Three documents are directly applicable to Scotland, two of which are for health and care settings[2, 60] with the other aiming to support compliance with waste producer's Duty of Care and is not setting-specific.[4] Five documents are directly applicable to the UK[3, 34, 36, 54, 56] except where Scottish legislation diverges. Of these, three are applicable to health and care settings,[3, 34, 54] one is specific to care homes,[36] and the setting for the British Standard is not clear.[56] Guidance by the WHO is applicable internationally to settings with differing levels of resource which may limit direct applicability to high resource Scottish settings.[21] Applicability of documents from Canada,[37] New Zealand[20] and guidance applicable to the EU/EAA[48] not clear given the role of national legislation in waste management in health and care settings. The legislation included to answer this research question was not specific to health and care settings but is applicable to labelling of healthcare waste.[9, 22, 69]

9.4 Are the studies generalisable to the target population?

Comment here on sample size and methods of sample selection. Is the sample representative of the specific population/group of interest? Generalisability is only relevant to primary research studies.

Comments
No primary studies were included for this research question, so factors determining generalisability such as sample size and methods do not apply.

9.5 Are there concerns about publication bias?

(see SIGN 50, section 5.3.5)

Comment here on whether there is a risk in the evidence base that studies have been selectively published based on their results (and thus a risk that results from published studies are systematically different from unpublished evidence).

Comments
Publication bias is not of concern for evidence included for this research question.

B: Evidence to Decision

9.6 Recommendations

What Recommendations or Good Practice Points are appropriate based on this evidence?

Note the following terminology:

- **"must"** implies that the health and care setting must implement the recommended approach and is used where a recommendation has been directly lifted from legislation or mandatory guidance
- **"should"** implies that the health and care setting "should" implement the recommended approach unless a clear and compelling rationale for an alternative approach is present
- **"should consider"** implies that the health and care setting should consider implementing the recommended approach

Recommendation	Grading
R9.1 Healthcare waste must be appropriately labelled and marked as per legislation which is summarised in SHTN 03-01.	Recommendation
GPP9.1 Healthcare waste may be labelled using written labels, numbered tags, tape or pre-printed labels.	Good Practice Point

9.7 Balancing benefits and harms

Comment here on the potential impact of the Recommendation or Good Practice Point on service users, visitors and staff. Benefits and harms include considerations beyond IPC.

Benefits

List the favourable changes in outcome that would likely occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about pros.

Benefits
R9.1 Adherence to SHTN 03-01 facilitates compliance with associated corporate and social governance responsibilities, including legal requirements for health and safety and waste management. R9.1 and GPP9.1 Adherence to labelling requirements assists root cause analysis where there is an investigation into an adverse event.

Risks and harms

List the adverse events or other unfavourable outcomes that may occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about cons.

Risks and harms
R9.1 and GPP9.1 No risks or harms identified.

Benefit-Harm assessment

Classify as “benefit outweighs harm” (or vice versa) or a “balance of benefit and harm.” Description of this balance can be from the individual service user/staff/visitor perspective, the societal perspective, or both. Recommendations or Good Practice Points are possible when clear benefit is not offset by important harms, costs or adverse events (or vice versa).

Benefit-Harm assessment
R9.1 and GPP9.1 Only benefits identified.

9.8 Feasibility

Is the Recommendation or Good Practice Point implementable in the Scottish context?

Describe (if applicable) financial implications, opportunity costs, material or human resource requirements, facility needs, sustainability issues, human factors etc., that may be associated with following a Recommendation or Good Practice Point. State clearly if information on feasibility is lacking.

Feasibility
R9.1 and GPP9.1 Human resource for education, training and audit will be required to support the implementation of safe waste management practice within health and care settings. However, for most settings these practices are already established.

9.9 Expert Opinion

Summarise the expert opinion used in creating the Recommendation or Good Practice Point. If none were involved, state “none”. Translating evidence into action often involves expert opinion where evidence is insufficient. Clearly outlining that expert opinion helps users understand their influence on interpreting objective evidence. Expert opinion may also be required where there is no evidence available.

Expert opinion
R9.1 There is legislation requiring appropriate labelling of healthcare waste[9, 22, 69] which is detailed in SHTN 03-01,[2] therefore no expert opinion is required.

Expert opinion
GPP9.1 Extant guidance describes various methods for labelling, including written labels, numbered tags, tape[2] or pre-printed labels.[2, 3, 21] It is the expert opinion of ARHAI Scotland and its stakeholders that, so long as waste is labelled appropriately as per R9.1 and supports traceability, any of the described methods of labelling are sufficient.

9.10 Value judgements

Summarise value judgements used in creating the Recommendation or Good Practice Point. If none were involved, state “none”. Translating evidence into action often involves value judgements, which include guiding principles, ethical considerations, or other beliefs and priorities. Clearly outlining value judgements helps users understand their influence on interpreting objective evidence.

Value judgements
R9.1 and GPP9.1 No value judgements to note.

9.11 Intentional vagueness

State reasons for any intentional vagueness in the Recommendation or Good Practice Point. If none was intended, state “none”. Recommendations and Good Practice Points should be clear and specific, but if there is a decision to be vague, acknowledging the reasoning clearly promotes transparency. Reasons for vagueness may include inadequate evidence; inability to achieve consensus regarding evidence quality, anticipated benefits/harms, or interpretation of evidence; legal considerations; economic reasons; ethical/religious reasons.

Intentional vagueness
R9.1 and GPP9.1 No intentional vagueness to note.

9.12 Exceptions

List situations or circumstances in which the Recommendation or Good Practice Point should not be applied.

Exceptions
R9.1 and GPP9.1 No exceptions to note.

9.13 Recommendations for research

List any aspects of the question that require further research.

Recommendations for research
No recommendations for research to note.

Research Question 10: How should waste be transported in health and care settings?

A Quality of Evidence

10.1 How reliable is the body of evidence?

(see SIGN 50, section 5.3.1, 5.3.4)

Comment here on the quantity of evidence available on this topic and its methodological quality. Please include citations and evidence levels.

If there is no available evidence to answer the key question, go to section B.

Comments	Evidence level
In total, 17 documents were included to answer this research question. One guidance document was graded AGREE: 'Recommend with Modifications' as systematic reviews were used to identify evidence supporting recommendations but some methodological detail was lacking.[12] 12 documents were graded SIGN50 Level 4, expert opinion,[1-4, 18, 20, 21, 37, 47, 51, 60, 70] and has potential bias given little detail is provided regarding how recommendations were formulated, and it is not always clear where expert opinion has taken precedence over scientific evidence. It is therefore considered low quality evidence. Four pieces of legislation were included that were graded as 'Mandatory'.[6, 7, 9, 28] No primary evidence was included to answer this research question.	1 x AGREE: 'Recommend with Modifications' 12 x SIGN50 Level 4 – expert opinion 4 x SIGN50 'Mandatory'

10.2 Is the evidence consistent in its conclusions?

(see SIGN 50, section 5.3.2)

Comment here on the degree of consistency demonstrated by the evidence. Where there are conflicting results, indicate how the judgement was formed as to the overall direction of the evidence.

Comments

Two SIGN50 level 4 guidance documents consistently state that special (hazardous) and non-hazardous waste should not be transported together and that containers should remain shut during transport.[20, 21]

There was a lack of consistency in the included evidence as to how special (hazardous) waste should be transported:

- special (hazardous) waste should not be left unattended in publicly accessible areas (SIGN50 level 4)[20]
- damaged clinical waste bags should not be moved until placed in new, intact receptacles (SIGN50 level 4)[3]
- do not transport hazardous waste by hand (SIGN50 level 4),[21] including direct handling of Ebola waste (SIGN50 level 4)[37]
- do not use waste chutes (SIGN50 level 4),[21] but their role in transporting healthcare waste in Scottish health and care settings is not clear (SIGN50 level 4)[51]
- discouraged transportation of Ebola and Marburg waste, which may require precautions which are not described (AGREE 'recommend with modifications')[12]
- rigid transportation carts for Ebola and Marburg waste should contain absorbent material (SIGN50 level 4)[47]
- non-sharps waste should only be handled by the outer container and transportation carts with guard rails or raised edges used for large and heavy containers (SIGN50 level 4)[37]

Frequency of collection

Only one SIGN50 level 4 expert opinion document defines collection.[20] There was consistency on the following points regarding frequency of collection:

Comments

- two SIGN50 level 4 guidance documents state that collection should be scheduled[2, 21]
- two SIGN50 level 4 guidance documents state that waste containers should not be left to overflow[21, 60]

Additional recommendations regarding frequency of collection which were not consistent in the evidence base include:

- one SIGN50 level 4 guidance document states that time between collection should be "as short as reasonably practicable", infectious waste should be collected weekly or longer if the infectious waste is refrigerated[2]
- one SIGN50 level 4 guidance document states that frequency of collection should be according to quantity of waste produced, infectious waste should be collected daily and non-hazardous waste can be collected less frequently[21]

Transportation route

While Standards New Zealand (SIGN50 level 4) state that waste should not be transported through clinical areas,[20] the WHO (SIGN50 level 4) advise that transportation through clinical areas should be limited.[21] There was consistency in SIGN50 level 4 expert opinion guidance that Ebola or Marburg waste should be "properly contained" when being transported.[37, 70] CDC (SIGN50 level 4) signposts to packaging requirements for this purpose.[47]

Other recommendations on transportation route in SIGN50 level 4 guidance were not consistent:

- route should be determined by waste volume, number of bags/containers, waste type, storage and trolley capacity, distance and journey time[21]
- collection from "most hygienically sensitive medical areas" first[21]
- routes are reliable[21]
- routes are well-lit and easy to use[20]

Transportation carts

There was consistency in three SIGN50 level 4 guidance documents that transportation carts are leak-proof[18, 20, 21] two state that they be labelled,[20, 21] and

Comments
two state that they are assigned to a waste stream to prevent contamination.[3, 21] Further recommendations were made by the WHO (SIGN50 level 4), including that they are easy to load and unload, have no sharp edges, are easy to move, sized relative to volume of waste being transported, enclosed with drainage and plug.[21] **Checks following transportation** Two SIGN50 level 4 expert opinion documents address checks that should be carried out following transportation but were not consistent: • receptacle seals should be checked for damage[21] • trolleys and carts should be checked for damage after use[20] Furthermore, it is consistently recommended in three SIGN50 level 4 guidance documents that transportation carts are kept clean.[2, 3, 21] **Legislative requirements** Four SIGN50 level 4 expert opinion guidance documents provide guidance on compliance with the following mandatory legislation, the consistency of which was not assessed:[1-4] • Special Waste Regulations 1996 (as amended)[28] • Environmental Protection Act 1990[6] • Environmental Protection (Duty of Care) (Scotland) Regulations 2014[9] • COSHH 2002[7]

10.3 Is the evidence applicable to Scottish health and care settings?

(see SIGN 50, section 5.3.3)

For example, do the studies include interventions, comparators or outcomes that are common to Scottish health and care settings?

Comments
Of the guidance included, four are directly applicable to Scotland,[2, 4, 51, 60] and two to the UK[1, 3] including Scotland except where Scottish legislation diverges. Two guidance documents were included that are published by the WHO so are

Comments
applicable internationally to settings with differing levels of resource which may limit direct applicability to high resource Scottish settings.[12, 21] Applicability of the remaining guidance from the US,[18, 47, 70] Canada,[37] and standards from New Zealand[20] is not clear given the role of national legislation in waste management policy. Two guidance documents support compliance with legislation and are not health and care setting-specific.[1, 4] Remaining guidance was applicable to health and care settings.[2, 3, 18, 20, 21, 37, 47, 51, 60, 70] None of these guidance documents explicitly address transportation of waste in care settings. There were three pieces of UK legislation[6, 7, 28] and one piece of Scottish legislation[9] included, none of which are specific to health and care settings but are applicable in Scotland.

10.4 Are the studies generalisable to the target population?

Comment here on sample size and methods of sample selection. Is the sample representative of the specific population/group of interest? Generalisability is only relevant to primary research studies.

Comments
No primary studies were included for this research question, so factors determining generalisability such as sample size and methods do not apply.

10.5 Are there concerns about publication bias?

(see SIGN 50, section 5.3.5)

Comment here on whether there is a risk in the evidence base that studies have been selectively published based on their results (and thus a risk that results from published studies are systematically different from unpublished evidence).

Comments
Publication bias is not of concern for evidence included for this research question.

B: Evidence to Decision

10.6 Recommendations

What Recommendations or Good Practice Points are appropriate based on this evidence?

Note the following terminology:

- **"must"** implies that the health and care setting must implement the recommended approach and is used where a recommendation has been directly lifted from legislation or mandatory guidance
- **"should"** implies that the health and care setting "should" implement the recommended approach unless a clear and compelling rationale for an alternative approach is present
- **"should consider"** implies that the health and care setting should consider implementing the recommended approach

Recommendation	Grading
GPP10.1 When transporting waste receptacles around the health and care setting: • Receptacles should be handled with care and held away from the body. • Bags should only be handled by the neck and must not be dragged or thrown.	Good Practice Point
GPP10.2 Special (hazardous) waste should not be left unattended whilst being transported in a health and care setting.	Good Practice Point
GPP10.3 Damaged waste bags containing infectious clinical waste should be placed within a new, intact receptacle/bag.	Good Practice Point
GPP10.4 Trolleys, carts or any other containers used to transport waste in health and care settings should be easy to clean. Containers for transporting	Good Practice Point

Recommendation	Grading
waste should be able to hold any liquid waste spills should they occur, for example enclosed with drainage and plug.	
GPP10.5 Trolleys, carts or any other containers used for transporting waste must be kept clean and be included in cleaning schedules. Transport containers should be steam-cleaned or disinfected regularly as per SHTN 03-01 guidance.	Good Practice Point
GPP10.6 Different waste streams being transported from intermediate to bulk storage should remain segregated and not be collected in the same trolley, cart or container in health and care settings.	Good Practice Point
GPP10.7 Waste bags should be transported from intermediate to bulk storage in trolleys, carts or containers for that intended purpose, rather than carried by hand.	Good Practice Point
GPP10.8 When transporting healthcare waste in a secondary trolley, cart or container from intermediate to bulk storage, staff should ensure that these are loaded safely and not over filled.	Good Practice Point
GPP10.9 Waste collections from intermediate and bulk storage should be scheduled, accounting for quantity of waste produced, to prevent accumulation of waste in storage areas. Time between waste collections should be as short as reasonably practicable.	Good Practice Point
GPP10.10 Waste being transported from intermediate storage from multiple care areas within the same facility to bulk storage should not be transported through clinical areas where	Good Practice Point

Recommendation	Grading
possible. Identified routes should be used specifically for the purpose of waste transportation.	
R10.1 Staff transporting waste in health and care settings must be provided with appropriate PPE. The items of PPE required should be determined by risk assessment.	Recommendation
R10.2 Consignment notes should be provided with special (hazardous) waste being transported out-with the health or care setting, with requirements detailed in SHTN 03-01.	Recommendation

10.7 Balancing benefits and harms

Comment here on the potential impact of the Recommendation or Good Practice Point on service users, visitors and staff. Benefits and harms include considerations beyond IPC.

Benefits

List the favourable changes in outcome that would likely occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about pros.

Benefits
GPP10.1 Handling waste receptacles with care and holding them away from the body may reduce the risk of staff exposure to potentially infectious or harmful agents from the outside of waste receptacles. GPP10.1 Carrying waste bags by the neck rather than dragging them along the floor may prevent waste spills and contamination of the health or care environment. GPP10.1 Handling waste bags by the neck rather than throwing them may reduce the risk of damage to the waste bag and therefore prevent waste spills and contamination of the environment.

Benefits
GPP10.2 Ensuring that special (hazardous) waste is attended at all times during transport, may reduce the risk of unauthorised access and/or exposure to potentially infectious or harmful agents. GPP10.3 Transferring split or damaged waste bags into new, intact receptacles using the appropriate precautions may reduce the risk of environmental contamination through waste spills and/or patient, service user, staff and visitor exposure to potentially infectious or harmful agents. GPP10.4 Trolleys, carts or containers with drainage and plug features support effective cleaning, which may reduce the risk of cross contamination and staff exposure to potentially infectious or harmful agents. GPP10.4 Trolleys, carts or containers that contain waste spills may reduce the risk of environmental contamination and/or patient, service user, staff and visitor exposure to potentially infectious or harmful agents. GPP10.5 Maintaining the cleanliness of transportation trolleys, carts or containers may reduce the risk of cross contamination and/or staff exposure to potentially infectious or harmful agents. GPP10.6 Continued segregation of waste during transportation on site facilitates the ongoing correct management of waste streams and safe management of any waste spills. GPP10.7 Transportation of waste bags from intermediate to bulk storage by trolley, cart or container enables fast removal in large quantities which may reduce the risk of environmental contamination and/or patient, service user, staff and visitor exposure to potentially infectious or harmful agents through accumulation of waste. GPP10.7 Transportation of waste bags in a trolley, cart or container that will contain spills, may reduce the risk of environmental contamination and/or patient, service user, staff and visitor exposure to potentially infectious or harmful agents. GPP10.8 Safe loading of trolleys, carts or containers for transporting waste may reduce the risk of waste spills and therefore potential environmental

Benefits
contamination and/or patient, service user, staff and visitor exposure to potentially infectious or harmful agents. GPP10.9 Scheduled waste collections may reduce the risk of waste receptacles becoming overfilled in clinical and storage areas therefore, reducing the risk of environmental contamination and/or patient, service user, staff and visitor exposure to potentially infectious or harmful agents. GPP10.10 Identifying planned routes for the transportation of waste from intermediate to bulk storage which limit movement through clinical areas, may reduce the risk of cross contamination and/or patient, service user, staff and visitor exposure to potentially infectious or harmful agents. R10.1 Adherence to current legislation and regulations facilitates compliance with associated corporate and social governance responsibilities, including legal requirements for health and safety and waste management. R10.2 Adherence to SHTN 03-01 facilitates compliance with associated corporate and social governance responsibilities, including the legal requirements of the applicable health and safety and waste management.

Risks and harms

List the adverse events or other unfavourable outcomes that may occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about cons.

Risks/Harms
GPP10.1, GPP10.2, GPP10.3, GPP10.4, GPP10.5, GPP10.6, GPP10.7, GPP10.8, GPP10.9, GPP10.10, R10.1 and R10.2 No risks or harms identified.

Benefit-Harm assessment

Classify as “benefit outweighs harm” (or vice versa) or a “balance of benefit and harm.” Description of this balance can be from the individual service user/staff/visitor perspective, the societal perspective, or both. Recommendations or Good Practice Points are possible when clear benefit is not offset by important harms, costs or adverse events (or vice versa).

Benefit-Harm assessment
GPP10.1, GPP10.2, GPP10.3, GPP10.4, GPP10.5, GPP10.6, GPP10.7, GPP10.8, GPP10.9, GPP10.10, R10.1 and R10.2 Only benefits identified.

10.8 Feasibility

Is the Recommendation or Good Practice Point implementable in the Scottish context?

Describe (if applicable) financial implications, opportunity costs, material or human resource requirements, facility needs, sustainability issues, human factors etc., that may be associated with following a Recommendation or Good Practice Point. State clearly if information on feasibility is lacking.

Feasibility
GPP10.1, GPP10.2, GPP10.3, GPP10.4, GPP10.5, GPP10.7, GPP10.8, GPP10.9, GPP10.10, R10.1 and R10.2 Human resource for education, training and audit will be required to support the implementation of safe waste management practice within health and care settings. However, for most settings these practices are already established. GPP10.4, GPP10.5, GPP10.6, GPP10.7 and GPP10.8 Suitable equipment in sufficient numbers will be required which may have financial implications. GPP10.9 Reliance on waste contractor fulfilling scheduled waste collection duties to ensure waste is not left to accumulate. GPP10.10 Some health and care settings may not be designed to allow for separate service routes for the purpose of transporting waste.

10.9 Expert Opinion

Summarise the expert opinion used in creating the Recommendation or Good Practice Point. If none were involved, state “none”. Translating evidence into action often involves expert opinion where evidence is insufficient. Clearly outlining that expert opinion helps users understand their influence on interpreting objective evidence. Expert opinion may also be required where there is no evidence available.

Expert opinion

GPP10.1 Although the WHO advise against transportation of waste by hand,[21] it is the expert opinion of ARHAI Scotland and its stakeholders that it will sometimes be necessary. For example, when transporting healthcare waste bags from the clinical area to intermediate storage. As such, it is the expert opinion of ARHAI Scotland and its stakeholders that such receptacles should be transported as described in GPP10.1, as per benefits listed in section 10.7.

GPP10.2 ARHAI Scotland and its stakeholders support expert opinion guidance advising against leaving special (hazardous) waste unattended during transportation in a health or care setting.[20]

GPP10.3 ARHAI Scotland and its stakeholders support expert opinion guidance advising that damaged clinical waste bags should not be transported until placed into a new, intact receptacle.[3]

GPP10.4 Recommendations for features of trolleys, carts or containers used to transport waste in health and care settings are made in extant guidance.[3, 18, 20, 21] However, the evidence base underlying these recommendations and IPC benefit is not clear. ARHAI Scotland and its stakeholders support expert opinion guidance stating that waste transportation containers should be kept clean[2, 3, 21] therefore, supporting that they should have features that support cleaning like a drain and plug.

GPP10.5 ARHAI Scotland and its stakeholders support the guidance for cleaning on-site transport trolleys, carts or containers as outlined in SHTN 03-01.[2] It is the expert opinion of ARHAI Scotland and its stakeholders that regular monitoring and cleaning of these containers may reduce the risk of cross-contamination and staff exposure to potentially infectious or harmful agents. It is the expert opinion of ARHAI Scotland and its stakeholders that local policy and guidance should determine the responsibility, frequency and method of cleaning.

GPP10.6 Although expert opinion guidance advises that hazardous and non-hazardous waste, and different categories of hazardous waste, should be transported separately,[11, 20] this guidance does not specify if this refers to transportation from the clinical area or intermediate storage. It is the expert opinion of ARHAI Scotland and its stakeholders that it should only be necessary to

Expert opinion

transport different waste streams in separate trolleys, carts or containers when transporting waste from intermediate to bulk storage. Waste being transported from clinical areas to intermediate storage is managed in small quantities generally by hand which will be easy to identify and segregate appropriately. Waste being transported from intermediate to bulk storage is managed in large quantities therefore, mixing waste streams in this instance may increase the risk of subsequent incorrect segregation and complicate risk assessment when dealing with any waste spills.

GPP10.7 Although the WHO advise against transportation of waste by hand,[11] it is the expert opinion of ARHAI Scotland and its stakeholders that in Scottish settings, this only applies to transportation of larger volumes of waste from intermediate to bulk storage.

GPP10.8 Although expert opinion guidance suggests that waste transportation containers are shut or securely closed whilst waste is being transported on-site.[11, 20] It is the expert opinion of ARHAI Scotland and its stakeholders that ensuring safe loading and not overfilling secondary transportation containers should be sufficient support safe transportation of waste.

GPP10.9 ARHAI Scotland and its stakeholders support expert opinion guidance advising scheduled waste collection[2, 11] including SHTN 03-01 specifying that time between waste collections should be as short as reasonably practicable.[2] There was conflicting evidence regarding collection frequency for infectious clinical waste which may depend on local circumstances such as refrigerated storage,[2, 11] so a specific recommendation is not made. Although the evidence did not specify scheduled waste collections for collection from intermediate or bulk storage,[2, 11] it is ARHAI expert opinion that waste collections should be scheduled for both.

GPP10.10 Expert opinion guidance advises limiting transportation of waste through clinical areas.[20] However, this may not always be possible, for example when transporting a sealed infectious clinical waste bag from the clinical area to intermediate storage. Therefore, it is the expert opinion of ARHAI Scotland and its stakeholders that this only applies for waste being transported in trolleys, carts or

Expert opinion
containers from intermediate to bulk storage. ARHAI Scotland supports WHO guidance advising that planned routes should be used.[21] R10.1 This recommendation is based off of COSHH Regulations, graded as Mandatory,[7] and supporting interpretation of these regulations in SHTN 03-01.[2] Therefore, there is sufficient evidence to support this recommendation, no expert opinion to note. R10.2 Mandatory legislation requires waste producers to provide consignment notes for special (hazardous) waste[28] which is interpreted in SHTN 03-01.[2] Therefore, evidence is sufficient and expert opinion is not required.

10.10 Value judgements

Summarise value judgements used in creating the Recommendation or Good Practice Point. If none were involved, state “none”. Translating evidence into action often involves value judgements, which include guiding principles, ethical considerations, or other beliefs and priorities. Clearly outlining value judgements helps users understand their influence on interpreting objective evidence.

Value judgements
GPP10.1, GPP10.2, GPP10.3, GPP10.4, GPP10.5, GPP10.6, GPP10.7, GPP10.8, GPP10.9, GPP10.10, R10.1 and R10.2 No value judgements to note.

10.11 Intentional vagueness

State reasons for any intentional vagueness in the Recommendation or Good Practice Point. If none was intended, state “none”. Recommendations and Good Practice Points should be clear and specific, but if there is a decision to be vague, acknowledging the reasoning clearly promotes transparency. Reasons for vagueness may include inadequate evidence; inability to achieve consensus regarding evidence quality, anticipated benefits/harms, or interpretation of evidence; legal considerations; economic reasons; ethical/religious reasons.

Intentional vagueness
GPP10.1, GPP10.2, GPP10.3, GPP10.4, GPP10.5, GPP10.6, GPP10.7, GPP10.8, GPP10.9, GPP10.10, R10.1 and R10.2 No intentional vagueness to note.

Intentional vagueness
GPP10.9 Collection frequency is not specified, as this will be determined by local risk assessment. GPP10.10 Intentionally vague regarding identified routes, as these will be dependent on local circumstance.

10.12 Exceptions

List situations or circumstances in which the Recommendation or Good Practice Point should not be applied.

Exceptions
GPP10.1, GPP10.2, GPP10.3, GPP10.4, GPP10.5, GPP10.6, GPP10.7, GPP10.8, GPP10.9, GPP10.10, R10.1 and R10.2 No exceptions to note. GPP10.10 Some healthcare facilities may not have separate service routes for the purpose of transporting waste in which case, waste should only be transported through clinical areas during quiet periods.

10.13 Recommendations for research

List any aspects of the question that require further research.

Recommendations for research
It was not always clear in extant guidance when recommendations for transportation of waste within a healthcare setting applied to transportation from the clinical area to intermediate storage, from intermediate to bulk storage or both. Further clarification on how recommendations for transportation of waste differ between these two distinct stages in waste management would be beneficial.

Research Question 11: How should waste be stored prior to uplift for disposal in health and care settings?

A Quality of Evidence

11.1 How reliable is the body of evidence?

(see SIGN 50, section 5.3.1, 5.3.4)

Comment here on the quantity of evidence available on this topic and its methodological quality. Please include citations and evidence levels.

If there is no available evidence to answer the key question, go to section B.

Comments	Evidence level
In total, there were 20 pieces of evidence that addressed waste storage. One guidance document was graded as AGREE: 'Recommend with Modifications', as systematic reviews were used to identify evidence supporting recommendations, but some methodological detail was lacking.[12] 17 documents were graded SIGN50 Level 4, expert opinion[2-4, 16, 18, 20, 21, 33, 36, 47, 52, 54, 60, 71-74] and has potential bias given little detail is provided regarding how recommendations were formulated and it is not always clear where expert opinion has taken precedence over scientific evidence. It is therefore considered low quality evidence. Remaining evidence included two legislations graded as 'Mandatory'.[6, 9] No primary evidence was included to answer this research question.	17 x SIGN50 Level 4 – expert opinion 1 x AGREE: 'Recommend with Modifications' 2 x SIGN50 'Mandatory'

11.2 Is the evidence consistent in its conclusions?

(see SIGN 50, section 5.3.2)

Comment here on the degree of consistency demonstrated by the evidence. Where there are conflicting results, indicate how the judgement was formed as to the overall direction of the evidence.

Comments

Legislative requirements

SHTN 03-01 (SIGN50 level 4) signposts to the following mandatory legislation that waste storage in Scotland should comply with,[2] the consistency of which was not assessed:

- The Environmental Protection Act 1990[6]
- The Environmental Protection (Duty of Care) (Scotland) Regulations 2014[9]

Three SIGN50 level 4 expert opinion guidance documents support compliance with this legislation.[2, 4, 16]

The following recommendations regarding waste storage were made consistently in SIGN50 level 4 expert opinion guidance:

- storage capacity relative to frequency of collection[2, 21, 54, 60]
- storage capacity relative to the amount and type of waste produced[21, 54, 60]
- contingency arrangements should be made to account for storing unpredicted increases in volume of waste[21, 33, 60]
- designated storage should be easy to clean[20, 21, 54, 60]

The following recommendations were also made in SIGN50 level 4 expert opinion guidance, but there was a lack of consistency:

- storage should be large enough that it can be accessed by the required personnel and they can enter and move around[20]
- waste may be stored in vehicles as part of contingency planning, containers should be stored upright and waste bags should not be compressed[3]
- PPE should be worn when entering waste storage, including industrial boots and heavy-duty gloves[21]

Comments

Three SIGN50 level 4 expert opinion guidance documents differentiated between intermediate storage and bulk storage.[2, 20, 21]

Three SIGN50 level 4 guidance documents are consistent in stating that intermediate storage should be secure, not publicly accessible, and large enough to allow waste segregation.[2, 54, 60]

Recommendations made in SIGN50 level 4 expert opinion guidance for bulk storage in health and care settings are more extensive. The following recommendations are consistent:

- well-lit and ventilated[2, 18, 20, 21]
- located away from food preparation, general storage areas, and publicly accessible routes[2, 20, 21]
- fully enclosed and secure[2, 16]
- structured to enable separate storage of waste streams[2, 21, 33, 54, 60]
- on a well-drained, impervious hard-standing [2, 4, 20, 21, 36]
- readily accessible, but only to authorised people[2, 20, 21, 33]
- inaccessible to animals and free from insects or rodents[2, 4, 18, 20, 21, 33]
- provided with wash-down facilities[2, 36]
- provided with washing facilities for employees[2] such as a hand wash basin with running water and a tap[21]
- clearly marked with warning signs[2, 21]
- contain separate labelled areas for waste according to disposal route[2, 20]
- drained to a sewer[2, 21]

Whereas the following recommendations are only made in SHTN 03-01 (SIGN50 level 4):[2]

- kept locked when not being used
- provided with access to first-aid facilities
- large enough to enable secure separate storage of sharps containers and medicinal waste

Comments
There was a lack of consistency in SIGN50 level 4 expert opinion guidance recommending waste storage in dirty utility rooms.[21, 52, 54, 71-74] Three SIGN50 level 4 expert opinion guidance documents are consistent in stating that refrigerated infectious waste can be stored for a longer period before collection[2, 20, 21] and two SIGN50 level 4 expert opinion guidance documents state that anatomical waste should be stored under similar conditions as infectious waste.[3, 21] Whereas the evidence consistently advises that Category A infectious waste should not be stored for more than 24 hours (SIGN50 level 4, AGREE 'recommend with modifications').[2, 12] There was also a lack of consistency in the following recommendations for infectious waste made in SIGN50 level 4 guidance: • hazardous waste storage should be labelled with a biohazard sign, have special waste drainage if possible, and have surfaces that can be disinfected easily[21] • infectious waste should not be stored outside unless no alternative is available, environmental risk assessments have been carried out, container lids remain on and locked and containers are on impermeable surfaces with sealed drains[3] • Category A infectious waste should be stored securely with limited access[2] • Ebola and Marburg waste should only be accessible to waste contractors[47]

11.3 Is the evidence applicable to Scottish health and care settings?

(see SIGN 50, section 5.3.3)

For example, do the studies include interventions, comparators or outcomes that are common to Scottish health and care settings?

Comments
Of the guidance included, four are directly applicable to Scotland[2, 4, 60, 71] and ten to the UK [2, 3, 16, 33, 36, 52, 54, 72-74] including Scotland except where Scottish legislation diverges. Two guidance documents were published by the WHO so are applicable internationally to settings with differing levels of resource which may limit direct

Comments
applicability to high resource Scottish settings. Applicability of the remaining guidance from the US,[18, 47] and New Zealand standards[20] is not clear given the role of national legislation in waste management policy. One guidance document supports compliance with Scottish legislation so is not healthcare setting specific.[4] Remaining guidance is applicable to health[2, 3, 12, 18, 20, 21, 47, 54, 60] and care settings.[16, 33, 36] Guidance by the Department of Health is specific to surgical settings,[52] inpatient settings,[72] renal wards[73] and clinical support spaces.[74] There was one piece of UK legislation[6] and one piece of Scottish legislation[9] included, and neither are specific to health and care settings.

11.4 Are the studies generalisable to the target population?

Comment here on sample size and methods of sample selection. Is the sample representative of the specific population/group of interest? Generalisability is only relevant to primary research studies.

Comments
No primary studies were included for this research question, so factors determining generalisability such as sample size and methods do not apply.

11.6 Are there concerns about publication bias?

(see SIGN 50, section 5.3.5)

Comment here on whether there is a risk in the evidence base that studies have been selectively published based on their results (and thus a risk that results from published studies are systematically different from unpublished evidence).

Comments
Publication bias is not of concern for evidence included for this research question

B: Evidence to Decision

11.6 Recommendations

What Recommendations or Good Practice Points are appropriate based on this evidence?

Note the following terminology:

- **"must"** implies that the health and care setting must implement the recommended approach and is used where a recommendation has been directly lifted from legislation or mandatory guidance
- **"should"** implies that the health and care setting "should" implement the recommended approach unless a clear and compelling rationale for an alternative approach is present
- **"should consider"** implies that the health and care setting should consider implementing the recommended approach

Recommendation	Grading
R11.1 Healthcare waste must be stored securely. Waste should not be allowed to accumulate in corridors, within care areas, or other publicly accessible areas.	Recommendation
GPP11.1 Waste storage room capacity should take into consideration the quantity and type of waste produced. Waste storage rooms should be large enough to accommodate segregation of waste streams and for staff to be able to enter and move around.	Good Practice Point
GPP11.2 Local arrangements should be in place to manage and store unpredicted increases in volume of waste such as that associated with outbreak or contingency events, or when scheduled waste collection is not able to be carried out. Special (hazardous) waste should not be stored outside.	Good Practice Point

Recommendation	Grading
GPP11.3 Intermediate and bulk storage should be secure and inaccessible to the public. Wheeled storage containers should be locked at all times except when being filled by staff.	Good Practice Point
GPP11.4 Requirements for bulk storage areas in health and care settings should be applied as described in SHTN 03-01.	Good Practice Point
GPP11.5 Specific storage requirements (i.e. refrigeration) for infectious clinical waste should be applied as described in SHTN 03-01.	Good Practice Point

11.7 Balancing benefits and harms

Comment here on the potential impact of the Recommendation or Good Practice Point on service users, visitors and staff. Benefits and harms include considerations beyond IPC.

Benefits

List the favourable changes in outcome that would likely occur if the Recommendation/Good Practice Point were followed correctly. Be explicit, clear about pros.

Benefits
R11.1 Secure storage of healthcare waste supports compliance with the Duty of Care regulations under the associated corporate and social governance responsibilities, including the legal requirements for health and safety and waste management. R11.1 Secure storage of healthcare waste minimises the risk of healthcare worker, service user and/or visitor exposure to potentially infectious or harmful agents. GPP11.1 Identifying a suitable area for waste storage taking into consideration the amount and type of waste produced, frequency of collection and capacity it

Benefits
will hold, may reduce the risk of waste overflow, incorrect segregation, staff compressing bags to fit into storage and contamination of the environment. GPP11.1 Establishing an area for waste storage which is large enough to allow entry and free movement by staff, may reduce the risk of slips and trips occurring within these areas and assist in the moving and handling of waste. GPP11.1 Storage areas that are large enough to accommodate the appropriate colour coded bins or containers ensure that waste remains segregated in storage which may reduce the risk of categories of special (hazardous) waste being mixed. GPP11.2 Contingency planning for waste storage reduces the likelihood of waste storage containers and storage spaces overflowing, and therefore reduces the risk of healthcare environmental contamination and of patient, staff, service user and visitor exposure to potentially infectious or harmful agents. GPP11.3 Secure storage areas reduces the risk of the public being exposed to special (hazardous) waste. GPP11.4 Adherence to SHTN 03-01 facilitates compliance with associated corporate and social governance responsibilities, including the legal requirements of applicable health and safety and waste management. GPP11.5 Adhering to guidance for storing infectious waste provided in SHTN 03-01 may reduce the risk of contamination of the healthcare environment with infectious agents and exposure to patients, staff, service users and visitors.

Risks and harms

List the adverse events or other unfavourable outcomes that may occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about cons.

Risks/Harms
R11.1, GPP11.1, GPP11.2, GPP11.3, GPP11.4 and GPP11.5 No risks or harms identified.

Benefit-Harm assessment

Classify as “benefit outweighs harm” (or vice versa) or a “balance of benefit and harm.” Description of this balance can be from the individual service user/staff/visitor perspective, the societal perspective, or both. Recommendations or Good Practice Points are possible when clear benefit is not offset by important harms, costs or adverse events (or vice versa).

Benefit-Harm assessment
R11.1, GPP11.1, GPP11.2, GPP11.3, GPP11.4 and GPP11.5 Only benefits identified.

11.8 Feasibility

Is the Recommendation or Good Practice Point implementable in the Scottish context?

Describe (if applicable) financial implications, opportunity costs, material or human resource requirements, facility needs, sustainability issues, human factors etc., that may be associated with following a Recommendation or Good Practice Point. State clearly if information on feasibility is lacking.

Feasibility
GPP11.1 Waste storage capacity would require consideration during design for construction or refurbishment. R11.1, GPP11.2, GPP11.3 and GPP11.5 Human resource will be required to plan, educate and implement safe waste management processes. However, for most settings these practices are already established. GPP11.3 and GPP11.4 Suitable equipment in sufficient numbers will be required which may have financial implications

11.9 Expert Opinion

Summarise the expert opinion used in creating the Recommendation or Good Practice Point. If none were involved, state “none”. Translating evidence into action often involves expert opinion where evidence is insufficient. Clearly outlining that expert opinion helps users understand their influence on interpreting objective evidence. Expert opinion may also be required where there is no evidence available.

Expert opinion
R11.1 Waste storage requirements for health and care settings are determined by legislation which is graded as Mandatory[6, 9] and interpreted by guidance supporting compliance with this legislation by the Scottish Government[4] and SHTN 03-01[2] graded as Level 4. Therefore, there is sufficient evidence to support this recommendation, no expert opinion to note. GPP11.1 ARHAI Scotland supports expert opinion guidance regarding considerations of waste storage size.[2, 20, 21, 33, 54, 60] it is the expert opinion of ARHAI Scotland and its stakeholders that this also applies for intermediate storage of waste. GPP11.2 ARHAI Scotland supports extant guidance recommending contingency planning arrangements when increased volumes of waste need to be stored.[21, 33, 60] GPP11.3 ARHAI Scotland supports expert opinion guidance stating that both intermediate[2, 54, 60] and bulk waste storage[2, 20, 21] should be inaccessible to the public. It is the expert opinion of ARHAI Scotland and its stakeholders that when waste is stored in wheeled storage containers, that these should remain locked unless they are being filled. GPP11.4 ARHAI Scotland supports recommendations made for bulk healthcare waste storage in SHTN 03-01.[2] GPP11.5 ARHAI Scotland supports infectious waste storage requirements described in SHTN 03-01.[2]

11.10 Value judgements

Summarise value judgements used in creating the Recommendation or Good Practice Point; if none were involved, state “none”. Translating evidence into action often involves value judgements, which include guiding principles, ethical considerations, or other beliefs and priorities. Clearly outlining value judgements helps users understand their influence on interpreting objective evidence.

Value judgements
R11.1, GPP11.1, GPP11.2, GPP11.3, GPP11.4, GPP11.5, GPP11.6 and GPP11.7 No value judgements to note.

11.11 Intentional vagueness

State reasons for any intentional vagueness in the Recommendation or Good Practice Point. If none was intended, state “none”. Recommendations and Good Practice Points should be clear and specific, but if there is a decision to be vague, acknowledging the reasoning clearly promotes transparency. Reasons for vagueness may include inadequate evidence; inability to achieve consensus regarding evidence quality, anticipated benefits/harms, or interpretation of evidence; legal considerations; economic reasons; ethical/ religious reasons.

Intentional vagueness
R11.1, GPP11.1, GPP11.2, GPP11.3, GPP11.4, GPP11.5, GPP11.6 and GPP11.7 No intentional vagueness to note.

11.12 Exceptions

List situations or circumstances in which the Recommendation or Good Practice Point should not be applied.

Exceptions
R11.1, GPP11.1, GPP11.3, GPP11.4 and GPP11.5 No exceptions to note. GPP11.2 Special (hazardous) waste may be stored outside following a multi-disciplinary risk assessment if there is no alternative.

11.13 Recommendations for research

List any aspects of the question that require further research.

Recommendations for research
Lack of consistency in extant guidance regarding waste storage requirements for infection prevention and control purposes may be representative of the lack of research within the field. Environmental sampling studies of waste storage areas may offer insight into effective waste management practice in preventing environmental contamination. Studies measuring compliance with waste management protocol may offer insight into where lapses in protocol could result in environmental contamination. Retrospective studies of this type however would face feasibility issues, like auditing correct waste management.

Research Question 12: How should waste spillages be managed?

A Quality of Evidence

12.1 How reliable is the body of evidence?

(see SIGN 50, section 5.3.1, 5.3.4)

Comment here on the quantity of evidence available on this topic and its methodological quality. Please include citations and evidence levels.

If there is no available evidence to answer the key question, go to section B.

Comments	Evidence level
Ten documents were included, seven of which were graded SIGN50 level 4, expert opinion.[2, 3, 16, 20, 21, 36, 37] Expert opinion guidance has potential bias given little detail is provided regarding how recommendations were formulated, it is not stated that systematic methods were used to identify supporting evidence and it is not always clear where expert opinion has taken precedence over scientific evidence. It is therefore considered low quality evidence. Three documents were included which were graded as 'Mandatory'[7, 75, 76] as compliance is compulsory in Scotland. No primary evidence was included to answer this research question.	7 x SIGN50 level 4, expert opinion 3 x SIGN50 'Mandatory'

12.2 Is the evidence consistent in its conclusions?

(see SIGN 50, section 5.3.2)

Comment here on the degree of consistency demonstrated by the evidence. Where there are conflicting results, indicate how the judgement was formed as to the overall direction of the evidence.

Comments

Spill management

SHTN 03-01 (SIGN50 level 4) states that procedures should be in place to address spills,[2] and two SIGN50 level 4 guidance documents state that procedures should include how to handle waste safely and with required PPE.[2, 21]

Four SIGN50 level 4 guidance documents address how waste spills should be managed,[2, 21, 36, 37] but there was little consistency due to the differing level of detail provided:

- "appropriate", "enhanced" PPE should be worn to clean up EVD waste spills[37]
- WHO provide an example waste spill procedure,[21] but it is not clear if it is considered best practice
- infectious agent involved in spill should be identified in case evacuation is required[21]
- the area where an EVD waste spill has occurred should be made inaccessible to others until disinfected[37]
- sharps should not be picked up by hand[2, 21]
- spills in bulk storage in care homes should be immediately cleaned up[36]
- HTM 07-01 does not differentiate between protocols for managing waste spills and generic spills[3]

Training

Four SIGN50 level 4 guidance documents consistently recommend that staff dealing with spillages should be appropriately trained,[2, 16, 21, 37] one of which also recommends use of visual prompts.[2]

Spill kits

There was consistency across five SIGN50 level 4 guidance documents stating that employers should provide appropriate equipment for handling waste spills.[2, 16, 20, 21, 37] Four SIGN50 level 4 guidance documents describe specific items, but do not provide evidence supporting inclusion of these items:

- disinfectant[2, 16, 20, 21, 37]

Comments

- waste receptacles[2, 16, 20, 21]
- (disposable or single-use) gloves and overalls or apron[2, 16, 20]
- facemask or shield[20]
- items to contain the spill e.g. disposable cloths,[2] absorbent material[20, 21]
- "protective equipment" to secure the area (type not specified)[21]
- equipment for picking up spilled waste e.g. "means of collecting sharps" [2] or bucket and shovel[20]

Legislative requirements

SHTN 03-01 (SIGN50 level 4) signposts to mandatory legislation employers must follow regarding the reporting of waste spills and provision of appropriate PPE:[2]

- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR)[76]
- CEL 43 (2009)[75]
- COSHH 2002[7]

Consistency of this mandatory legislation has not been assessed.

12.3 Is the evidence applicable to Scottish health and care settings?

(see SIGN 50, section 5.3.3)

For example, do the studies include interventions, comparators or outcomes that are common to Scottish health and care settings?

Comments

One guidance document is directly applicable to Scotland,[2] and three to the rest of the UK.[3, 16, 36] Guidance published by the WHO is applicable internationally to settings with different levels of resource which may limit direct applicability to high resource Scottish settings.[21] However, applicability of New Zealand Standards[20] and Canadian guidance for acute care settings[37] is not clear given the role of national legislation in waste management in health and care settings.

Four documents are applicable to settings where healthcare waste is produced,[2, 3, 20, 21] one of which is NHSScotland specific.[2] One document is specific to Ebola

Comments
care in acute care settings[37] and two guidance documents included are specific to care homes,[16, 36] one of which also captures social care.[16] The two legislative documents included are applicable to employers throughout the UK.[7, 76] and the Chief Executive Letter is applicable in Scotland.[75]

12.4 Are the studies generalisable to the target population?

Comment here on sample size and methods of sample selection. Is the sample representative of the specific population/group of interest? Generalisability is only relevant to primary research studies.

Comments
No primary studies were included for this research question, so factors determining generalisability such as sample size and methods do not apply.

12.5 Are there concerns about publication bias?

(see SIGN 50, section 5.3.5)

Comment here on whether there is a risk in the evidence base that studies have been selectively published based on their results (and thus a risk that results from published studies are systematically different from unpublished evidence).

Comments
Publication bias is not of concern for evidence included for this research question.

B: Evidence to Decision

12.6 Recommendations

What Recommendations or Good Practice Points are appropriate based on this evidence?

Note the following terminology:

- **"must"** implies that the health and care setting must implement the recommended approach and is used where a recommendation has been directly lifted from legislation or mandatory guidance

- **“should”** implies that the health and care setting “should” implement the recommended approach unless a clear and compelling rationale for an alternative approach is present
- **“should consider”** implies that the health and care setting should consider implementing the recommended approach

Recommendation	Grading
GPP12.1 Spillages of waste should be cleaned up as soon as reasonably practicable.	Good Practice Point
GPP12.2 SHTN 03-01 should be followed regarding requirements for workplace-specific procedures for handling waste spills.	Good Practice Point
GPP12.3 When a waste spill occurs, assessment of infection risk should be undertaken to ensure necessary IPC measures are implemented.	Good Practice Point
GPP12.4 Spilled waste and any absorbent materials used to soak up this waste should be disposed of as infectious clinical waste. Where the waste spill has been risk assessed as non-hazardous, for example uncontaminated food or drink spillage, then absorbent material may be disposed of via non-hazardous waste stream.	Good Practice Point
GPP12.5 Sharps waste spills should not be picked up by hand.	Good Practice Point
GPP12.6 Training should be provided to those handling waste spills, and prompts such as posters may be used detailing spill procedures.	Good Practice Point
GPP12.7 Kits to manage waste spills should be available in healthcare facilities and in all vehicles carrying healthcare waste. Spill kits may include items to contain the spill, equipment for cleaning up spilled waste	Good Practice Point

Recommendation	Grading
and appropriate PPE. Local Board risk assessment should be undertaken to determine what specific items are required.	
GPP12.8 In the event of a waste spillage, the responsible person (trained staff) should manage spillages of blood/body fluids specifically by following Infection Control Precautions as outlined in the NIPCM, refer to Appendix 9 for the flowchart.	Good Practice Point
R12.1 Occupational exposure events involving waste spills must be reported to the Health & Safety Executive under Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013.	Recommendation

12.7 Balancing benefits and harms

Comment here on the potential impact of the Recommendation or Good Practice Point on service users, visitors and staff. Benefits and harms include considerations beyond IPC.

Benefits

List the favourable changes in outcome that would likely occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about pros.

Benefits
GPP12.1 Cleaning up a waste spill as soon as reasonably practicable may reduce the risk of patient, service user, staff and visitor exposure to potentially infectious or harmful agents and reduces the risk of slips, trips and falls. GPP12.1 Cleaning up a waste spill as soon as reasonably practicable allows staff to prioritise patient care and determine how the waste spill will be managed, as per GPP12.3 and GPP12.8. GPP12.2 Adherence to workplace-specific procedures for handling waste spills supports appropriate cleaning of the environment according to waste type.

Benefits
GPP12.2 Adherence with SHTN 03-01 supports compliance with associated corporate and social governance responsibilities, including the legal requirements of applicable health and safety and waste management. GPP12.3 Determining the infectious agent(s) involved in a waste spill ensures that the appropriate prevention and control measures can be applied if required, such as gathering the appropriate materials required and implementing evacuation of the area. GPP12.4 Disposal of spilled waste and absorbent materials used as infectious clinical waste ensures that waste items potentially contaminated with infectious agents are disposed of in the appropriate waste stream. GPP12.5 Not picking up sharps by hand may reduce the risk of sharps injury. GPP12.6 Appropriate training and educational resource prompts for waste (including sharps) spill procedures supports adherence with correct protocols. GPP12.7 Provision of spill kits in areas of health and care settings where waste is handled supports timely cleaning, which may reduce the risk of patient, staff, service user and visitor exposure to potentially infectious or harmful agents. GPP12.8 Adherence with the National Infection Prevention and Control Manual and Appendix 9 for management of waste spills ensures compliance with evidence-based guidance. R12.1 Adherence with Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 supports compliance with associated corporate and social governance responsibilities, including legal requirements for health and safety and waste management.

Risks and harms

List the adverse events or other unfavourable outcomes that may occur if the Recommendation or Good Practice Point were followed correctly. Be explicit, clear about cons.

Risks/Harms
GPP12.1, GPP12.2, GPP12.3, GPP12.4, GPP12.5, GPP12.6, GPP12.7, GPP12.8 and R12.1 No risks or harms identified.

Benefit-Harm assessment

Classify as “benefit outweighs harm” (or vice versa) or a “balance of benefit and harm.” Description of this balance can be from the individual service user/staff/visitor perspective, the societal perspective, or both. Recommendations or Good Practice Points are possible when clear benefit is not offset by important harms, costs or adverse events (or vice versa).

Benefit-Harm assessment
GPP12.1, GPP12.2, GPP12.3, GPP12.4, GPP12.5, GPP12.6, GPP12.7, GPP12.8 and R12.1 Only benefits identified.

12.8 Feasibility

Is the Recommendation or Good Practice Point implementable in the Scottish context?

Describe (if applicable) financial implications, opportunity costs, material or human resource requirements, facility needs, sustainability issues, human factors etc., that may be associated with following a Recommendation/Good Practice Point. State clearly if information on feasibility is lacking.

Feasibility
GPP12.3 There may be financial implications when disposing of items involved in a waste spill as infectious waste. GPP12.5 Human resource for education and training will be required to support the implementation of safe waste management practice within health and care settings. Specific procedures will depend on local policy overseen by the local board waste manager and available equipment. However, for most settings these practices are already established. GPP12.6 There may be financial implications relating to the procurement of suitable items for spill kits.

Feasibility
GPP12.1, GPP12.2, GPP12.4, GPP12.7, GPP12.8 and R12.1 None.

12.9 Expert Opinion

Summarise the expert opinion used in creating the Recommendation or Good Practice Point. If none were involved, state “none”. Translating evidence into action often involves expert opinion where evidence is insufficient. Clearly outlining that expert opinion helps users understand their influence on interpreting objective evidence. Expert opinion may also be required where there is no evidence available.

Expert opinion
GPP12.1 Although expert opinion guidance specified waste spills in bulk storage in care home settings should be cleaned up immediately,[36] it is ARHAI expert opinion that, although waste spillages should be cleaned promptly, this should not compromise patient care and appropriate planning should take place. GPP12.2 ARHAI Scotland supports workplace-specific waste spill procedure requirements, as per SHTN 03-01.[2] GPP12.3 WHO guidance states that infectious agents involved in waste spills should be determined in case evacuation of the area is required.[21] However, it is the expert opinion of ARHAI Scotland and its stakeholders that IPC measures to manage waste spills would be more extensive than just evacuation of the area and would include PPE selection and cleaning methods. GPP12.4 ARHAI Scotland supports disposal of spilled waste items and absorbent materials used in clean up as infectious waste, as per SHTN 03-01.[2] It is the expert opinion of ARHAI Scotland and its stakeholders that absorbent materials from waste spills risk assessed as non-hazardous can be disposed of via non-hazardous disposal routes. GPP12.5 ARHAI Scotland supports extant guidance, including SHTN 03-01, advising that sharps should not be picked up by hand.[2, 21] GPP12.6 ARHAI Scotland supports use of training and prompts to support waste spill procedures, as per expert opinion guidance.[2, 16, 21, 37]

Expert opinion
GPP12.7 Consistent with expert opinion guidance including SHTN 03-01,[2, 16, 20, 21, 37] ARHAI Scotland supports procurement of spill kits for managing waste spills in healthcare facilities and vehicles for waste transportation. While expert opinion guidance suggests some items which may be included to contain the spill, clean up the spilled waste items and PPE, this is low quality evidence and there is no primary evidence supporting inclusion of specific items. It is therefore the expert opinion of ARHAI Scotland and its stakeholders that local risk assessment should be undertaken to determine which items are required based on clinical activities being carried out and associated risks. R12.1 This recommendation is based on RIDDOR,[76] which is legislation, and a Chief Executive Letter[75] which require that work-related accidents are reported and are graded as Mandatory. Therefore, there no expert opinion is required.

12.10 Value judgements

Summarise value judgements used in creating the Recommendation or Good Practice Point. If none were involved, state “none”. Translating evidence into action often involves value judgements, which include guiding principles, ethical considerations, or other beliefs and priorities. Clearly outlining value judgements helps users understand their influence on interpreting objective evidence.

Value judgements
GPP12.1, GPP12.2, GPP12.3, GPP12.4, GPP12.5, GPP12.6, GPP12.7, R12.1 and R12.2 No value judgements to note.

12.11 Intentional vagueness

State reasons for any intentional vagueness in the Recommendation or Good Practice Point. If none was intended, state “none”. Recommendations and Good Practice Points should be clear and specific, but if there is a decision to be vague, acknowledging the reasoning clearly promotes transparency. Reasons for vagueness may include inadequate evidence; inability to achieve consensus regarding evidence quality, anticipated benefits/harms, or interpretation of evidence; legal considerations; economic reasons; ethical/ religious reasons.

Intentional vagueness
GPP12.1, GPP12.2, GPP12.3, GPP12.4, GPP12.5, GPP12.6, GPP12.7, R12.1 and R12.2 No intentional vagueness

12.12 Exceptions

List situations or circumstances in which the Recommendation or Good Practice Point should not be applied.

Exceptions
GPP12.5 Sharps may be picked up by hand if risk assessment determines this as the safest method for retrieval. GPP12.1, GPP12.2, GPP12.3, GPP12.4, GPP12.6, GPP12.7, GPP12.8 and R12.1 No exceptions to note.

12.13 Recommendations for research

List any aspects of the question that require further research.

Recommendations for research
No recommendations for research to note – research into environmental decontamination of health and care settings should be relevant to handling waste spills in these settings.

Definitions

Term used	Description	Evidence
Recommendation	In general, 'Recommendations' should be supported by high- to moderate-quality evidence. In some circumstances, however, 'Recommendations' may be made based on lower quality evidence when high-quality evidence is impossible to obtain, and the anticipated benefits strongly outweigh the harms or when the Recommendation is required by Legislation or Mandatory Guidance.	Sufficient evidence (SIGN50 level 1++, 1+, 2++, 2+, 3, 4* AGREE Recommend AGREE Recommend (with Modifications)) Legislation, or mandatory guidance
Good Practice Point	Insufficient evidence or a lack of evidence to make a recommendation but identified best practice based on the clinical/technical experience (expert opinion) of the Working Group, with a clear balance between benefits and harms.	Insufficient evidence + Working Group expert opinion OR No evidence + Working Group expert opinion
No Recommendation	Both a lack of pertinent evidence and an unclear balance between benefits and harms.	No evidence

* A Recommendation cannot be developed when there is only SIGN50 level 4 evidence available.

The considered judgement form and recommendation system are adapted from the following three guidance documents:

- Update to the Centers for Disease Control and Prevention and the Healthcare Infection Control Practices Advisory Committee Recommendation Categorization Scheme for Infection Control and Prevention Guideline Recommendations. (2019)
- Scottish Intercollegiate Guidelines Network (SIGN). A guideline developer's handbook. (2019)
- Grading of Recommendations, Assessment, Development and Evaluation (GRADE) Handbook. (2013)

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