



Hand washing and hospital staff

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Elisabeth Roth učo: 359159

Contact: 359159@mail.muni.cz

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Introduction

From a historical perspective, adequate hand hygiene has proved to be a powerful tool in combating hospital-related infections and thus preventing death. This was demonstrated in 1847 by doctor Ignaz Semmelweis who introduced obligatory hand washing among obstetricians which led to a dramatic impact on the reduction of puerperal fever among hospitalized mothers (1).

Hand washing is not only a hospital-related issue but also very important in the general population, especially in developing countries where maintenance of sanitation is a great issue. This is demonstrated by the fact that the most common cause of death in children under the age of five in third world countries is from diarrhoea and pneumonia (2, 3). If proper hand washing with soap was practiced in daily life activities, such as in food handling or after visiting the bathroom, a high proportion of the incidence of such diseases would be preventable or dramatically reduced. There are numbers indicating that adequate hand washing is an even more powerful tool in combating these diseases than vaccinations or other medical measures (2, 4, 5).

To take action against the global problem of health-care associated infections (HAI) and improve hand hygiene the WHO has started the annual campaign “Save lives: Clean your hands” (6). It aims at educating about correct hand washing and they have developed guidelines for how it should be performed (7). The preferred way of washing hands is by use of water and soap and preferably in combination with alcohol-based formulas (8). If there is dirt present on the hands before cleaning, both soap and then alcohol should be used. According to a study made by the University Of Oregon School Of Public Health there is no significant difference if plain soaps or soaps with anti-microbial action are used (2). The WHO guidelines also stress the importance of duration of hand washing and a simple rule for common people to keep in mind is to clean their hands for approximately as long time as it

takes to sing the melody „Happy birthday“ two times. A stepwise manual has been developed and it involves in total 11 steps (8).

The main points of these guidelines is to initiate by putting water on the hands followed by application of sufficient amount of soap. Then certain rubbing movements of the hands are essential in order to ensure that microbes on all skin surfaces of the hands are removed. Important surfaces are the dorsum and palms of the hands, between fingers, over nails, and the thumbs. Washing with water should be followed again and proper drying of the hands with a paper towel. A very important step is the use of a paper towel or your elbow to turn off the tap, otherwise the hands are contaminated again and the procedure has to be repeated (8).

In health care, several additional products besides hand cleaning with soap are used according to WHO (9):

- Alcohol/based hand rub
- Antimicrobial soap
- Antiseptic agents
- Antiseptic hand wipe
- Detergents (surfactants)
- Waterless antiseptic agents

These hand cleaning products are accompanied with certain practices (8):

- Antiseptic hand washing
- Antiseptic hand rubbing
- Hand antiseptis/decontamination/degerming
- Hand care
- Hand washing with soap (plain soap or antimicrobial soap)
- Hand cleansing

- Hand disinfection
- Hygienic hand washing
- Surgical hand antisepsis/hand preparation

In health care, hospital-associated infections (HAI) are an increasing problem and practicing cleaning and disinfection of hands is essential. It is estimated that about 5-15 % of patients being admitted to hospitals in developed countries are affected to any extent by HAI (9, 10, 11). Out of these HAI the most frequent ones are urinary tract infections, surgical site infections, blood stream infections, and pneumonia (9, 12). The risk is especially high in patients hospitalized in the ICU due to more frequent catheterizations and invasive devices (9, 13). Substantial transfer of microorganisms from patients to health care workers during contact-related procedures occur even at trivial non-invasive situations, e.g. when measuring blood pressure, taking the pulse or mere touching of the patient (9, 14).

A study on this topic was performed in the north of India among health care workers in an intensive care unit where the frequency of hand washing as well as situations when it was performed was observed. The observations took place randomly during daytime at intervals of 10 minutes and the number of hand washing incidents was counted. Also, the category of health care workers assessing the patients was taken into account. As might be expected, nurses constituted the health care category with most opportunities to clean their hands and in second place trainees. The overall compliance to hand washing among all categories was estimated to 26.0% and among nurses it was 21.48%. Preventive measures to improve this were undertaken afterwards and the results improved to 57.36% for all health care professionals and for nurses to 61.59%. These preventive measures included e.g. increased access to hygienic products, posters, and verbally correcting mistakes made by the medical personnel. The health care workers were asked about their own opinion why they thought the compliance was so poor and more than one third answered that it was due to lack of time (15).

Besides guidelines for how to adequately perform hand washing, WHO has also developed recommendations for health care professionals when to practice hand hygiene associated with patient care. According to these recommendations there are five essential moments (16):

1. Before touching a patient
2. Before clean or aseptic procedures
3. After body fluid exposure risk
4. After touching a patient
5. After touching patient surroundings

A very important aspect of hand hygiene in health care is the use of protective single-use gloves (17). According to Centres for Disease Control and Prevention (CDC), protective gloves are required in any situation with a patient where there is “contact with blood or other potentially infectious material, mucous membranes or damaged skin”(17, 18, 19). It is also fundamental to use only one pair of gloves per patient and to dispose them directly after finishing an infectious procedure before continuing with another (17, 18, 19). Important to stress in this context is that using disposable gloves does not replace adequate hand hygiene as there is still some contamination of the hands taking place. The gloves have microspores and small pathogens, e.g. some viruses are still capable of being transmitted (17, 18).

A study performed on the compliance of disposable glove use among health workers concluded that the rate of compliance among doctors was higher than among nurses. This in spite of nurses being more involved in performing interventions posing an infectious risk, e.g. in blood taking, catheterizations, and wound dressings. Other observations made in the same study were that the compliance was reduced with increased number of interventions that required glove use and also in health workers after working many hours (17).

Additional notes on hand hygiene in a health care setting includes avoidance of wearing nail polish and artificial nails, keeping nails short, and not to wear jewellery on hands or arms, or watches (20).

A Norwegian study was conducted on the topic of bacterial contamination in association with health care workers wearing bracelets, watches, rings, nail polish and the length of their nails. The results proved that the bacterial contamination was increased in health care workers wearing all of these items, however, in the case of nail polish there could not be proven any link to increased numbers of bacteria present on the hands in this specific study. Regarding the length of nails the study showed that hands with more than 2 mm natural nail length had higher number of bacteria present (21). The current guidelines from WHO is to keep nails under 5 mm in length (21, 22).

Another aspect of hand hygiene that the same study put focus on was the use of hand cream. Although hand creams serve the purpose of preventing cracks in the skin to keep it intact from microorganisms (21, 22, 23), this study showed that the contamination of bacteria on the hands was greater some minutes after hand cream administration. One reason could be explained by that directly after administration before the hand cream has been properly absorbed by the skin, the contamination is temporarily greater, but the exact reason behind is uncertain (21).

Generally, it is important to keep the skin intact in preventing further spread of pathogens. This is especially important in a hospital setting among health care workers where repetitive hand washing can cause irritant dermatitis which further promotes bacteria to reside on the hands. Dermatitis is especially evident in workers exposed of wet environment. To prevent cracks in the skin and possible dermatitis, hand moisturizers should be used as a preventive measure. Alcohol-based rub formulas are also possible to use when appropriate as they are more sparing for the skin than hand washing (24).

Methods used to evaluate hand washing include observation of the hands under UV-light where skin surfaces that were contaminated can be seen as spots. Most frequent skin surfaces being missed include under and around nails, thumbs, and around wrists. Another way of estimating the cleanliness of the hands is cultivation on a Petri dish with a swab that has been inoculated first onto the skin and then transferred to the medium of the Petri dish (25).

Discussion

Pathogens causing serious life-threatening disease in humans can be frequently colonized from the hands of health care workers. Such pathogens include e.g. MRSA (methicillin resistant *S.aureus*), VRE (vancomycin resistant *Enterococcus*), *Candida* spp., and *Clostridium difficile* (26, 27, 28). Since no pathogens are visible on the bare hands it is easy to forget and underestimate their capacity for causing harm. It could be especially easy to forget for people that normally never come in contact with life-threatening infections and apparently not even for health care workers that encounter such patients on a daily basis in the intensive care unit. This could pose a problem in motivating the general population to practice hand washing more often and in a correct way as what WHO is trying to campaign for. However, hand washing is not alone responsible for the development of multi-resistant strains and the prevalence of other infectious diseases, but as stated before in the introduction (2, 4, 5) it is estimated to be just as potent as any vaccine. Though, this effect might be more apparent in developing countries where the general standard of sanitation is poor.

Health care workers represent an important link between the hospital environment and the society outside of it. Therefore, they carry a great responsibility to reduce the transmission of infectious diseases, to practice hygienic measures routinely, but also to set a good example and educate other people on the significance of good hand hygiene. It has been noted even among health care workers that if senior workers (26, 29, 30) or teachers of medical students promote hand hygiene the general compliance will be greater (26, 31).

Conclusion

Ever since doctor Ignaz Semmelweis demonstrated the great impact of simple hand washing in combating puerperal fever, adequate hand hygiene has become essential in medicine. WHO has continued to promote hand washing in the general population and among health care workers in order to combat infectious diseases and the spread of multi-resistant bacteria. Therefore, special guidelines have been developed for this purpose.

To some extent the transmission of microorganisms between patients and health care providers is inevitable, but on the other hand it has also proved to be dependent on the general attitude of health care workers and how compliant they are to regular hand hygiene routines. Transmission of microorganisms take place even at standard non-invasive procedures, e.g. in blood pressure measurement or when taking the pulse.

Disposal gloves is another important aspect of hand hygiene and it should serve as a complement to hand washing when in contact with body surfaces, fluids or secretions that pose a risk of infection. Additional important aspects of hand hygiene include to not use watches, bracelets, rings, nail polish, and to keep nails short.

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