

Patient's Safety in Your Hands

Hastaları Ellerinle Koru

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ABSTRACT

Hand hygiene is a general term describing any hand cleansing (and care) action. Hand cleansing with soap and water has been the primary measure of personal hygiene for centuries. In the 20th century, many studies revealed the important role of healthcare workers' hands in the transmission of nosocomial pathogens. This leads to the first national hand hygiene guidelines being published in the 1980s. Alcohol-based hand antiseptics include ethanol, isopropanol or n-propanol, or a combination of two of those products. Addition of chlorhexidine, quaternary ammonium compounds, octenidine or triclosan to alcohol-based formulations can result in persistent activity. Perceived barriers to adherence with hand hygiene practice recommendations include skin irritation caused by hand hygiene agents, inaccessible hand hygiene supplies, interference with healthcare worker patient relationships, patient needs perceived as a priority over hand hygiene, wearing of gloves, forgetfulness, lack of knowledge of guidelines, insufficient time for hand hygiene, high workload and understaffing, and the lack of scientific information showing a definitive impact of improved hand hygiene on healthcare associated infections rates.

Key words: Hand hygiene, alcohol-based hand rub, patient safety.

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ÖZET

El hijyeni, el temizliğini (bakımını) betimleyen genel bir ifadedir. Sabun ve su ile yapılan el temizliği, yüzyıllardır kişisel temizliğin birincil önlemini oluşturmaktadır. Yirminci yüzyılda hasta bakımı ve sağlık uygulamaları ile ilişkili enfeksiyonların elle taşınması ve bulaştırılması ile ilgili çok sayıda çalışma 1980'li yıllarda basılan ilk ulusal el hijyeni rehberlerinin hazırlanmasına önderlik etmiştir. Alkol bazlı el dezenfektanları etanol, izopropanol, n-propanol veya bunlardan ikisinin karışımını içermektedir. Klorheksidin, kuarterner amonyum bileşikler, oktenidin ve triklosan gibi maddelerin eklenmesi, alkol bazlı antiseptiklerin etki süresini artırmaktadır. El dezenfektanlarının sebep olduğu cilt problemleri, el hijyeni için gerekli malzemenin teminindeki problemler, sağlık çalışanının hastaya sunduğu sağlık hizmetinin niteliğini zedeleyen müdahaleler, hasta ihtiyaçlarının el hijyeninden daha öncelikli olduğu düşüncesi, eldiven kullanımı, unutkanlık, rehberler konusundaki bilgi yetersizliği ve el hijyeninin hasta bakımı ve sağlık uygulamaları ile ilişkili enfeksiyon oranlarında kesin iyileşme sağladığını gösteren bilimsel çalışmalarla ilgili bilgilendirmenin eksikliği el hijyeni uygulamalarına uyum konusundaki algılanan engellerdir.

Anahtar kelimeler: El yıkama, el hijyeni, alkol bazlı el dezenfektanı, hasta güvenliği.

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BURDEN of HEALTHCARE ASSOCIATED INFECTIONS

According to HELICS' (Hospital in Europe Link for Infection Control through Surveillance) data, approximately 5 million healthcare associated infections (HAIs) are likely to occur in acute care hospitals in Europe annually, representing around 25 million extra days of hospital stay accompanied by a corresponding economic burden of €13-24 billion. In general, the mortality rate due to HAIs in Europe is estimated to be 1% (50.000 deaths per year). Furthermore HAIs contribute to at least 2.7% of deadly incidents (135.000 deaths per year)^[1]. The estimated HAI incidence rate in the USA was 4.5% in 2002, corresponding to 9.3 infections per 1000 patient-days and 1.7 million affected patients, approximately 99.000 deaths were attributed to HAIs^[2]. In 2004 the annual economic impact of HAIs in the USA was approximately US\$ 6.5 billion^[3]. Many studies conducted in developing countries report hospital wide higher HAI rates than in developed countries. In one-day prevalence surveys in single hospitals in Albania, Morocco, Tunisia, and the United Republic of Tanzania, HAI prevalence rates were 19.1%, 17.8%, 17.9% and 14.8%, respectively^[4-7]. A small number of studies from developing countries assessed the most frequent HAI risk factors as prolonged length of stay, surgery, intravascular and urinary catheters, and sedative medication^[5-9].

HAND HYGIENE

Hand hygiene is a general term describing any hand cleansing (and care) action. Hand cleansing with

soap and water has been the primary measure of personal hygiene for centuries^[10,11]. While in 1795, Alexander Gordon of Aberdeen might have been one of the first to suggest transmission of an "infectious agents" via hands^[12], Oliver Wendell Holmes from Boston, USA, and especially the observations and intervention of Ignaz Phillipus Semmelweis in Vienna, Austria, in the mid-1800s, were the first to actually prove the link between a "fever/infection and "dirty" hands of healthcare workers (HCW)^[13]. In the 20th century, many studies revealed the important role of HCWs' hands in the transmission of nosocomial pathogens. This leads to the first national hand hygiene guidelines being published in the 1980s^[13]. In 1995 and 1996 the CDC's Healthcare Infection Control Practices Advisory Committee (HICPAC) recommended that either antimicrobial soap or a waterless antiseptic agent should be used for hand cleansing after leaving the room of a patient with multidrug-resistant pathogens^[14,15]. While at that time alcohol-based handrubs (ABHRs) were the standard in many European healthcare settings, the 2002 HICPAC guideline was the first US guideline to recommend ABHR when available^[16]. The highest priority of the First Global Patient Safety Challenge, Clean Care is Safer Care, was the development of a WHO Guideline on Hand Hygiene in Healthcare^[17] that should have helped to apply a global Hand Hygiene Improvement Strategy that was centered around the point-of-care use of ABHRs. Since then, many studies have shown that this approach can reduce HAIs and their consequences, such as prolonged hospital stay, long-term

disability, increased resistance of micro-organisms to antimicrobials, massive additional financial burden, and excess deaths.

There are even some studies revealing the effectiveness of hand hygiene in reducing of rates of HCl and methicillin resistant *Staphylococcus aureus* (MRSA). The occurrence of hospital acquired MRSA cases significantly decreased after a successful hand hygiene promotion programme in a hospital in the United Kingdom^[18]. According to a study in Australia, hand hygiene culture and habits provided a 57% reduction of MRSA bacteraemia episodes as well as a significant reduction of the overall number of clinical isolates of MRSA and extended spectrum beta-lactamase producing *Escherichia coli* and *Klebsiella* spp.^[19]. In a study that measured HCAI rates, attack rates of MRSA cross-transmission, and consumption of handrub in parallel, compliance to recommended hand hygiene practices improved progressively from 48% in 1994 to 66% in 1997. As the option of handwashing with soap and water remained at a stable frequency, the frequency of handrubbing noticeably increased over that period and the consumption of alcohol-based handrub solution increased from 3.5 litres to 15.4 litres per 1000 patient-days between 1993 and 1998, respectively^[20].

WHO GUIDELINE on HAND HYGIENE

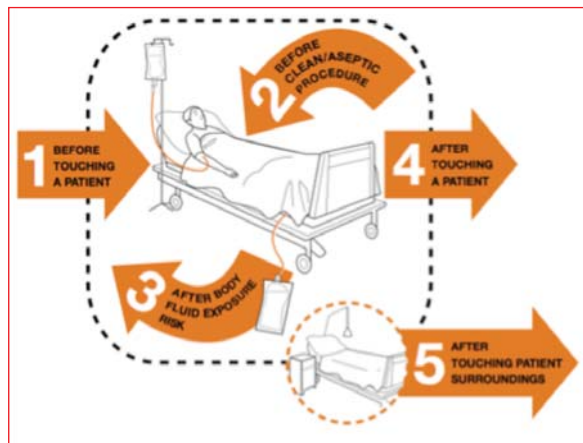
Since the WHO guideline is based on probably the most extensive review of the hand hygiene literature done in the post-Semmelweis area, it seems redundant to repeat what the WHO experts wrote. In the following we would like to point out some of the main messages and than discussion topics that are always challenging to implement in the WHO guideline.

The WHO guideline is centered on two important concepts of hand hygiene: i) the “system-change” and ii) the “five moments” of handhygiene.

i) While ABHRs were consistently used in many Northern-European countries as the mainstay for hand hygiene, other countries either preferred hand washing (with or without medicated soap), or at least had no preference between hand washing and ABHRs. The so-called system-change is the switch from water and (medicated) soap to ABHR at the point-of-care. Only the point-of-care, and thus rub-on use of a hand disinfectant, will allow for high compliance with hand hygiene. A system limited by structural constrains such as

sinks which are far a way from the point of care, will ultimately fail (and actually did fail in many countries over the last 150 years).

ii) The second most important change of the WHO guidelines tried to better define the indications for hand hygiene. The “five moments” which by now has become a standard phrase used by infection control practitioners when describing the indications of hand hygiene? The guideline acknowledged the fact that a detailed description of all hand hygiene indications would be impossible and thus tried to summarize the basic principals in a “handful” of easy to remember recommendations.



1. Before touching the patient
2. Before a clean/aseptic procedure
3. Presence of body fluid exposure risk
4. After touching a patient
5. After touching patients' surroundings'

Critics of the “five moments” comment on the fact that this would increase the number of hand hygiene moments, which would lead to duplication (an “after touching” followed by an “before touching”), and would include trivial moments. What they seem to forget is the fact that we failed to successfully describe detailed indications for over a century and that even the best guideline does not free us from actually thinking about what we are doing.

WHO HANDRUB FORMULATION

WHO has defined handrub formulations to help countries and health-care facilities adopt alcohol-based handrubs as the gold standard for hand hygiene

in health care. WHO recommends alcohol-based handrubs because of the following reasons:

1. Evidence-based, intrinsic advantages of fast-acting and broad-spectrum microbicidal activity with a minimal risk of generating resistance to antimicrobial agents,

2. Suitability for use in resource-limited or remote areas with lack of accessibility to sinks or other facilities for hand hygiene (including clean water, towels, etc.),

3. Capacity to promote improved compliance with hand hygiene by making the process faster and more convenient,

4. Economic benefit by reducing annual costs for hand hygiene, representing approximately 1% of extra-costs generated by HCAI,

5. Minimization of risks from adverse events because of increased safety associated with better acceptability and tolerance than other products^[21-28].

Alcohol-based hand antiseptics include ethanol, isopropanol or n-propanol, or a combination of two of those products. The antimicrobial activity of alcohols depends on their ability to denature proteins^[29]. Alcohol solutions including 60-80% alcohol are most effective^[30-31]. Alcohols have excellent in vitro germicidal activity against gram-positive and gram-negative vegetative bacteria (including multidrug-resistant pathogens such as MRSA and VRE), *Mycobacterium tuberculosis*, and a variety of fungi^[29,30]. However, they have practically no activity against bacterial spores or protozoan oocysts, and very poor activity against some non-enveloped (non-lipophilic) viruses. In tropical facilities, inactivity against parasites is a major concern for the opportunity to promote the extensive use of alcohol-based handrubs. Typically, log reductions of the release of test bacteria from artificially contaminated hands average 3.5 log₁₀ after a 30 second application, and 4.0-5.0 log₁₀ after a 1 minute application^[32]. Addition of chlorhexidine, quaternary ammonium compounds, octenidine or triclosan to alcohol-based formulations can result in persistent activity^[32]. A synergistic combination of octoxyglycerine and preservatives has resulted in prolonged activity against transient pathogens^[10]. Nevertheless, a recent study on bacterial population kinetics on gloved hands following treatment with alcohol-based handrubs with and without

supplements (either CHG or mectronium etilsulfate) revealed that the contribution of supplements to the delay of bacterial regrowth on gloved hands was minor^[33]. A number of factors that include the type of alcohol used, concentration of the alcohol, contact time, and volume of alcohol used, effect the efficiency of alcohol-based products on hand hygiene. A small volume (0.2-0.5 mL) of alcohol applied to the hands is no more effective than washing them with plain soap and water^[34,35]. Chlorhexidine, chloroxylenol, hexachlorophene, iodine and iodophors, quaternary ammonium compounds, triclosan are other useful substances for hand hygiene. Alcohol-based preparations proved more effective than plain soap and water, and most formulations were superior to povidone-iodine- or CHG-containing detergents. Among the alcohols, a clear positive correlation with their concentration is noticeable and, when tested at the same concentration, the order in terms of efficacy is: ethanol is less effective than isopropanol, and the latter is less effective than n-propanol^[36]. In observational studies conducted in hospitals, HCWs cleaned their hands on average from 5 to as many as 42 times per shift and 1.7-15.2 times per hour^[37-39]. The average frequency of hand hygiene episodes varies with the method used for monitoring and the setting where the observations were conducted; it ranges from 0.7 to 30 episodes per hour. On the other hand, the average number of opportunities for hand hygiene per HCW varies markedly between hospital wards; nurses in paediatric wards, for example, had an average of eight opportunities for hand hygiene per hour of patient care, compared with an average of 30 for nurses in ICUs^[40,41]. Adherence of HCWs to recommended hand hygiene procedures has been reported with very variable figures, in some cases unacceptably poor, with mean baseline rates ranging from 5% to 89%, representing an overall average of 38.7%^[42,43]. Perceived barriers to adherence with hand hygiene practice recommendations include skin irritation caused by hand hygiene agents, inaccessible hand hygiene supplies, interference with HCW-patient relationships, patient needs perceived as a priority over hand hygiene, wearing of gloves, forgetfulness, lack of knowledge of guidelines, insufficient time for hand hygiene, high workload and understaffing, and the lack of scientific information showing a definitive impact of improved hand hygiene on HCAI rates^[44-46].

HAND HYGIENE and RELIGION

There are several reasons why religious and cultural issues should be considered when dealing with the topic of hand hygiene and planning a strategy to promote it in health-care settings. The degree of HCWs' compliance with hand hygiene as a fundamental infection control measure in a public health perspective may depend on their belonging to a community oriented, rather than an individual-oriented society. Hand hygiene can be practised for hygienic reasons, ritual reasons during religious ceremonies, and symbolic reasons in specific everyday life situations. Judaism, Islam and Sikhism, for example, have precise rules for handwashing included in the holy texts and this practice punctuates several crucial moments of the day. Of the five basic tenets of Islam, observing regular prayer five times daily is one of the most important. Personal cleanliness is paramount to worship in Islam. Muslims must perform methodical ablutions before praying, and clear instructions are given in the Qur'an as to precisely how these should be carried out^[47,48]. In some religions, alcohol use is prohibited or considered an offence requiring a penance (Sikhism) because it is considered to cause mental impairment (Hinduism, Islam). As a result, the adoption of alcohol-based formulations as the gold standard for hand hygiene may be unsuitable or inappropriate for some HCWs, either because of their reluctance to have contact with alcohol, or because of their concern about alcohol ingestion or absorption via the skin. Even the simple denomination of the product as an "alcohol-based formulation" could become a real obstacle in the implementation of WHO recommendations. For Muslims, any substance or process leading to a disconnection from a state of awareness or consciousness (to a state in which she or he may forget her or his Creator) is called *sukur*, and this is *haram*. For this reason, an enormous taboo has become associated with alcohol for all Muslims. Some Muslim HCWs may feel ambivalent about using alcohol-based handrub formulations. The statement issued by the Muslim Scholars' Board of the Muslim World League during the Islamic Fiqh Council's 16th meeting held in Mecca, Saudi Arabia, in January 2002: "It is allowed to use medicines that contain alcohol in any percentage that may be necessary for manufacturing if it cannot be substituted. Alcohol may be used as an external wound cleanser, to kill germs and in external

creams and ointments^[49]. It has been suggested to avoid the use of the term "alcohol" in settings where the observance of related religious norms is very strict and rather use the term "antiseptic" handrubs. However, concealing the true nature of the product behind the use of a non-specific term could be construed as deceptive and considered unethical; further research is thus needed before any final recommendation can be made.

A hygiene education programme is relied on to introduce new infection control policies in health care. However, education alone may not be sufficient. A unique teaching session is unlikely to be successful and, even after positive change is noted, it might not be maintained. HCWs' attitudes and compliance with hand hygiene are extremely complex and multifactorial, and studies indicate that a successful programme would have to be multidisciplinary and multifaceted^[50-53]. Education is important and critical for success and represents one of the cornerstones for improvement of hand hygiene practices^[54]. It is therefore an essential component of the WHO multimodal Hand Hygiene Improvement Strategy together with other elements, in particular, the building of a strong and genuine institutional safety culture which is inherently linked to education. The reasons why education is important can be summarized as follows. It is important to notice that HCWs' compliance could be very low when guidelines are simply circulated down the hospital hierarchy: research indicates that the compliance rate can be as low as 20%^[55]. When monitored, compliance with MRSA precautions was only 28% in a teaching hospital; compliance was as low as 8% during the evening shift and 3% during the night shift. The success of the implementation process depends on the effectiveness of the education programme, and careful planning is essential^[56].

GLOVE USE

The impact of wearing gloves on compliance with hand hygiene policies has not been definitively established, as published studies have yielded contradictory results^[10,37,44]. Several studies found that HCWs who wore gloves were less likely to cleanse their hands upon leaving a patient's room, and two established an association between inappropriate glove use and low compliance with hand hygiene^[37,44]. In contrast, three other studies found that HCWs who wore gloves were

significantly more likely to cleanse their hands following patient care. Most of these studies were focused on hand hygiene performance after glove removal only and did not consider other indications. One study found that the introduction of gloves increased overall compliance with hand hygiene, but the introduction of isolation precautions did not result in improved compliance^[57]. For example, compliance with glove changing when moving between different body sites in the same patient was unsatisfactory, as well as compliance with optimal hand hygiene practices. Furthermore, although some studies demonstrated a high compliance with glove use, they did not investigate its possible misuse^[58,59]. Surveys conducted at facilities with limited resources showed that low compliance with recommendations for glove use and its misuse is not only associated with shortage of supply, but also with a poor knowledge and perception of the risk of pathogen transmission^[60-62].

DISPENSERS

Alcohol-based handrub dispensers have been traditionally been set up next to the sink in the health care facilities, generally adjacent to the wall-mounted liquid soap. Frequently, these dispensers were designed to allow the user to apply handrub without using their contaminated hands to touch the dispenser (elbow-activated). At present it is clear that exclusively wall-mounted dispensers (by the sink), are not sufficient to allow hand hygiene at the point of care. Placement of handrubs dispensers should promote hand hygiene where it is required in health care (Figure 1).

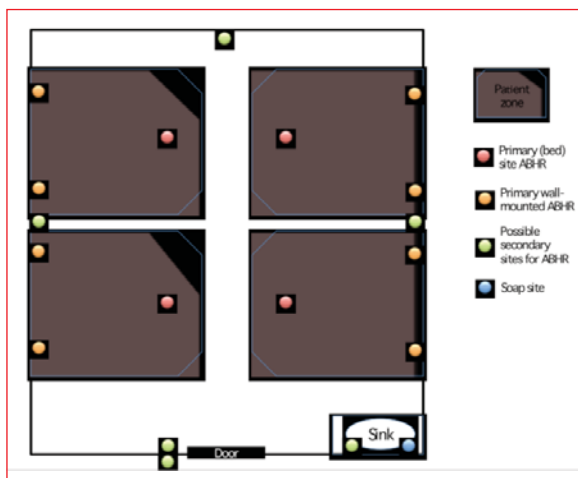


Figure 1. Probable localizations of alcohol-based handrub in the patient room.

In general, the different forms of dispensers, such as wall-mounted and those for use at the point of care should be used in combination to achieve maximum compliance. Wall-mounted soap dispensing systems are recommended to be located at every sink in patient and examination rooms. In patient areas where beds are geographically in very close proximity, common in developing countries, wallmounted, alcohol-based handrubs can be placed in the space between beds to facilitate hand hygiene at the point of care. Some institutions have customized dispensers to fit on carts or intravenous-pools to ensure use during care delivery. A variation of wall-mounted dispensers is holders and frames that allow placement of a container that is equipped with a pump. The pump is screwed onto the container in place of the lid. It is likely that this dispensing system is associated with the lowest cost. Containers with a pump can also be placed easily on any horizontal surface, e.g. cart/trolley or night stand/ bedside table. A disadvantage of these “loose” systems is the fact that the bottles can be moved around easily and may be misplaced, resulting in decreased reliability.

Studies that compared the use of personal alcohol-based handrub dispensing systems with the traditional wall-mounted dispenser and sinks were unable to show a sustained effect on hand hygiene compliance, possibly because the increased availability of hand hygiene products is only a single intervention within a broad multimodal approach^[63]. Individual, portable dispensers are ideal if combined with wall-mounted dispensing systems, to increase point-of-care access and enable use in units where wall-mounted dispensers should be avoided or cannot be installed.

The added value of “nontouch” dispensers is not clear. Where affordable, they might stimulate HCWs for more frequent use, but due to the fact that they are more costly and mostly “mounted” they are not sufficient to cover all indications in the patient zone. Furthermore, many of these systems have to be filled with the manufacturer’s own handrub, which is generally more expensive than other products distributed in 500 mL and 1000 mL standardized containers. In general, the maintenance is more complicated and the chance of malfunction is higher in automated systems.

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