

Personal Protective Equipment (PPE) for High Consequence Infectious Diseases (HCIDs) Literature Review

Executive Summary

Version 1.0

25 August 2025

Executive Summary

This literature review and related documents inform the National Infection Prevention and Control Manual (NIPCM) High Consequence Infectious Disease (HCID) Addendum. This literature review update and related documents replace the NIPCM Personal Protective Equipment (PPE) for Infectious Diseases of High Consequence (IDHC) literature review.

There are three documents to note:

- **Literature review** which provides a comprehensive review of the evidence.
- **Considered judgement forms** which outline the evidence base and expert opinion used to develop the recommendations and good practice points for each literature review research question. Also detailed are the benefits, potential harms, feasibility or implementation, value judgements, intentional vagueness, and exceptions associated with the recommendations and good practice points.
- **Evidence tables** which detail all the included studies and provide an assessment of the evidence for each research question of the literature review.

Scope

Research Questions

There are 12 research questions (RQ) in this literature review. Five new RQs were added in this update, which looked to define legislative requirements regarding PPE for HCID, the storage of PPE for HCID and the disposal or reprocessing of PPE after use when caring for patients with HCIDs. An RQ was also added to further address the definition of competency in regards to PPE for HCID and how this is measured.

- [RQ 1](#) defines high consequence infectious diseases and provides the UK HCID list.
- [RQs 2](#) and [4](#) provide an overview of legislative requirements for PPE for HCID and the preferred design features of PPE for HCID. No standards specific to

PPE used in HCID ensembles were identified, instead standards for each PPE item can be found in the relevant NIPCM literature review.

- [RQ 3](#) covers evidence that provides recommendations for HCID PPE ensembles. The ways in which items of PPE should be worn together as HCID ensembles is addressed in [RQ 5](#). Donning and doffing of HCID PPE ensembles is covered by [RQ 6](#).
- [RQs 7, 8, and 9](#) cover storage, waste disposal, and management or processing of reusable PPE.
- [RQs 10, 11, and 12](#) address training and competency of staff in the use of HCID PPE ensembles.

Change to Practice

The most notable change to practice introduced as a result of this update is the introduction of the UK unified HCID assessment PPE ensemble. This ensemble was developed through a series of published simulation exercises, has been agreed by four nations, and endorsed by the Advisory Committee on Dangerous Pathogens (ACDP).

Change to Recommendations (R) and Good Practice Points (GPP)

A good practice point outlining the UK unified HCID assessment PPE ensemble ([GPP3.1](#)) replaces recommendations for differing ensembles depending on infectious agent transmission route included in previous versions of this review. Additionally, previous recommendations to use risk assessment in PPE selection have been removed due to the development of the unified ensemble for all HCIDs. Furthermore, donning and doffing good practice points have been updated to reflect the recommended ensemble ([GPP6.1](#) and [GPP6.3](#)).

Good practice points were added as part of this update to highlight that only reusable PPE (wellington boots) used to care for a suspected HCID patient who ultimately returns a negative test result should be processed/disinfected and reused ([GPP9.1](#)). Until HCID status is known, reusable PPE (wellington boots) should be stored in a designated container ([GPP9.2](#)).

In previous versions of this review a recommendation stating the definition of competency regarding PPE was included. This have been removed during this update due to lack of evidence.

Recommendations regarding staff training ([R11.1](#) and [R11.3](#)) have been updated to include the training of staff that are to act as donning and doffing 'buddies'.

Summary of Recommendations (R) and Good Practice Points (GPP) based on current evidence

Research Question 1: What is the definition of a HCID?

This research question aimed to outline how high consequence infectious diseases are currently defined within the literature. The UK definition of a HCID is provided by the UK Health Security Agency (UKHSA) and is as follows:

- 'an acute infectious disease
- typically has high case-fatality rate
- may not have effective prophylaxis or treatment
- is often difficult to recognise and detect rapidly
- has the ability to spread in the community and within healthcare settings
- requires an enhanced individual, population and system response to ensure it is managed effectively, efficiently and safely.'

Research Question 2: What legislative requirements are in place regarding employers providing PPE for staff at risk of exposure to HCIDs?

R2.1 Employers (i.e. NHSScotland) must provide PPE in line with the Health and Safety at Work Act (1974), the Control of Substances Hazardous to Health (2002 as amended) regulations, and the

	Personal Protection Equipment at Work Regulations 1992 (as amended).
R2.2	Employers (i.e. NHSScotland) must provide training and information on how to use and store said PPE, in line with the Health and Safety at Work Act (1974), the Control of Substances Hazardous to Health (2002 as amended) regulations, and the Personal Protection Equipment at Work Regulations 1992 (as amended).
R2.3	Employees must comply with said legislation by ensuring that suitable PPE is worn correctly for the task being carried out in line with the Health and Safety at Work Act (1974), the Control of Substances Hazardous to Health (2002 as amended) regulations, and the Personal Protection Equipment at Work Regulations 1992 (as amended).

Research Question 3: What is the required PPE for HCIDs?

GPP3.1 For all HCIDs the recommended PPE ensemble should include:

- **fit-tested and fit-checked filtering face piece 3 (FFP3) respirator**
- **hood**
- **full-face visor**
- **long rear-fastening fluid-resistant surgical gown tied to the side**
- **wide, extra-long medium thickness plastic apron (such as worn for endoscopy)**
- **inner gloves**
- **middle gloves taped to the gown with microporous tape**
- **outer gloves**
- **wellington boots (a half- or one-size larger than wearer's usual size)**

GPP3.2 PPE worn for the care of patients with suspected or confirmed HCID should create a complete protective barrier to protect against contamination with, and infection transmission of, the infectious agent.

Research Question 4: What standards (EN) must PPE adhere to and what design features are desirable?

R4.1 All PPE intended for use in Scottish health and care settings must bear a CE mark that signifies compliance with the Personal Protective Equipment Regulations 2002.

R4.2 Any design characteristics of PPE worn to protect against HCIDs should not impact upon the protective effect or the ability of the wearer to perform tasks/duties associated with their job role.

GPP4.1 All PPE worn for protection against HCIDs should adhere to the relevant International and British Standards.

GPP4.2 Stock of PPE for protection against HCID should include a range of sizes.

GPP4.3 PPE worn to protect against HCIDs should be made of material that is resistant or impermeable to infectious agents and is compliant with relevant legislation and standards (as per [R4.1](#) and [GPP4.1](#)).

GPP4.4 Of the three layers of gloves worn in HCID PPE ensembles, the middle layer should be made with a longer length cuff.

GPP4.5 To aid in doffing, boots worn for protection against HCIDs should be a half- to one-size larger than the wearer's usual shoe size.

Research Question 5: Should different elements of PPE for HCID be integrated/interfaced and how should this be done i.e. use of tape?

R5.1 When it is necessary to wear more than one item of PPE for protection against HCID, these should be compatible and retain protective effect when worn together.

GPP5.1 When taping the middle pair of gloves to the gown (as is required in the UK unified HCID assessment PPE ensemble), micropore tape should be used. Four pieces of tape should be placed lengthwise (from wrist to elbow).

Research Question 6: How should PPE for HCID be donned and doffed?

GPP6.1 Before commencing the donning protocol HCWs should put on scrubs, and perform a personal risk assessment to ensure they:

- are hydrated and fed
- have been to the toilet
- feel well enough to enter the patient's room
- have removed extraneous items (i.e. jewellery, name badge, pens)
- have performed hand hygiene

GPP6.2 A detailed and pre-defined sequence for donning and doffing should be adopted, implemented and monitored by Scottish health and care settings.

GPP6.3 The following donning sequence should be followed, taking time to ensure each item is fitted correctly, adjusted to obtain a good fit and interfaces well with the other items of PPE:

1. wellington boots (a half- or one-size larger than wearer's usual size)

2. FFP3 respirator
3. Anti-infection hood
4. First pair of gloves (standard nitrile)
5. Gown – Do not use the inside tie, secure the Velcro fastening at the back of the neck, tie at the sides and ensure the gown cuffs fully overlap the bottom pair of gloves
6. Check for sufficient overlap of the gown over wellington boots (10-15cm)
7. Second pair of gloves (long cuffed), these should fully overlap the cuff of the gown
8. Tape the second pair of gloves to the gown using four strips of microporous tape placed lengthways
9. High grade, long length plastic apron. Tie ensuring a ‘high fit’ i.e. with the apron high up over the chest area
10. Visor. Ensure the band of the visor overlaps with the hood, showing no skin. Visors should wrap around the face and extend below the chin
11. Third pair of gloves (task specific)

GPP6.4 A trained observer or ‘buddy’ should run through each step to ensure each item of PPE is donned correctly; once all checks are complete the ‘buddy’ should record the time of HCW entering patient area.

GPP6.5 The following doffing sequence should be followed:

1. remove apron. Pull forward from the front of the apron to break the neck tie. Fold apron down on itself, hold at edges of apron and pull to break waist tie. Roll the apron in on itself taking care to touch the inside only
2. outermost gloves (third pair)

3. gown. Unfasten the side tie of the gown, remove by grabbing the shoulder areas with the opposite hands, pull away from the body folding inside out. The second pair of gloves (taped to sleeves of gown) should come off with the gown
4. visor. Stand straight, reach for the band at the back of the head and lift upwards and over the head (do not lean forward)
5. anti-infection hood – touching only the outer surface, slowly pull apart the Velcro tabs at the side of the hood and keep them in your vision, bend forward at the waist and lift the hood up and over the head
6. inner gloves
7. perform hand hygiene with ABHR (dispensed by a buddy)
8. FFP3 mask. Standing up straight, slide fingers under the bottom strap and move up to the top strap, lift these to the top of the head. Lift the straps over the top of the head and allow the mask to fall away
9. wellington boots
10. perform hand hygiene.

GPP6.6 A trained observer or ‘buddy’ should inspect the HCW PPE before doffing to check for damage or contamination, following a hands-off approach. They should assist the HCW with verbal prompts to ensure the correct doffing sequence is followed.

GPP6.7 Where contact with the HCW providing care is required during doffing by a trained observer or ‘buddy’ they should wear:

- Fluid resistant gown
- Type II fluid resistant surgical face mask
- Full-face visor
- Long cuffed gloves
- Wellington Boots

Where there is risk of aerosolization of an infectious agent the surgical face mask should be substituted for a fit-tested FFP3 respirator.

GPP6.8 Sharp instruments should not be used to assist in the removal of PPE.

GPP6.9 Removal of PPE should take place in a designated area, agreed locally (for example an amber zone), outwith the patient care area (red zone) and that can be easily decontaminated.

Research Question 7: How should PPE for HCID be stored?

- GPP7.1** PPE for HCIDs should be stored in a clean and dry, place where it can be easily accessed and not exposed to potentially damaging conditions.
- GPP7.2** Rotation of HCID PPE stock should be implemented to ensure there is no deterioration in protective effect as a result of stock passing its expiry date whilst in storage.
- GPP7.3** Health and care facilities should hold a stock of PPE that would be sufficient to care for a patient with a suspected or confirmed HCID for approximately 72 hours (local variation and transfer times should be considered) and to provide PPE for regular staff training.

Research Question 8: How should single-use PPE for HCID be disposed of?

- GPP8.1** PPE waste generated from caring for HCID patients must be disposed of as per SHTN 03-01.

Research Question 9: How should reusable PPE for HCID be managed/processed?

- GPP9.1** When a patient returns a positive HCID sample, reusable PPE (wellington boots) should be disposed of as per SHTN 03-01.
- GPP9.2** Any reusable PPE items (wellington boots) should have a defined disinfection protocol in place and be correctly stored.
- GPP9.3** Disinfectant products should be suitable for use against the identified infectious agent, compatible with the PPE item and used in accordance with the manufacturer's instructions.

GPP9.4 While awaiting patient results, reusable PPE (wellington boots) should be stored in a designated container before disinfection or disposal.

Research Question 10: How is ‘competence’/‘competency’ defined and measured regarding PPE for HCIDs?

Competence can be defined as:

‘the combination of training, skills, experience, and knowledge that a person has and their ability to apply them to perform activities safely to a recognised standard on a regular basis.’

Competency can be measured by ensuring staff meet knowledge and understanding, and performance criteria including:

- Knowing how to safely put on, remove, and dispose of PPE.
- Using all items of PPE according to manufacturers instructions and local policy.

Research Question 11: What training is required for staff to be considered ‘competent’ in the use of PPE for HCID and how frequently should staff be trained to remain competent?

R11.1 Training for both wearers and donning/doffing buddies must be formed of both theory and practice.

R11.2 Training for both wearers and donning/doffing buddies must include:

- How to correctly fit and wear all required PPE
- The purpose and limitations of the required PPE
- How to don, doff and dispose of all required PPE safely
- Procedures to follow if there is a breach in PPE

R11.3	Regular refresher training for both wearers and donning/doffing buddies should be provided to ensure HCWs remain competent in the requirements specified in R11.2 for PPE required for HCID.
R11.4	Training should be completed before staff care for suspected or confirmed HCID patients.
GPP11.1	The frequency of refresher training should be determined locally, but should occur at least annually as a minimum with consideration given to increasing frequency for staff groups most likely to come into contact with HCID patients.
GPP11.2	Records of who has undertaken training and when this occurred should be kept to monitor staff training.

Research Question 12: How should staff competency be assessed?

GPP12.1	Staff should be able to correctly perform all tasks related to wearing PPE for HCID including:
	<ul style="list-style-type: none"> • Donning PPE in the correct sequence • Doffing PPE in the correct sequence and using the correct techniques • Safely disposing of PPE
GPP12.2	Assessments should check and record correct completion of each step of PPE donning and doffing, and ensure the trainee understands the theory underpinning the process.
GPP12.3	Assessment of staff competency on donning and doffing should be supported by use of training checklists, assessment videos and other methods of knowledge and skills assessment.
GPP12.4	Staff should complete assessment of PPE for HCID competency, without assistance or prompting, without error.