

The Re-Use of Personal Protective Equipment

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Produced by: Frontline Collaboration Against COVID-19
Humanitarian Analysis, Guidance and Support for NHS
Workers

The Problem

Shortages and stock outs of PPE supplies has led to health workers considering the re-use of PPE.

Purpose of this guidance

To provide advice on the safe re-use of PPE in health care settings. Public Health England (PHE) states that the “reuse of PPE should be implemented until confirmation of adequate re-supply is in place”.

Who is this guidance for?

For the managers of facilities where PPE is being used and for health care workers who will wear it. Note this guidance is general and health workers should check with local protocols and guidance.

The rationale for selecting PPE

PPE comprises single-use and re-usable items. Recommended PPE for each setting is provided by Public Health England (PHE)¹ for health care workers in secondary health care, primary healthcare, outpatients, community and social care, ambulances, paramedics, transport and pharmacists.

Most clinical PPE are single-use items, apart from scrubs, face visors. Re-usable items can be cleaned and decontaminated prior to re-use.

¹ <https://www.gov.uk/government/publications/wuhan-novel-coronavirus-infection-prevention-and-control/covid-19-personal-protective-equipment-ppe>

The re-use of PPE in the UK

The latest guidance from Public Health England (PHE) on PPE aligns with current evidence and the Center for Disease Control (CDC)² and the World Health Organization (WHO)³ guidance on optimising the supply of personal protective equipment (PPE) and the use of PPE when in short supply. The Health and Safety Executive (HSE) has approved session and reuse of PPE in times of extreme shortages and where it is safe to do so. “Some of the PPE in the NHS COVID-19 Ensemble is designated by the manufacturers as being single use. However, the HSE recognises that some compromise is needed to optimise the supply of PPE in times of extreme shortages”.

HSE say there is a need for “documentation of how any re-use will be managed (recognising that some PPE is personal, for example FFP3/FFP2 respirators) and should include a record of systems of work to manage how integrity checks and decontamination processes are being carried out. It should also recognise that certain equipment (for example gloves and aprons) cannot be reused.

Organisations should ensure healthcare workers are appropriately hydrated during prolonged use and trained to recognise dehydration, fatigue and exhaustion while wearing PPE.

Further work on validating methods to safely reprocess masks and fluid repellent gowns is under way and future updates will be circulated when available”.

The use of PPE should be in line with the following principles:

- Only urgent or emergency face-to-face contacts in the health and social care setting.
- Where an individual has a multi-drug resistant or other key pathogen, transmission-based infection prevention control precautions should apply to prevent cross transmission to other individuals.

Sessional use of PPE¹

A single session is a period of time where the wearer is undertaking duties in a hot/red zone or other risk environment. This includes: a ward round, or taking observations of several patients in a cohort bay or ward. The length of a session will depend on the clinical activity, and the session ends when the wearer leaves this setting. Note that people should be well-hydrated before donning (putting on PPE) as once on they will not be able to drink again until they have doffed (undressed).

While generally considered good practice, there is no evidence to show that discarding disposable respirators, facemasks or eye protection in between each patient reduces the risk of infection transmission to the health and social care worker or the patient. Indeed, frequent handling of this equipment to discard and replace it could theoretically increase risk of exposure in high demand environments, for example, by leading to increasing face touching during removal. The rationale for recommending sessional use in certain circumstances is therefore to reduce risk of inadvertent indirect transmission, as well as to facilitate delivery of efficient clinical care.

PPE should not be subject to continued use if damaged, soiled, compromised, uncomfortable or in other circumstances (outlined in section 10¹), and a session should be ended. The duration of a session and the use of PPE items should not exceed manufacturer instructions. Appropriateness of

² [CDC strategies for US-healthcare settings on COVID-19: Strategies for Optimizing the Supply of PPE](#)

³ [WHO's guidance on the Rational use of personal protective equipment for coronavirus disease 2019](#)

single versus sessional use is dependent on the nature of the task or activity being undertaken and the local context.’

Reuse of PPE

Scrubs

Cotton scrubs offer a comfortable base layer, can be laundered and re-used.

Gowns & Coveralls⁴.

Fluid repellent hospital gowns or coveralls are indicated for use for the care of patients in high risk areas, where aerosol generating procedures (AGPs) are being performed.

Gowns: Disposable fluid repellent long-sleeved gowns are for single use or for single session use in certain circumstances (section 6¹) but should be discarded at the end of a session or earlier if damaged or soiled.

Coveralls: Single-use, disposable. Disposable fluid repellent coveralls are an alternative to long sleeved fluid repellent gowns for aerosol generating procedures or when working in higher risk acute areas¹.

Disposable fluid repellent coveralls or long-sleeved gowns are for single use or for single session use in certain circumstances (section 6¹) but should be discarded at the end of a session or earlier if damaged or soiled.

Alternatives: There are 3 main options that can be considered if gowns are not available:

- Reserve disposable, fluid repellent gown or coveralls for AGPs and surgical procedures.
- Disposable, non-fluid repellent gowns or coveralls with a disposable plastic apron for high-risk settings and AGPs with forearm washing once gown or coverall is removed.
- Reusable (washable) surgical gowns or coveralls or similar suitable clothing (for example, long-sleeved laboratory coat, long-sleeved patient gown or industrial coverall) with a disposable plastic apron for AGPs and high-risk settings with forearm washing once gown or coverall is removed. These would need to be washed in a hospital laundry and capacity for hospital laundries may need to be increased. If the gown or coverall becomes visibly soiled, it must be disposed of as infectious waste (followed by hand hygiene, donning of a new gown, and appropriate donning of new gloves).

The following important factors would safely reduce gown usage over a session but organisations should develop an implementation and action plan suitable to their organisation:

- Label all higher risk area bays, single rooms, corridors, treatment rooms and nurses’ stations as ‘clinical’ areas within a specific hospital area. Limit ‘non-clinical’ areas to staff kitchen/rest areas and changing room.
- Once gown or coverall is donned, the gown/coverall should remain on the staff member until their next break. Plastic aprons and gloves should be changed between patients (with the notes from aprons highlighted below).

⁴ <https://www.gov.uk/government/publications/wuhan-novel-coronavirus-infection-prevention-and-control/managing-shortages-in-personal-protective-equipment-ppe> (accessed 26/04/2020)

- Staff should doff the gown or coverall only when going from the clinical to non-clinical area of the ward, or if they are leaving the ward for a break.
- If leaving a higher risk area/theatre ward with a patient to transfer them to another area staff should retain their gown or coverall and other PPE.
- Teams that assist with turning and moving patients (“proning teams”), allied health professionals and other teams should retain gowns or coveralls on sessional basis, changing gloves/aprons between patients/residents and performing hand hygiene.

Reuse of gowns and coveralls

Consider shifting disposable gowns or coveralls to reusable options, retaining disposable gowns only for high risk AGPs, if laundry capacity allows, options include:

- reusable gowns
- reusable (washable) laboratory coats
- reusable (washable) long sleeved patient gowns
- reusable coveralls

Footwear

Rubber boots should be flexible and comfortable for wearers, and seamless boots were preferred to aid decontamination. White or bright colours (not red) were the preferred option as contamination could be seen easily. The sole needs to be slip resistant, yet without a deep tread which can make it challenging to clean.

If not wearing rubber boots, wear wipeable shoes and clean them with Clinell antimicrobial wipes if they become grossly contaminated, and after finishing your shift. Shoes should be left at work or kept separately from other clothes. Please do not wear shoe covers or bin bags over your shoes as you may slip.

Apron

Aprons are for use when there is risk of splashes or sprays to protect clothing, where gowns are used on a sessional basis or where the gowns are not fluid resistant. Re-use of aprons is not recommended⁵. Single-use disposable aprons must be disposed of immediately after completion of a procedure or task and after each patient contact to reduce the risk of cross-contamination¹.

Gloves

Single use, disposable. PHE states that double gloving is not necessary (section 10¹) for care of suspected or confirmed cases of COVID-19. Gloves are available in a variety of materials, are single use and must be disposed of after each use. Non-powdered, nitrile gloves are the most commonly recommended for healthcare. Sessional use or of reuse examination gloves for clinical care should be avoided⁵.

Eye Protection - Face shields, visors and goggles

Goggles: Goggles provide barrier protection for the eyes. Goggles used for healthcare applications are typically reusable⁴. During the Ebola response it was found that goggles could be re-used up to approximately 50 times before becoming unusable e.g. delamination and clouding.

⁵ <https://www.gov.uk/government/publications/wuhan-novel-coronavirus-infection-prevention-and-control/managing-shortages-in-personal-protective-equipment-ppe> (accessed 26/04/2020)

Visors/Face shields: Visors provide barrier protection to the facial area and related mucous membranes (eyes, nose, lips) and are considered an alternative to goggles. Visors should be used if AGP aerosol-generating procedure is performed. Visors are available in both disposable and reusable options⁴. Disposable, single-use, eye and face protection is recommended for single or single session use and then is to be discarded as healthcare (clinical) waste.

The goggles or visor/face shield should be removed upon exiting the ward area per standard practice. However, reusable eye and face protection is acceptable if decontaminated between single or single sessional use, according to the manufacturer's instructions or local infection control policy.

Only if items are in extremely short supply, single use only items could be re-used in a similar way as re-usable items. The standard method of cleaning is to use a detergent product either combined/sequentially with a decontamination product as agreed by the local infection prevention and control (IPC) specialists. They should be rinsed thoroughly to remove any residual detergent or cleaning product and left to dry. Items will degrade over time with repeated cleaning, particular the anti-fog component and will need to be resupplied regularly.

Eye and face protection should be discarded and replaced and not be subject to continued use if damaged (do not fix with tape), soiled (for example, with secretions, body fluids) or uncomfortable.

Use of Clinell⁶ wipes have been reported to cause glazing and cracking⁷. Repeated decontamination² of visors in high levels of hypochlorite solution can lead to delamination and clouding of the visors. Visors need replaceable acetate screens and plastic adjustable head pieces. Metal supports can be used but may rust.

Face mask

Respirators can be single use or single session use (disposable) and fluid-resistant. Note that valved respirators are not fully fluid-resistant unless they are also 'shrouded'. Valved, non-shrouded FFP3 respirators are not considered to be fluid resistant.

Respirators are for single use or single session use (section 6¹) and then are to be discarded as healthcare (clinical) waste (hand hygiene must always be performed after disposal). It is important that the respirator maintains its fit, function and remains tolerable for the user.

The respirator should be discarded and replaced and NOT be subject to continued use in any of the following circumstances:

- If it is damaged
- If it is soiled (for example, with secretions, body fluids)
- If it is damp
- The facial seal is compromised
- It is uncomfortable
- It is difficult to breathe through

⁶ <https://gamahealthcare.com/products/antimicrobial-hand-wipes>

⁷ Verbal report Health Worker NHS Trust UK (16/04/2020)

⁸ The UK MoD found the use of an ultraviolet tracer effective during their simulation training for the clinical management of Ebola virus disease.

- Post single use or single session use
- The mask should be removed and discarded if hard to breathe through

Note, hand hygiene should be performed before removing the face mask.

Fluid repellent surgical face masks (FRSM) and disposable respirators (FFP3/ FFP2/ N95).

The manufacturers' guidance should be followed in regard to the maximum duration of use. FFP3/FFP2/N95 respirators have a large capacity for the filtration and retention of airborne contaminants, and can develop a film of aerosols over the surface and so if put in a box after use, the virus can transfer to the box and possibly contaminate the inside of the mask, they cannot be disinfected.

The number of hours is dependent on local (for example, heat, activity length, shift-length) and individual factors. In practice, this may vary from 2 to 6 hours.

If the mask is removed for any reason for example on exiting a hot/red zone, taking a break or completing a shift, they should be disposed of as clinical waste. If a mask is touched or adjusted, hand hygiene should be performed immediately.

If where in an appropriate setting surgical masks are used, these are single-use, and must be changed when they become moist or damaged. They should be worn once and then discarded.

Important requirements in the reuse of face masks are as follows:

There is a lack of evidence to suggest the use of homemade masks or cloth masks in health and care settings is suitable.

Disinfecting PPE

To disinfect PPE

- Follow manufacturer's guidelines.
- Use soap and water for visors, Clinell wipes can cause glazing and cracking.
- Cotton scrubs can be bleached, laundered and re-used.
- Chlorine solutions can be used for disinfecting where advised by manufacturers see below for details on preparation and usage. Followed by soaking for 15 minutes, then rinsed in water, dried and returned for re-use.
- UV lights were used in Ebola, e.g. UK MoD reported to use them successfully during their pre-deployment simulation exercise⁴.

Preparation of chlorine solutions⁹:

- Work in a well-ventilated room or, better still, outside in the shade but protected from the wind. Wear personal protective equipment.
- Prepare solutions with clean, cold (or room temperature) water, in plastic containers only (corrosion of metal, inactivation of chlorine).

⁹MSF, Management of a Cholera Epidemic, <https://medicalguidelines.msf.org/viewport/CHOL/english/appendix-15-preparation-and-use-of-chlorine-solutions-32409866.html> (accessed 15/04/2020)

- Respect the recommended dilutions (an over-diluted product is less active; an over-concentrated product can cause irritation and corrosion).
- Use a clean, dry, plastic or glass receptacle to measure the dose of product or the measurer (e.g. measuring spoon) provided by the manufacturer.
- Pour the amount of water required into a container then add the product (and not the other way around) without splashing. Mix well using a clean stirrer used only for this purpose. Do not add any other product (e.g. a detergent) to chlorine solutions.
- For calcium hypochlorite, leave the solution to rest for a few minutes and only use the supernatant. Transfer the supernatant into another receptacle and discard the calcium residue into a waste pit after each preparation.
- Label the containers, specifying the chlorine concentration.

Use

The WHO and CDC recommend cleaning objects and laundry with detergent and water before applying chlorine solution. This helps prevent the inactivation of chlorine. Chlorine is also a bleaching agent. Use 0.05% chlorine solution to disinfect laundry and not a 0.2% solution which discolours it. The disinfection of objects, requires 15 minutes of contact time. If used for laundry it must also be soaked for 15 minutes, but not longer. Do not rinse afterwards.

	Disinfection of laundry (after cleaning)	materials, aprons, boots, (after cleaning)
Product	0.05% solution	0.2% solution
Preparation		
Sodium dichloroisocyanurate (NaDCC) granules, 55% active chlorine	18 g/20 litres 1 level 20 ml measuring spoon per 20 litres of water (110 g in 120 litres of water)	72 g/20 litres 4 level 20 ml measuring spoons per 20 litres of water (430 g in 120 litres of water)
Sodium dichloroisocyanurate (NaDCC) tablet, 1 g of active chlorine/tablet	10 tablets per 20 litres of water	40 tablets per 20 litres of water (2 tablets per litre)
Calcium hypochlorite (HTH®) granules, 65-70% active chlorine	15 g/20 litres: 1 level 20 ml measuring spoon per 20 litres of water (90 g in 120 litres of water)	60 g/20 litres: 4 level 20 ml measuring spoons per 20 litres of water (360 g in 120 litres of water)

To prepare a 0.2% chlorine solution the concentration of the bleach to be used, expressed in “active chlorine” on the commercial product, must be taken into account. The following formula is used to

calculate the amount of water per quantity of bleach: % of chlorine in liquid bleach ÷ % chlorine desired – 1.

Quality Monitoring

PPE should be monitored and any failures reported using a formal reporting mechanism. Faulty batches of PPE need to be disposed of and replacements sourced quickly.

Further Information

The BMA, provides guidance and links for doctors on the latest PPE advice:

<https://www.bma.org.uk/advice-and-support/covid-19/practical-guidance/covid-19-ppe-for-doctors>

Public Health England, UK government provides advice on use of PPE by health and social care workers, in the context of the current COVID-19 pandemic:

<https://www.gov.uk/government/publications/wuhan-novel-coronavirus-infection-prevention-and-control/managing-shortages-in-personal-protective-equipment-ppe> (accessed 26/04/2020)

References

The Center for Disease Control, USA. [CDC strategies for US-healthcare settings on COVID-19: Strategies for Optimizing the Supply of PPE](#)

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About Us:

Frontline Collaboration Against COVID-19

We are a group of leading healthcare practitioners and humanitarian experts with frontline experience in the UK and around the world. We are communicating daily with NHS practitioners to understand the problems they are facing in responding to the COVID-19 pandemic. We have identified urgent, unmet needs in terms of knowledge and know-how.

We are rapidly responding to these needs with practical guidance and tools that draw on international humanitarian response and outbreak experience. At the same time, we are engaging the institutions and leadership of the overall response to lobby for system-wide improvements.

Our support is designed to complement the formal NHS system.

Our vision is of Leaders, Healthcare workers and Humanitarians Working Together Against COVID-19.

Feedback

We welcome your feedback and suggestions. Please contact us at info@beckhealthcare.co.uk

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