

VIDEOS IN CLINICAL MEDICINE

# Hand Hygiene

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## OVERVIEW

Health-care associated infections are a threat to patient safety and the most common adverse events resulting from a stay in the hospital.<sup>1</sup> Approximately 5 to 10% of hospitalized patients in the developed world acquire such infections, and the burden of disease is even higher in developing countries. Proper use of hand hygiene is a critical to the prevention of these infections, but compliance among health care workers is most often below 40%.

Hand hygiene serves many purposes in the health care setting.<sup>1</sup> It prevents both endogenous and exogenous infections in patients, contamination of the hospital environment with potential pathogens, and cross-transmission of microorganisms between patients. When used in conjunction with the appropriate protective equipment, it also protects health care workers from the hazards of occupational infections.

## EQUIPMENT

Essential equipment for the performance of adequate hand hygiene includes an alcohol-based hand-rub formulation or soap, water, and drying agents such as disposable paper or cloth towels. Alcohol-based hand rubs with optimal antimicrobial efficacy usually contain 75 to 85% ethanol, isopropanol, or n-propanol, or a combination of these products.<sup>1</sup> Formulations containing lower alcohol concentrations (i.e., 60 to 70%) are acceptable provided that they have been tested in the laboratory in accordance with the standards established by the European Committee for Standardization or the American Society for Testing and Materials.<sup>1</sup> Hand rubs must be supplemented with emollients to protect the skin. Product containers should be easily available at the point of care — within 3 ft (1 m) of the most likely area of use — or should be carried in small bottles by health care workers for their own personal use.<sup>1,2</sup>

Soaps are detergents that can remove lipids and dirt. Their antibacterial effect results from their capacity to dislodge bacteria from the skin when combined with the rubbing of hands and the rinsing effect of running water.<sup>1</sup>

## INDICATIONS

Indications for hand hygiene are clearly defined by authoritative bodies, including the Centers for Disease Control and Prevention<sup>3</sup> and the World Health Organization (WHO).<sup>1</sup> To better understand these indications, it is necessary to have a knowledge of the basic principles of microbial pathogen cross-transmission in the health care setting.<sup>4</sup>

The skin and mucous membranes of humans are colonized by various microbial species. When hospitalized, patients gradually shed these microorganisms onto inanimate objects in their immediate surroundings (e.g., bed linens and bedside furniture).<sup>4</sup> Consequently, hospitals contain a multitude of microbial environments. Some, dubbed “patient zones,” consist of a patient and the patient’s immediate surroundings. Others, such as corridors and public areas, are also

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colonized with microorganisms as a result of contamination by health care workers, patients, and even visitors. Cross-transmission of potential pathogens from one environment to another occurs mainly through health care workers' hands.<sup>4</sup>

To prevent cross-transmission from one patient to another, health care workers must perform hand hygiene immediately before touching a patient or when entering a patient zone. The correct moment to perform hand hygiene before touching a patient is critical.<sup>5</sup> Hand hygiene should be performed close to the site of care to avoid recontamination if hands come into contact with an object distant from the patient, such as a doorknob.<sup>4,5</sup> Hand hygiene must be performed between the last hand-to-surface contact with an object located outside the patient zone and the first within the patient zone — ideally, immediately before touching the patient.<sup>5</sup>

Hand hygiene should also be performed just after leaving the patient and before touching any object located outside the patient zone.<sup>5</sup> Completion of this step will limit the risk of germ dissemination to the health care environment. Since the patient's immediate surroundings are also contaminated by the patient's skin flora, contact with objects located in the patient's environment, such as a monitor, bedside table, or bed rail, must be followed by the use of hand hygiene even if there is no direct contact with the patient.

Certain body regions must also be kept as free as possible of microorganisms. These include zones of impaired host defense, such as mucous membranes and breaks in skin (e.g., surgical wounds) and sites of invasive device insertion (e.g., vascular or urinary catheters and endotracheal tubes).<sup>4</sup> Microorganisms that colonize the health care worker's hands, the patient's skin, or the immediate surroundings must not be introduced into these zones of lowered immune protection. For these reasons, it is essential to perform hand hygiene immediately before touching nonintact skin and mucous membranes and before manipulating invasive devices<sup>5</sup> to prevent colonization that may subsequently lead to infection.

Finally, hand hygiene protects health care workers. Some patient care activities expose workers to potentially infectious body fluids, such as blood or respiratory secretions. To prevent infection and colonization, hand hygiene must be performed immediately after completing a task associated with a risk of hand exposure to body fluids, even in the absence of visible soiling and when gloves have been used.<sup>1,4,5</sup>

According to the WHO, the five moments that call for the use of hand hygiene<sup>1,4,5</sup> include the moment before touching a patient, before performing aseptic and clean procedures, after being at risk of exposure to body fluids, after touching a patient, and after touching patient surroundings.

#### HAND-HYGIENE TECHNIQUE

There are two recognized techniques for performing hand hygiene: hand rubbing with an alcohol-based hand-rub formulation and hand washing with soap and water.

To perform hand rubbing, apply a palmful of alcohol-based hand rub to a cupped hand and rub hands together to cover all surfaces.<sup>1</sup> Then rub hands again, palm to palm. To reach the dorsal interdigital area of the hand, rub the fingers of one hand over the dorsum of the other hand and interlace the fingers. Repeat the procedure on the palmar side of the hands to reach the palmar interdigital area. To cleanse the dorsal aspect of the distal phalanges, rub the back of the fingers across the palm of the other hand with fingers interlocked. Decontaminate fingertips and the subungual region by rotating them in the palm of the other hand. To cleanse the base of the thumb, clasp it in the palm of the other hand and rotate the thumb. Each sequence should be repeated on both hands. The entire procedure should take 20 to 30 seconds to complete (Fig. 1). Hands should be rubbed until dry to ensure maximum efficacy. Complete drying of the hands in less than 20 seconds is usually due to insufficient application of the product.



**Figure 1.** Steps Performed When an Alcohol-Based Hand-Rub Formulation Is Used for Hand Hygiene.

To hand wash, wet with water and apply the amount of soap necessary to cover all surfaces. Rub hands vigorously together to cover all surfaces and complete the procedure by following the steps described for hand rubbing (Fig. 1). When hands have been thoroughly decontaminated, rinse with water and dry with the use of a disposable paper towel, cloth towel, or a hot-air dryer. Gently pat skin rather than rubbing it to protect hands from cracking. Avoid reusable towels, as they are a possible source of cross-infection.<sup>1</sup> When hands are dry, turn off the faucet using a paper towel to prevent recontamination. The entire procedure should take at least 40 to 60 seconds to complete.

#### CHOICE OF TECHNIQUE

Hand rubbing with an alcohol-based formulation is the preferred hand-cleansing procedure in most clinical situations.<sup>1-3</sup> The main advantages of alcohol-based hand rubs as compared with soap and water include availability at the point of care, a higher level of antimicrobial efficacy, faster use, and better skin tolerability.<sup>1</sup> Specific indications for hand washing instead of alcohol-based hand rubbing include visible hand contamination with blood, body fluids, or proteinaceous material and exposure of hands to spore-forming organisms (e.g., *Clostridium difficile* or *Bacillus anthracis*).<sup>1,3</sup> Hand washing must also be performed after use of the restroom.

#### APPROPRIATE USE OF GLOVES

Gloves prevent the transmission of microorganisms from the health care worker's hands to the patient<sup>1,4</sup> and reduce the health care worker's risk of acquiring infections from patients. Clean, nonsterile examination gloves must be worn during patient care activities that may involve exposure to potentially infectious material (e.g., blood, body fluids, mucous membranes, or nonintact skin) or to patients who are colonized or infected with selected pathogens transmitted through contact (e.g., *C. difficile* or methicillin-resistant *Staphylococcus aureus*).

Glove use does not replace the need to perform hand hygiene.<sup>1,5</sup> When an indication for hand hygiene occurs during glove use, the health care worker must remove the gloves, perform hand hygiene, and don another pair of gloves, if still indicated. Hand hygiene must always be performed after glove removal because gloves may have defects and because hand contamination may occur during removal (Fig. 2). Do not disinfect or reuse gloves, since alcohol may degrade glove material and lead to holes and leakage.<sup>1</sup>



**Figure 2.** Hand Hygiene after Gloves Are Removed.

#### JEWELRY AND FINGERNAILS

Do not wear rings or bracelets during patient care, since they increase the bacterial load of the skin.<sup>1,3</sup> If you have a wedding ring, a simple alternative is to wear it on a chain around your neck. In some health care environments, wedding rings may be tolerated. Review and comply with the policy in place at your facility.

Long fingernails are associated with infection outbreaks of resistant pathogens at health care facilities.<sup>1,3</sup> Fingernails should be kept short (<0.2 in. or 0.5 cm in length), and artificial nails or nail extenders should not be worn, since they are associated with outbreaks of cross-transmission and infection with resistant pathogens.<sup>1</sup> Nail polish is acceptable, providing its integrity is preserved. Fingernail diseases, such as onychomycosis, should be treated promptly; they may reduce the efficacy of hand hygiene.



**Figure 3.** Use of a Skin-Care Product Helps to Prevent Irritation.

#### COMPLICATIONS

Irritant dermatitis can occur after repeated use of hand-hygiene products.<sup>1</sup> Common symptoms include dryness, itching, and sometimes cracking and bleeding. In rare cases, allergic dermatitis can occur. Damaged skin is more difficult to clean

and may be more susceptible to skin colonization, thus leading to microbial transmission. To prevent skin irritation, use skin-care products frequently during work shifts (Fig. 3),<sup>1</sup> favor the use of alcohol-based hand rubs rather than soap,<sup>1,2</sup> avoid the use of hot water when hand washing,<sup>1</sup> refrain from using gloves unless specifically needed,<sup>1</sup> and dry hands completely before donning gloves.<sup>1</sup>

Although exceedingly rare, flash fires involving health care workers' hands have been reported,<sup>1</sup> mostly caused by a static spark that occurred while hands were still impregnated with alcohol. To prevent such events, make sure that hands are fully dry before touching objects.

Some hand-hygiene agents (particularly hand-rub gels) may give those using them a sense of product buildup after repeated use. Occasional hand washing can correct this problem, but it is preferable for health care institutions to select hand rubs that do not induce this feeling of buildup to maximize compliance with requirements for hand hygiene.<sup>1</sup>

#### RELIGIOUS ISSUES

Although some religions prohibit the use of alcohol, all accept its use as a medical agent and recognize the unique value of using alcohol-based hand rubbing in health care settings.<sup>6</sup> For example, the Islamic religion permits the use of alcohol as a medicinal agent.

#### PROMOTION OF HAND HYGIENE

Successful promotion of hand hygiene results from the implementation of multiple strategies. These strategies include instituting system change (e.g., making hand-hygiene products available at the point of care), educating health care workers, monitoring compliance and providing feedback, and embedding the practice of hand hygiene in the institutional safety culture.<sup>1,2</sup>

#### SUMMARY

Hand hygiene is a procedure that should be mastered by all health care workers. Hand hygiene is not optional — it is mandatory. It must be used conscientiously to decrease the occurrence of infections associated with health care and to increase patient safety. Proper use of hand hygiene is a sign of competency, professionalism, and respect.

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