GUIDELINE ON HAND HYGIENE IN HEALTH CARE IN THE CONTEXT OF FILOVIRUS DISEASE OUTBREAK RESPONSE

RAPID ADVICE GUIDELINE

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Guideline on Hand Hygiene in Health Care in the Context of Filovirus Disease Outbreak Response

Rapid advice guideline

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Summary of the recommendations

Introduction

This document provides a summary of the recommendations for hand hygiene best practices to be performed by health workers providing care and/or support to patients with filovirus infection (Ebola and Marburg viruses). The background for the development of these recommendations is described in Annex 1. The recommendations were developed in accordance with the World Health Organization **(**WHO) Rapid Advice Guideline procedures (see "Methods" in Annex 2) and are based on systematic reviews of the scientific evidence (see summaries of the results in the "Rationale and remarks" section of each recommendation and in Annex 2) and the consensus of experts. Considerations related to guideline implementation are available in Annex 3.

Recommendations

Recommendation 1.

WHO recommends performing hand hygiene, by using either an alcohol-based handrub or soap and running water, applying the correct technique recommended by WHO. Alcohol-based handrubs should be made available at every point of care (at the entrance and within the isolation rooms/areas) and are the standard of care. If alcohol-based handrubs are unavailable, hand hygiene should be performed with soap and running water whenever necessary. When hands are visibly soiled, hand hygiene should always be performed with soap and running water.

Strong recommendation, high quality evidence for the effectiveness of alcohol-based handrub or soap and water.

Rationale and remarks:

This first recommendation is based on the WHO Guidelines on Hand Hygiene in Health Care (*1*) and is included also in the 2014 WHO Interim Infection Prevention and Control Guidance for Care of Patients with Suspected or Confirmed Filovirus Haemorrhagic Fever in Health-Care Settings, with Focus on Ebola (*2*). The preferred use of alcohol-based handrub for hand hygiene in health care is based on the following criteria for which evidence is provided in the WHO Guidelines and its related Summary (*3*), namely:

- elimination of the majority of microorganisms (including viruses);
- the short time required for microbicidal activity (20 to 30 seconds);
- availability of the product at the point of care;
- better skin tolerability;
- no need for any particular infrastructure (clean water supply, washbasins, soap and hand towels).

Handwashing with soap and water is also considered highly effective at removing microbial contamination (*1*), although no specific data are available for filovirus. However, according to experts' consensus, handwashing with soap and water can be considered highly effective against enveloped viruses.

The correct application technique and duration of the procedure are considered crucial to achieving the desired effect for both handrubbing with an alcohol-based handrub and handwashing with soap and water. For handrubbing, WHO recommends applying a palmful of alcohol-based handrub to

cover all surfaces of the hands. Hands should be rubbed by following specific steps for 20 to 30 seconds until dry (Figure 1) (*1-3*). When washing hands with soap and water, hands should be wet with clean, running water and a sufficient amount of product to cover all surfaces should be applied. Hands should be rinsed with water and dried thoroughly with a single-use towel (*1, 2*). WHO recommends that to achieve the desired effect, the procedure should last 40-60 seconds (Figure 2) (*1-3*).

Recommendation 2.

In settings where bleach/chlorine solutions are currently used for hand hygiene, WHO recommends implementing a strategy to change to alcohol-based handrub or soap and water.

Strong recommendation, high quality evidence for the effectiveness of alcohol-based handrubs or soap and water.

Rationale and remarks:

This recommendation is also based on the WHO Guidelines on Hand Hygiene in Health Care (*1*) which urge health-care administrators to provide access to a safe, continuous water supply and to the necessary facilities to perform handwashing, and a readily accessible alcohol-based handrub at the point of patient care. The Guidelines also urge national governments to make improved hand hygiene adherence a national priority and to consider providing a funded, coordinated implementation programme, while ensuring monitoring and long-term sustainability.

Recommendation 3.

Bleach/chlorine solutions currently in use for hand hygiene and glove disinfection may be used in the interim period in emergency situations until alcohol-based handrubs or soap and water become available.

Conditional recommendation, very low-quality evidence for the comparative efficacy of bleach/chlorine solutions compared with alcohol-based handrub or soap and water, and very low-quality evidence about tolerance to bleach or chlorine solutions for hand hygiene and glove disinfection.

Rationale and remarks:

Very limited evidence was found to evaluate the efficacy of sodium hypochlorite (bleach/chlorine solutions) compared with other agents when used for hand hygiene or glove disinfection. No comparative study is available to show the efficacy of bleach/chlorine solutions in preventing the transmission of filovirus or other enveloped viruses to patients and health-care workers or in reducing the viral load on hands. However, according to expert consensus, bleach/chlorine solutions with a concentration of 500 ppm sodium hypochlorite (0.05% chlorine solution) can be considered efficacious against filovirus, including when used for hand hygiene.

Furthermore, available data indicate that for hand hygiene efficacy, there is a link between bleach/chlorine solutions' concentration and contact time. A concentration of 0.05% chlorine solution applied for a minimum time of 40 to 60 seconds until hands are dried is considered appropriate for hand hygiene practices. To perform the correct technique, the same steps as for handrubbing should be followed (Figure 1) (*1-3*).

There is extremely limited evidence showing that bleach/chlorine solutions used for hand hygiene purposes can cause skin irritation or lesions.

There is no evidence that low concentrations of bleach/chlorine solutions used for hand hygiene cause respiratory irritation, other respiratory symptoms or asthma. However, respiratory symptoms are clearly reported and described in patients, health workers and other users as a consequence of exposure to bleach/chlorine solutions used for environmental decontamination.

Finally, there is evidence for risk of irritative conjunctivitis as a result of exposure to bleach/chlorine solutions.

Therefore, the experts concluded that the use of bleach/chlorine solutions at the concentrations currently used for hand hygiene (500 ppm sodium hypochlorite or a 0.05% chlorine solution) can be acceptable from a tolerability point of view, when other hand hygiene agents are unavailable. However, dermatologically speaking, alcohol-based handrubs are considered the best option for hand hygiene. In addition, using chlorine is not advised for people with pre-existing skin conditions (e.g. contact dermatitis). It is essential to establish safety measures and assessments in settings where bleach/chlorine solutions are being used for hand hygiene.

In terms of balancing benefits and harms, the conclusion is that for the proposed recommendation, the benefits outweigh the harms.

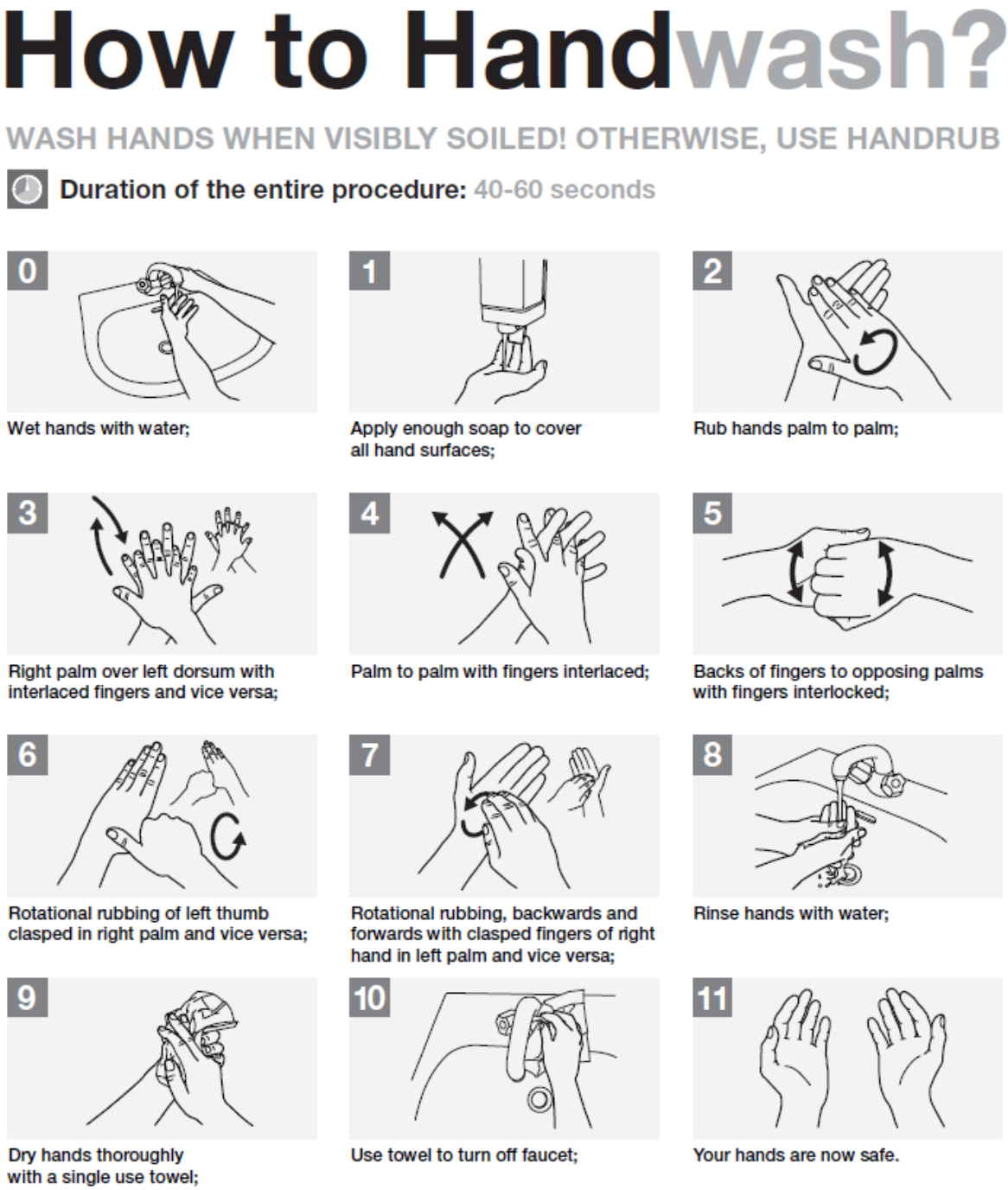
No major variability is expected with respect to the values and preferences of health workers and the use of chlorine solutions for hand hygiene. It was highlighted, however, that alcohol-based handrubs are generally preferred because they are better tolerated and produce much less skin barrier impairment than all other means of hand antisepsis mentioned in the present guideline.

With respect to glove disinfection, no study was retrieved on efficacy of bleach/chlorine solutions compared with alcohol-based handrub or other antisepsis products, including water and soap. Only one study assessed the permeability of surgical gloves to sodium hypochlorite 13% and showed no permeation or glove damage.

Although best IPC practices dictate that gloves should be changed between patients, in the specific context of EVD outbreaks, the decontamination of gloves has been considered for the purpose of avoiding changing both pairs of gloves between patients within the isolation area, given the high risk of health-care workers' hand contamination with a patient's blood and/or bodily fluids. Experts convened by WHO to develop recommendations on personal protective equipment to be used for the care of EVD patients (*4*), agreed that glove disinfection could help facilitate changing gloves safely, while providing clinical care for patients with filovirus disease and/or when gloves become compromised. In these cases, a two-step procedure should be followed: 1) disinfect the outer gloves before removing them safely and 2) keep the inner gloves on and disinfect them before putting on a fresh outer pair. Alcohol-based handrubs are preferred when disinfecting gloved hands. However, if this is unavailable, bleach/chlorine solutions are acceptable in the interim.

Figure 1. Handrubbing technique

Figure 2. Handwashing technique



Annex 1. Background for the development of these recommendations

Filovirus (Ebola and Marburg viruses) infections in humans are among the most severe and feared of all viral haemorrhagic fevers, with very high case fatality. Most outbreaks occur after a single or very small number of zoonotic infections, followed by person-to-person transmission with nosocomial amplification in settings with inadequate infection prevention and control, usually in the rural areas of countries with poor health-care infrastructure.

In most cases, the transmission of filovirus occurs when infected blood or other body fluids come into contact with the mucous membranes of the mouth, nose, eyes, or non-intact skin. Transmission can occur through direct contact with infected body fluids or through fomites (touching inanimate objects), such as the surfaces frequently touched by hands, utensils and bed linens that have recently been contaminated with infected body fluids. Transmission through intact skin has not been documented, but the infection can be transmitted through broken skin and via penetrating injuries of the skin, such as sharps and needle-stick injuries.

It must be emphasized that the protection of health-care workers, patients (whether infected with filovirus or not), and visitors requires the application of infection prevention and control procedures and protocols, of which hand hygiene best practices are an essential part. Strengthening and carefully applying standard precautions when providing care to ***all*** patients, regardless of the signs and symptoms they present with, is essential because the initial clinical manifestations of filovirus infection may be non-specific.

Hands are the most frequent vector of pathogens to other parts of the body, to other individuals, and to the environment. Hands contaminated with blood and/or bodily fluids (including when not visible) play a crucial role in the transmission of filovirus through direct contact with mucous membranes or broken skin. As a consequence, hand hygiene best practices and the appropriate use of gloves are essential, both to protect health workers, but also to prevent transmission to others. However, no single infection control measure is effective on its own, and must be carried out as part of a comprehensive package of infection prevention and control measures, including effective administrative, environmental and engineering controls.

The WHO Guidelines on Hand Hygiene in Health Care, issued in 2009, recommend the use of an alcohol-based handrub as the preferred means for routine hand antisepsis in all clinical situations, unless hands are visibly soiled, in which case handrubbing should be replaced by handwashing with soap and water (*1*). If alcohol-based handrub is unavailable, hands should be cleaned by washing with clean running water and soap, and by drying with disposable towels. These guidelines are based on previous recommendations by the Centers for Disease Control and Prevention (CDC) (*5*) and on systematic evidence reviews, expert consensus and pilot testing of the recommendations in the six WHO regions (*6*). The approach proposed by the WHO hand hygiene guidelines is currently considered the gold standard, used in all other existing national and international recommendations on hand hygiene.

Current WHO and CDC recommendations for the care of patients with suspected or confirmed filovirus infection follow the 2009 WHO Guidelines, in terms of hand hygiene best practices. However, chlorine solutions are currently widely used for hand hygiene in the African countries

affected by the Ebola virus disease (EVD) outbreak, because of the limited availability of alcohol-based handrub and soap, the ease of use of chlorine solutions, and the "fear" factor which pushes people to use an easily available environmental disinfectant.

The Filovirus Haemorrhagic Fever Guideline (*7*), published by Médecins Sans Frontières in 2008, recommends the use of 0.05% chlorine solution for handwashing (0.5% solution if in a high-risk zone) and 0.5% chlorine solution for the disinfection of gloved hands. The document does not mention the use of any other product, not even soap and water. The MSF document also states that chlorine solutions can damage both medical and household rubber gloves, and therefore advises that gloves should be regularly checked for damage, and the person wearing them should leave the high-risk area if the gloves appear damaged. This issue is raised in a more recent document developed by the Belgian Superior Health Council (*8*), which recommends against the washing of gloved hands, as this might increase the permeability of the glove.

The document also states that only gloves certified as chemically resistant and which comply with European directives should be used to handle chlorine solutions. The inconsistencies between the various guidelines describing hand hygiene best practice is unfortunately reflected in the variations among local standard operating procedures and rapid guidance documents created by local organizations or ministries of health in countries affected by the EVD outbreak. This is creating confusion, not only among staff involved in the EVD outbreak response, but also among patients, visitors, and members of the wider community who need to perform effective hand hygiene practices, to help stop the spread of EVD.

The 2009 WHO hand hygiene guidelines discuss the efficacy and side-effects of a broad range of hand hygiene agents. However, the guidelines provide limited guidance on the use of chlorine solutions because these are, in general, considered uncommon and unsuitable practices. However, chlorine is widely used in environmental disinfection, and sodium hypochlorite (household bleach) is the most readily available effective inactivation product for filoviruses, especially in Africa.

Many documents, including WHO guidelines, provide clear guidance on the use of chlorine solutions for environmental cleaning, decontamination of personal protective equipment and management of soiled linen. They also provide guidance on the local production of these solutions, although there is inconsistency regarding the concentration of chlorine to be used. Chlorine is potentially unstable and highly toxic, therefore, solutions should be prepared daily, kept out of sunlight (to prevent the deterioration of chlorine concentration), and handled with care.

International stakeholders and field partners (e.g. the Infection Control Africa Network and CDC), clinicians and other technical staff working in countries currently affected by the EVD outbreak have requested guidance on best hand hygiene practices in order to ensure the protection of health workers and to prevent disease transmission in health-care settings in the context of the current epidemic.

In response to the widespread use of chlorine solutions, which are currently recommended by some partners and in some ministerial standard operating procedures, and which are widely used in the context of the current EVD outbreak, WHO has undertaken a systematic examination of the evidence relating to the microbiological efficacy of chlorine solutions, optimal use concentrations, tolerability and potential side-effects when used for hand hygiene and/or glove disinfection.

Annex 2. Methods used for the development of this guideline

The development of these recommendations included a number of steps:

- the drafting of a scoping document in accordance with WHO standards for guideline development (*9*);
- the formulation of key questions;
- systematic reviews of the literature;
- an expert consultation; and
- an evidence-to-recommendations exercise using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) framework.

The research questions for the systematic review were:

1. What is the comparative efficacy of chlorine solutions for hand hygiene practices or disinfecting gloves for health workers compared with alcohol-based handrub or other antisepsis products, including soap and water?
2. Does the use of chlorine solutions for hand hygiene cause skin irritation or lesions, respiratory side-effects, or any other adverse reactions in health workers?
3. Do chlorine solutions used for disinfecting gloves increase glove permeability or the occurrence of perforations?

A Guideline Development Group (GDG) meeting was convened on 12-13 November 2014. The group comprised 13 experts chosen for their knowledge, field experience and technical expertise. According to WHO requirements for guideline development, members participated as independent experts and did not represent any agency, institute or country. Each GDG member completed a WHO Declaration of Interest form, and these were reviewed by the Steering Group prior to the meeting. None of the GDG members declared any relevant conflict of interests.

The results of three systematic reviews addressing the three research questions were submitted to the GDG ahead of the meeting and then presented to the experts during the meeting. An additional presentation by one of the experts on the susceptibility of filovirus to disinfectants contributed to the discussion and final conclusions. Full consensus was achieved within the GDG about the final recommendations.

In summary, the systematic reviews yielded no comparative studies using bleach/chlorine solutions versus alcohol-based handrub or soap and water for hand hygiene or glove disinfection. Very limited evidence was available on adverse reactions resulting from the use of bleach/chlorine solutions for hand hygiene, but more information could be derived from reports about use of this disinfectant for other purposes. Only one study was identified on the effect of chlorine solutions on glove permeability showing no permeation. No data were available from the literature on the values and preferences of health workers regarding the use of bleach/chlorine solutions for hand hygiene. Advice was gathered on the values and preferences of GDG members, including some professionals with field experience of the current outbreak, as well as extensive clinical experience of previous outbreaks of EVD.

Annex 3. Guideline implementation

Implementing these recommendations will require a multimodal strategy including education and training that is suitable for different categories of health workers (including cleaners, laboratory staff, etc), and which takes into account local customs and cultural norms. Adequate resources (human, material and financial) must be allocated, as soon as possible, to make alcohol-based handrub available at the point of care and to improve access to clean, running water and soap.

Furthermore, to achieve hand hygiene best practices in health care, resources need to be managed, involving several aspects: managing supplies; ensuring the availability of alcohol-based handrub or clean, running water and soap; the optimal placement of items for easy access; ensuring the quality of the items purchased; and good line management for reporting shortages.

Based on evidence related to implementation science, behavioural change, spread methodology, diffusion of innovation and impact evaluation, WHO developed a multimodal implementation strategy and tool package to enable the translation into practice of the WHO recommendations on hand hygiene (*1*). These have been tested and were shown to be effective in improving hand hygiene practices among health-care workers in a range of countries, including in settings with limited resources (*6*). A key pillar of this strategy relates to system change, namely increasing the availability of alcohol-based handrub, ensuring access to a safe, continuous water supply, as well as to the necessary facilities to perform handwashing. The availability of alcohol-based handrub might be limited in developing countries and in settings with limited resources. For this reason, WHO identified, tested and validated alcohol-based formulations that can be produced locally in health-care settings by following simple instructions (*10*). A recent survey in facilities from 29 countries (*11*) demonstrated that the WHO-recommended formulations can be easily produced locally, at low cost and are very well tolerated and accepted by health-care workers. Challenges may be encountered, however, in procuring the ingredients and the dispensers. Overall, the local production of alcohol-based handrub should be strongly encouraged and facilities should be dedicated to achieving this.

Changing the system and practices in the emergency situation of an outbreak and even beyond will be particularly challenging. Evidence-based approaches and proven behavioural change strategies need to be put in place. They require high-level commitment with implications at the political level, for WHO and its partners. In the context of the current EVD outbreak, the United Nations Mission for Ebola Emergency Response (UNMEER) represents the opportunity to join forces in order to tackle the entire value chain to achieve successful implementation of hand hygiene improvement strategies in the affected countries.

Accepting the use of bleach/chlorine solutions for hand hygiene in the context of the current EVD outbreak and until alcohol-based handrub or soap and water are available will be less disruptive to the outbreak response in this emergency situation than to actively advocate against it in the context of the limited available data. However, the risk is that accepting the use of bleach/chlorine solutions for hand hygiene may discourage administrators, policy-makers and logisticians from making efforts to enable the change to make alcohol-based handrub solutions and water and soap available.

Harm can also come from uncertainty around the quality of chlorine solutions. Indeed, it has been reported by several professionals in the field that the concentration of original bleach is often unavailable and therefore the dilutions prepared are probably unreliable. In the emergency situation of an outbreak, quality checks on concentrations are unlikely to be made or will be rarely and inconsistently applied. The use of these solutions at lower concentrations than they are meant to be

used may lead to inconsistent efficacy and could also result in a false sense of security, as well as lead to increased risk-taking. Therefore, regular quality control tests to check the concentration of chlorine solutions are highly recommended and can be easily performed by using the necessary testing strips, if made available.

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