

Provision of gloves for COVID-19 in health and care settings

**SBAR (Situation, Background,
Assessment, Recommendations)**

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1. Situation

Personal protective equipment (PPE) requirements for COVID-19 currently include use of disposable gloves in health and care settings. In the week ending 24 May 2020, disposable glove stocks in NHS England were reportedly running low. Although glove stocks in NHS Scotland are currently adequate, it may be prudent to assess options for potential downstream shortages.

The Health and Safety Executive (HSE) suggested that 0.5% sodium hypochlorite solution could be used for glove decontamination to extend their use if supplies run low, however glove decontamination is widely discouraged in UK health and care settings for infection prevention and control reasons. The safety and efficacy of glove decontamination in times of PPE shortages has not been fully investigated.

Further, recent communications have highlighted possible confusion regarding glove type and indications for use, after NSS National Procurement issued a statement to care homes stating that vinyl gloves should not be used for personal care as they offer less protection for the wearer. This was misinterpreted by various care providers as a change in guidance preventing the use of vinyl gloves. Consequently, a wider assessment of glove use for COVID-19 in health and care settings, and possible solutions to shortages, is required.

2. Background

Current COVID-19 IPC guidance recommends that disposable gloves must be worn when providing direct patient care and when exposure to blood and/or other body fluids is anticipated or likely; double gloving is not necessary.¹

A number of tables are provided in this guidance that outline the PPE requirements for primary, secondary, outpatient, and community settings, however the indications for wear are not clearly or consistently stated. For example, in table 1 it is stated that gloves should be worn for 'direct patient care (within 2 metres)' when working in an inpatient, maternity, or radiology area with possible/confirmed cases, however this is not stated for higher risk acute care areas with possible/confirmed cases. This could be interpreted to mean that gloves should be worn at all times in higher risk areas, even when not providing any direct care and when exposure to blood and or body fluids is not anticipated.

Table 2 (primary, outpatient, community and social care settings) is also open to misinterpretation, as glove use is recommended when visiting individuals in the extremely vulnerable group (there is no mention of direct care). This is likely to lead to overuse of gloves.

Anecdotally, over-use of gloves in the current COVID-19 climate in UK health and care settings is occurring, with reports of gloves being worn at all times in certain areas (not just for direct patient care). There is evidence from two studies that inappropriate glove use occurs in the UK during business as usual (non-pandemic situations).

An observational study conducted in three UK hospital wards found that almost half of all observed inappropriate glove use moments relate to failure to remove gloves and subsequent touching of another patient or objects outside the patient bed area while still wearing the same pair of gloves.²

A study conducted at two London district general hospitals observed that the proportion of glove overuse was 42%, defined as those who wore gloves when not required; gloves were worn inappropriately for tasks such as collecting equipment, answering the phone, talking to patients, and writing notes.³

Hand hygiene compliance was significantly worse following glove overuse, which highlights the contribution of glove overuse to overall poor hand hygiene and risk of cross-transmission. An up-to-date assessment of glove use in UK health and care settings would be beneficial however it is likely that inappropriate glove use is a continuing issue in health and care settings.

Solutions to glove shortages may incorporate strategies to reduce over-use, however in settings that are experiencing glove shortages, more radical measure such as procurement of alternative glove types and reuse of gloves may have to be considered.

3. Assessment

A rapid review of the available literature was conducted (see Appendix 1 for search strategies and methodology). The following research questions were assessed:

- What type of gloves are recommended for use in UK health and care settings?
- Are there any suitable glove alternatives when glove stocks are low?
- Should disposable gloves be washed and reused in health and care settings?
- How can overuse of gloves be prevented?

3.1 Recommended glove type for health and care settings

Disposable gloves should be worn when there is risk of contact with blood, body fluids, secretions and/or excretions, non-intact skin, mucous membranes, hazardous drugs and chemicals, e.g. cleaning agents.⁴ For both SIPC and TBP, latex (including de-proteinised natural rubber latex (DPNRL)) gloves are the preferred choice for health and care settings as they provide good fit, dexterity and comfort, and good barrier protection.⁴ Where latex gloves cannot be worn (due to allergic reaction), either nitrile or neoprene gloves are a suitable alternative.⁴

Medical gloves are covered by international standards EN455 (parts 1 to 4) and the Personal Protective Equipment Directive 89/686/EEC.⁴ Manufacturers may also provide evidence of compliance with EN 374, which specifies the capability of gloves to protect the wearer against chemicals and/or microorganisms. While there may be little difference in the barrier properties of unused intact gloves, it has been shown that vinyl has a lower tensile strength, elasticity, and tear/puncture resistance compared to latex and nitrile, and therefore loses its barrier integrity when performing rigorous procedures.⁴ Consequently, vinyl medical gloves can be worn in health and care settings but only in care situations where there is no anticipated exposure to blood and/or body fluids. Appropriate indications for vinyl gloves include environmental/patient equipment cleaning using detergent.⁵ Vinyl medical gloves may not be suitable for environmental decontamination with disinfectants (i.e. sodium hypochlorite); those in procurement must obtain manufacturer specifications for the intended use.

3.2 Alternative glove materials/types

The NIPCM gloves literature review identified a number of different glove material types however the evidence base for many of the materials was limited which prevented assessment of their suitability for health and care settings.⁴ Of those materials assessed, polythene, copolymer, ethylene-methyl methacrylate (EMA), and PVC gloves are not suitable for clinical care.⁴ As part of the COVID-19 response, the US Centers for Disease Control and Prevention (CDC) recommend that during periods of glove shortages, non-healthcare disposable gloves (e.g. food service or industrial chemical resistance gloves) may be considered for situations in which HCWs are not exposed to blood and/or body fluids.⁶

Glove material and durability should be appropriate to the intended use. Where alternative glove materials/types are being considered for use in place of approved brands, further information should be sought from the manufacturer regarding barrier protection including evidence that the glove conforms to the relevant British, European and international standards.

3.3 Reuse of disposable gloves

During business as usual (i.e. non-pandemic situations) there is consensus from UK and international guidance that gloves are a single-use item and should be changed after each use or upon completion of a task, and between patients to reduce the risk of crosscontamination.^{4,7-9}

Contrary to this, in 2016, the Commission for Hospital Hygiene and Infection Prevention at the Robert Koch Institute, Berlin, Germany, stated that when frequent glove changes are required and the workflow can only be assured without a glove change, gloves may be used for multiple activities on the same patient with a disinfection of gloved hands.¹⁰ Gloves that are to be disinfected must be resistant to chemicals as per EN 374 (and should include an alcohol test), and the gloves used should be compatible with the chosen ABHR.¹⁰ Notably, laboratory chemical permeation tests undertaken by glove manufacturers in accordance with EN 374 provide permeation times (the time taken for a specific chemical i.e. an alcohol to permeate the glove material) but these do not equate to safe wear time as the tests are not conducted under real-life conditions when the gloves are being worn.

During COVID-19-related disposable glove shortages, the CDC recommends that, in certain situations, glove wear can be extended by disinfection with ABHR up to six times per glove pair.⁶ This would allow the same pair of gloves to be worn when caring for multiple patients in a cohort. Evidence for the efficacy and safety of ABHR for glove disinfection is limited. One

study found that compared to un-gloved hands, disinfection using ABHR was more effective on gloved hands; ABHR efficacy was tested using artificial contamination with test microorganisms.¹¹ This study was limited in that it only tested five ABHR products and three different glove types (two nitrile, one latex), and found that efficacy varied depending on the glove-ABHR combination. This study was also referenced in a systematic literature review along with two other German studies that concluded that the efficacy of ABHR is at least as good on gloved hands as on bare hands for the tested combinations of gloves and types of hand rubs.¹² No studies were identified that assessed glove disinfection with ABHR in real life clinical settings.

Adverse effects related to ABHR glove disinfection have been reported. In one experimental study, subjective impressions of potential changes in the material structure and glove surface included gloves becoming sticky/tacky, gloves feeling tighter, and gloves frequently breaking when doffing.¹¹ Analysis of thirteen brands of nitrile and latex medical examination gloves from five manufacturers disinfected by two different ABHRs found that tensile strength decreased with each ABHR application.¹³ ABHRs had a greater effect on the tensile strength of the tested nitrile gloves compared to latex gloves, while ethanol-based ABHR resulted in smaller changes in tensile strength compared to isopropanol-based ABHR. Gloves also became sticky to touch after three or four ABHR applications.¹⁴ An experimental study designed to mimic anaesthetic glove wear reported zero micro-perforations following 8 applications of ABHR, however stickiness was reported; this study did not assess microbial contamination or assess the efficacy of the ABHR. Proven barrier integrity must also be accompanied by proven disinfectant efficacy.

The CDC also recommend that gloves can be disinfected up to ten times per pair using hand washing but that gloves must have long cuffs (to prevent water entry) however it is not clear where the evidence for this recommendation was obtained as no references were provided.⁶ As with ABHR, there is limited evidence regarding efficacy of hand washing for glove disinfection, from just two studies, both undertaken in dental settings. The first was undertaken in 1992 and tested the efficacy of non-sterile latex glove disinfection using a chlorhexidine hand wash (Hibiscrub).¹⁵ Dental personnel wore the same pair of gloves for multiple patients for a maximum duration of 1 hour; gloves were washed between patients and samples taken from gloves after each wash. Microorganisms were cultured from the washed glove surfaces in 45% of the samples collected; oral Streptococci were isolated from 8.4% of the 212 pairs of gloves examined, and perforations were noted in all glove types after repeated washing. This study was limited in that baseline samples of gloves prior to use were not collected. The second

study was laboratory based and tested the effect of disinfection with a non-antimicrobial liquid soap on the leakage rates of 3 different types of latex gloves (1 powdered, 2 non-powdered) used in dental settings.¹⁶ Two of the three glove types showed deterioration leading to water leakage after 5 washes; powdered latex gloves were significantly more likely to show damage after the first disinfection compared to non-powdered gloves. These studies indicate that gloves disinfected by hand washing may not offer full protection to the wearer.

As a last resort (presumably if ABHR stocks are depleted) the CDC also recommend that a 10-13% bleach solution may be considered for glove disinfection whereby gloved hands are dipped into the solution for 5 seconds and rinsed with water after 1 minute; the same pair of gloves can be disinfected up to 10 times.⁶ Notably, there is only one study provided for evidence for this and it involved only one glove type (Kimberly-Clark nitrile gloves). Glove manufacturers state that some of their nitrile and vinyl glove models are able to withstand permeation by sodium hypochlorite solution at a concentration of 10-13% for at least 8 hours, however these are typically gloves designed specifically for working with chemicals and/or in non-healthcare industries.¹⁷ Permeation times (as determined under laboratory conditions) do not equate to safe wear time; the glove must be fit for the intended purpose. Chemical compatibility information for medical examination gloves provides a guideline for glove use in applications where incidental splash exposure may occur, not intended prolonged chemical exposure. Possible safety issues related to using a bleach dip method with disposable medical gloves (including the impact of repeated dips and wear on glove integrity) have not been fully assessed, and the risk of cross-contamination related to communal use of such dip baths must be considered.

The Emergency Care Research Institute (ECRI), a US company that evaluates medical devices, recently conducted a review that summarises the possible strategies for glove shortages.¹⁸ This report highlighted a major safety limitation with the CDC recommendation to re-use gloves; HCWs are to dispose of gloves if they become damaged however it is difficult to detect micro-perforations - visible damage is most likely to occur during wear, by which point the glove is no longer offering any barrier protection. This report also points out that vinyl gloves are likely to degrade upon ABHR application.¹⁸

3.4 Strategies to reduce over-use of gloves

As previously discussed, the inconsistencies in indications for glove wear in the current UK COVID-19 IPC guidance, in combination with inappropriate glove use during BAU may be contributing to glove overuse during the COVID-19 pandemic. Unlike the CDC, the World Health Organization (WHO) does not recommend reuse of gloves.¹⁹ Instead, WHO recommend a multi-level approach to reduce PPE overuse, that includes administrative, environmental and engineering controls.¹⁹ In particular, HCWs should consider using PPE (including gloves) only if in direct close contact with a suspected/confirmed patient or when touching the environment of a suspected/confirmed patient.¹⁹ This can be interpreted to mean that a HCW entering the room but not engaging in direct patient care or touching any items/surfaces, would not have to wear gloves.

Reported glove shortages in NHS England are expected to relate to those gloves that are worn when blood/body fluid contact is anticipated i.e. latex and nitrile gloves. A possible solution would be to redistribute glove stocks according to glove indication; in settings/areas in which contact with blood and/or body fluids is not anticipated, provision of vinyl gloves should be prioritised, while latex and nitrile gloves should be prioritised for clinical settings where exposure to blood/body fluids is anticipated. Anecdotally, vinyl gloves tend to be used more in community rather than acute care settings, however provision of vinyl gloves may have been overlooked in acute care settings, possibly as a result of overreliance on latex/nitrile gloves use for cleaning and a lack of knowledge regarding glove indications. Additionally, as elective surgical/invasive procedures have been suspended, a surplus of sterile gloves could be made available for use for standard patient care (non-sterile) procedures.

4. Recommendations

The evidence base regarding glove disinfection is limited in both quantity and quality; no studies were identified that assessed ABHR glove disinfection in real-life clinical settings. From the limited experimental evidence identified, the efficacy of glove disinfection appears to vary depending on the glove and disinfectant type, as well as the duration and intensity of glove use. Of note, disinfection of vinyl gloves has not been fully assessed. There is not enough evidence to provide a recommendation for a particular glove and disinfectant type, or for any particular disinfection protocol (in terms of frequency and duration). Prevention of cross-transmission of infectious agents is reliant on HCWs undertaking effective glove disinfection at the correct moments. For these reasons, disinfection of gloves to allow extended wear should not be recommended in UK health and care settings.

Alternative strategies to disinfection to mitigate glove shortages include procurement of non-healthcare gloves (food-service or chemical protection gloves) where appropriate, redistribution of glove type depending on the clinical setting, and prevention of glove overuse. Prevention of glove over-use requires a strengthening of the knowledge base in health and care settings to reiterate appropriate glove indications at all times (not just during COVID-19) and to encourage use of vinyl gloves in place of latex/nitrile gloves where appropriate.

Appendix 1: Search strategy and methodology

The following search strategies were developed and search terms entered to Medline and Embase databases on 25 May 2020. Additional grey literature searching was conducted which included assessment of relevant guidance documents.

As this was a rapid review, evidence was critiqued by a single reviewer but not formally graded with the use of an appraisal tool.

Thirteen studies/guidance documents were assessed. Of these:

- 10 were included in the review.^{2, 3, 6, 11-16, 19}
- One study was excluded as only the abstract was available in English,²⁰
- Two studies were excluded as they did not answer the research questions.^{21, 22}

Search strategy 1

1. glove*.mp
2. exp gloves, protective/
3. exp gloves, surgical/
4. reuse.mp.
5. re-use.mp.
6. 1 or 2 or 3
7. 4 or 5
8. 6 and 7
9. remove duplicates from 8
10. limit 9 to english language
11. limit 10 to humans (57)

Search strategy 2

1. glove*.mp.
2. exp gloves, protective/
3. exp gloves, surgical/
4. disinfect*.mp.
5. decontaminat*.mp.
6. 1 or 2 or 3
7. 4 or 5
8. repeated.mp.
9. 6 and 7 and 8
10. remove duplicates from 9
11. limit 10 to english language
12. limit 11 to humans (36)

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