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Short report

COVID-19-associated shortage of alcohol-based hand rubs, face masks, medical gloves, and gowns: proposal for a risk-adapted approach to ensure patient and healthcare worker safety

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SUMMARY

The coronavirus disease 2019 (COVID-19) pandemic has caused a huge demand for alcohol-based hand rubs, medical gloves, face masks, and gowns in healthcare and from the public. More and more hospitals face a serious shortage of these articles. We propose a risk-adapted approach to ensure adequate patient and healthcare worker safety for as long as possible.

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Introduction

A shortage of essential equipment such as alcohol-based hand rubs (ABHRs), medical gloves, and face masks is currently being experienced by more and more healthcare

facilities worldwide due to the coronavirus disease 2019 (COVID-19) pandemic [1]. Although it is still highly desirable to use commercially produced quality hand rubs and single-use medical gloves and face masks, the current shortage of some articles is so profound that it results in uncertainty among healthcare workers (HCWs) as to whether it is safe for them to care for COVID-19 patients. Despite well-above-average early replenishment of inventories, further supplies in sufficient amounts are questionable due to uncertain production and logistics. Protection of frontline HCWs is crucial [2]. We

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propose a risk-adapted approach for ABHRs, medical gloves, face masks, and gowns in a shortage situation to ensure adequate patient care and HCW safety for as long as possible.

Hand rubs for surgical hand preparation

The vast demand for commercial ABHRs primarily for the control of severe acute respiratory syndrome coronavirus (SARS-CoV-2) in healthcare and among the public has the side-effect that well-formulated products with a high quality (spore filtration, proven efficacy, and good dermal tolerance) are now only sparse in some hospitals. This may also endanger their availability in the operating theatre. While the number of surgical procedures being performed is limited during the ongoing pandemic, facilities need to ensure that reliable products remain available for surgery. In case of a shortage in the operating theatre the alternatives listed in Table I are available.

Hand rubs for hygienic hand disinfection

ABHR consumption has increased hugely in hospitals, but also outside healthcare facilities. Commercial hand rubs can be found in shops, entrance halls of companies, public buildings, and many other areas. In addition, many citizens have bought hand rubs and use them regularly although thorough hand washing is considered to be sufficient in the community or home setting. ABHR is even being brought out of hospitals by both visitors and staff. Despite an extensive increase in production by many manufacturers there is a substantial shortage of commercially produced hand rubs in more and more hospitals. In case of a shortage the alternatives listed in Table II are available.

Face masks

Surgical face masks used in the operating room and FFP2 or N95 respirators are recommended as single-use products and

are used by HCWs treating COVID-19 patients [2]. Under certain conditions, an increase in the duration of wearing a mask or its reuse may be authorized [11]. They should normally not be reused but they are also in short supply in some areas. In this situation the manufacturer should be contacted for advice on whether it is possible to disinfect or reprocess the face mask. Coronaviruses are inactivated at 60°C in 30 min so that thermal disinfection may be an option [12]. The construction of the face mask may allow thermal disinfection [13]. But some masks may lose their filtration capacity or the fitting on the face, resulting in less protection for the user [13]. That is why it is so important to have a statement from the manufacturer. WHO indicates that reprocessing masks or respirators should only be considered when there is critical shortage or lack of them [2]. Any type of reprocessing should ensure the efficacy of the process, that the reprocessing method does not result in residual toxicity for the healthcare workers, and that the functional integrity and shape of the item is maintained [2]. The following options are available:

- The mask may be disinfected or sterilized.
 - Organize reuse of face masks (ideally person-bound) and thermal disinfection or steam sterilization [14].
 - Mark the mask (number of disinfections or sterilizations).
 - Evaluate any visible damage of the mask when disinfected or sterilized more often.
- No information.
 - Try to find information from other manufacturers with similar face masks.
- The mask should not be disinfected or sterilized.
 - FFP2 mask: keep the same mask for up to 8 h maximum [11].
 - Surgical face mask: keep the same mask for up to 4 h (French Society of Hospital Hygiene (SFHH)) or 6 h (WHO) maximum [2,11].
 - Try to find another supplier or accept the risk of a potentially insufficient protection.

Table I

Risk-adapted options to ensure effective (according to EN 12791 for testing the antimicrobial efficacy of a surgical hand preparation) and safe surgical hand rubs during shortage of commercial products

| | What to use | Reason |
|-------------------------------|---|--|
| Current standard | Commercial products effective in 1.5 min | Sufficient and approved antimicrobial efficacy (e.g. by regulatory authorities or positive lists for disinfectants); spore-filtration of solution is typically ensured |
| First choice during shortage | Modified WHO-recommended hand rubs ^a | Sufficient antimicrobial efficacy in 5 min [3]; hydrogen peroxide should kill any bacterial spores within 72 h [4] |
| Second choice during shortage | WHO-recommended hand rubs ^b Antimicrobial soaps based on 4% chlorhexidine gluconate [7] | Do not meet European efficacy requirements in 5 min [5,6]; hydrogen peroxide should kill any bacterial spores within 72 h [4] Often less effective compared to alcohol-based hand rubs; skin irritation more likely |

WHO, World Health Organization.

^a Modified formulation I: 80% w/w ethanol, 0.725% v/v glycerol, 0.125% v/v hydrogen peroxide; modified formulation II: 75% w/w iso-propanol, 0.725% v/v glycerol, 0.125% v/v hydrogen peroxide.

^b Formulation I: 80% v/v ethanol, 1.45% v/v glycerol, 0.125% v/v hydrogen peroxide; formulation II: 75% v/v iso-propanol, 1.45% v/v glycerol, 0.125% v/v hydrogen peroxide.

Table II

Risk-adapted options to ensure effective (according to EN 1500 for testing the bactericidal efficacy of products for hygienic hand disinfection) and well-tolerated hand rubs during shortage of commercial products; in suspension tests SARS-CoV-2 is inactivated by ethanol and iso-propanol at 30%, 40% and 60% in 30 s [8]

| | What to use | Target group | Reason |
|-------------------------------|---|--|---|
| Current standard | Commercial products effective in 30 s | HCWs; visitors; immunosuppressed population; general population. | Sufficient and approved antimicrobial efficacy (e.g. by regulatory authorities or positive lists for disinfectants); good dermal tolerance due to emollients. |
| First choice during shortage | Commercial products effective in 30 s | Only HCWs. The general population should use plain soap and water for hand washing; non-commercial alcohol-based hand rubs can be used by visitors and the immunosuppressed population. | |
| Second choice during shortage | Modified WHO-recommended hand rubs ^{a,b} | Only HCWs. Visitors should use simple alcohol–water mixtures ^c ; the general population should use soap and water. | Sufficient antimicrobial efficacy in 30 s; glycerol should improve the dermal tolerance when used frequently [4]. |
| Third choice during shortage | WHO-recommended hand rubs ^d | Only HCWs. Visitors should use simple alcohol–water mixtures ^c ; the general population should use soap and water. | Insufficient antimicrobial efficacy in 30 s [9]; glycerol should improve the dermal tolerance when used frequently [4]. |

HCW, healthcare worker; WHO, World Health Organization.

^a Modified formulation I: 80% w/w ethanol, 1.45% v/v or 0.725% v/v glycerol, 0.125% v/v hydrogen peroxide; modified formulation II: 75% w/w iso-propanol, 1.45% v/v or 0.725% v/v glycerol, 0.125% v/v hydrogen peroxide.

^b Comparative data show that both modified formulations are equally effective with 1.45% v/v and 0.725% v/v glycerol (M. Suchomel, unpublished data).

^c Examples are alcohol–water mixtures such as ethanol or iso-propanol at 70% v/v [10].

^d Formulation I: 80% v/v ethanol, 1.45% v/v glycerol, 0.125% v/v hydrogen peroxide; formulation II: 75% v/v iso-propanol, 1.45% v/v glycerol, 0.125% v/v hydrogen peroxide.

- The use of face shields may be an alternative [2].
- The masks should be worn for as long as possible [15].

To cope with the shortage, some establishments have made their own masks. These masks can be made with sterilization sheets and have to meet the standards European Norm (EN) 11607 and EN 868. The French Society of Sterilization Sciences and the SFHH issued an opinion on the materials that could be used for making protective masks and specifically on sterilization sheets and specifying the indications [16].

Medical gloves

Targeted use of medical gloves is currently not the standard. They are used more frequently by HCWs than indicated. In addition, many of the public wear medical gloves although they are not recommended and do not provide any additional protection compared to bare hands as long as the hand does not touch the face [2]. Their use is indicated in various clinical situations, e.g. when contact with blood or other potentially infectious materials, mucous membranes, or non-intact skin is anticipated [4]. The reuse of gloves is not recommended by WHO but, in the case of glove reuse, the safest reprocessing method should be implemented [4]. When medical gloves become sparse in healthcare, a few possibilities are available to slow down their consumption:

- Restrict glove use to the recommended indications only and control this restriction.
- If shortage continues: consider promoting the targeted disinfection of gloved hands according to the ‘five moments’ for ongoing care on the same patient (e.g. COVID-19 patients); gloves should be visibly clean and have no visible perforations [17,18].
- If shortage still persists: consider promoting the targeted disinfection of gloved hands according to the five moments for ongoing care on all patients in the same room (e.g. COVID-19 patients); gloves should be visibly clean and have no visible perforations; this approach contradicts the single-use principle of medical gloves.

Gowns

In case of a shortage of gowns the following options can be considered:

- Extension of the wearing of the disposable gown by the same caregiver for several COVID-19 patients [2]; additional conditions are defined by the SFHH: the gown should be worn with an additional disposable plastic apron which has to be changed between patients; tightness and integrity should be ensured; it should not be touched or worn outside the treatment areas [19].

- Cotton gowns can be washed and disinfected, e.g. in a washing machine with warm water (60–90°C) and laundry detergent [2].
- Disposable laboratory coats may also be used but only for brief contacts [2].
- In France it has been decreed that the same gown placed on a coat hook in the room should not be reused by healthcare workers even in a shortage situation [19].

Conclusions

Some options are available without compromising patient and HCW safety. When the COVID-19 pandemic is over, we can all return to the regular standard in healthcare with commercial hand rubs, single-use face masks, gloves, and gowns. However, in the current shortage situation we should seriously consider other options to ensure that patient and HCW safety is maintained as effectively as possible.

Conflict of interest statement

None declared.

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