

## Self-Assessment

Name one advantage of using soap and water over alcohol.

What is the primary mechanism by which alcohols work as antimicrobial agents?

Name one area commonly not cleaned well on the hands.

Employee name: \_\_\_\_\_



# Do You Have a Mystery on Your Hands?

## A Guide to Hand Hygiene



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## Introduction

The phrase “out of sight, out of mind” was a key element in hand hygiene up to the time of the Civil War. While bacteria was discovered by Anthony Von Leeuwenhoek in the 1600’s, their role in infective processes was poorly or not at all understood. During this time, disease was thought primarily to be the result of the body’s inflammatory response gone amuck. Dr. Ignaz Semmelweis developed the germ theory to explain the spread of illness. He published his theory in 1861, only to be dismissed from his position and ridiculed.

More recently, in 1975 and in 1985, the Centers for Disease Control and Prevention (CDC) published formal guidelines on hospital hand-washing practices. They recommended hand washing with non-antimicrobial soap between the majority of patient contacts and using antimicrobial soap before and after performing invasive procedures or in caring for high-risk patients. <sup>(6,7)</sup>

In 1996, the Healthcare Infection Control Practices Advisory Committee (HICPAC) recommended either using antimicrobial soap or a waterless antiseptic agent for cleaning hands upon leaving the rooms of patients with multidrug-resistant pathogens as well as providing recommendations for other clinical settings, including routine patient care. <sup>(6)</sup>

### Current Statistics

According to the CDC, it is estimated that washing hands with soap and water could reduce diarrheal disease-associated deaths by up to 50 percent. They also estimated that, on any given day, approximately one in 25 U.S. patients has at least one infection contracted during the course of his or her hospital stay, adding up to about 722,000 infections in 2011.



***“The most advanced medical care won’t work if clinicians don’t prevent infections through basic things such as regular hand hygiene.” —  
CDC Director Tom Frieden,  
M.D., M.P.H.***

### Resources

1. [www.cdc.gov/media/pressrel/r2k0306c.htm](http://www.cdc.gov/media/pressrel/r2k0306c.htm) Why is hand washing important? ... Unquestioned today as the most important tool in the healthcare worker’s arsenal for preventing infection, ...
2. [http://www.cdc.gov/healthywater/hygiene/fast\\_facts.html](http://www.cdc.gov/healthywater/hygiene/fast_facts.html)
3. <http://www.cdc.gov/handhygiene/Basics.html>
4. <http://www.cdc.gov/norovirus/about/overview.html>
5. [www.cdc.gov/hai/organisms/cdiff/Cdiff-patient.html](http://www.cdc.gov/hai/organisms/cdiff/Cdiff-patient.html)
6. The Morbidity and Mortality Weekly Report, Volume 51, No.RR-16, October 25,2002: “Guideline for Hand Hygiene in Health Care Settings” Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force.
7. <http://www.who.int/gpsc/en/>. World Health Organization.
8. Curtis V, Camicross S. Effect of washing hands with soap on diarrhoea risk in the community: A systematic review. *Lancet Infect Dis.* 2003;3(5):275-81.
9. <http://www.who.int/gpsc/en/>
10. Rabie T, Curtis V. Hand washing and risk of respiratory infections: a quantitative systematic review. *Trop Med Int Health.* 2006;11(3):258-67.
11. <http://www.cdc.gov/media/releases/2014/p0326-hospital-patients.html>
12. “How a team of doctors at one hospital boosted hand washing, cut infections and created a culture of safety” <http://news.yahoo.com/clean-hands--vanderbilt-s-hand-washing-initiative-172312795.html>
13. Epidemiologic Background of Hand Hygiene and Evaluation of the Most Important Agents for Scrubs and Rubs. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC523567>
14. <https://www.healthline.com/health-news/antibacterial-soaps-encourage-mrsa-in-nose-041014>

## Hand-Hygiene Barriers and Recommendations:

### Barriers

The biggest barrier to proper hand hygiene in health care is compliance. One hand-washing initiative began when a man witnessed first-hand the lack of hand hygiene following his wife's double-knee replacement surgery. He observed 92 instances when staff should have soaped up or used antiseptic foam but only 32 times when they actually did. With the help of key staff, the increased hand washing from 58 percent to 97 percent, resulted in corresponding drops in infections, one by 80 percent.<sup>(12)</sup>

The second biggest barrier is culture. For any initiatives to be successful, there has to be a shared sense of accountability with all of the health care facility's hierarchy. This means that a nurse or even a receptionist needs to feel comfortable enough to remind everyone (e.g., the chief of neurosurgery) to clean his or her hands and that the doctor would be expected to respond with a polite "thank you" without signs of annoyance, condescension or risks of negative repercussions.

### Recommendations

- Make improved hand hygiene an institutional priority and encourage staff to speak up, no matter who they see not cleaning their hands properly.
- Place alcohol-based hand rubs at entrance to patient room, or at bedside.
- Provide health care providers with pocket-sized containers of hand sanitizer.
- Monitor health care workers' adherence with recommended hand hygiene practices and give feedback.
- Implement a multidisciplinary program to improve adherence to recommended practices.
- Encourage patients and their families to follow good hand hygiene practices.
- Monitor the volume of alcohol-based hand rub used per 1,000 patient days.
- Monitor adherence to policies on wearing artificial nails.



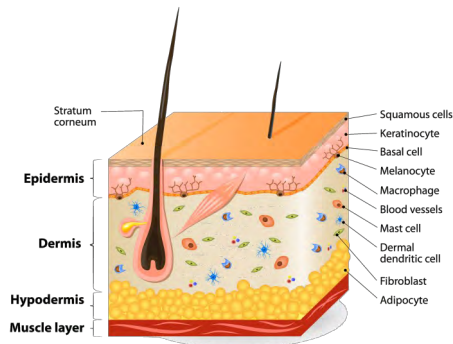
*“Although there has been some progress, today and every day, more than 200 Americans with healthcare-associated infections will die during their hospital stay,” states CDC Director Tom Frieden, M.D., M.P.H. “The most advanced medical care won’t work if clinicians don’t prevent infections through basic things such as regular hand hygiene.”*

## More Than Skin Deep

### Normal Skin Physiology

Skin is made up of epithelial cells that form at the germinating layer just above the dermis. Its cells are pushed upward as more cells are formed and changes are made to the cells, and they begin to form keratohyalin and eleidin, both precursor proteins to the final product, keratin.

**Keratin** is an insoluble, rope-like, fibrous protein that is lightweight, flexible, durable and of course water-resistant. Keratin forms the structural component of hair, calluses and nails, and it is what transforms skin into an outer waterproofed barrier for the body. Outer epithelial cells impregnated by keratin at the skin's surface are flattened, dead cells. These cells slough off at a rate of about one million cells per day.<sup>(6,7)</sup>



The skin's formation of this outer skin barrier is under homeostatic control. Therefore, the barrier reacts to external factors and internal agents (e.g., nutrient uptake).<sup>(6,7)</sup>

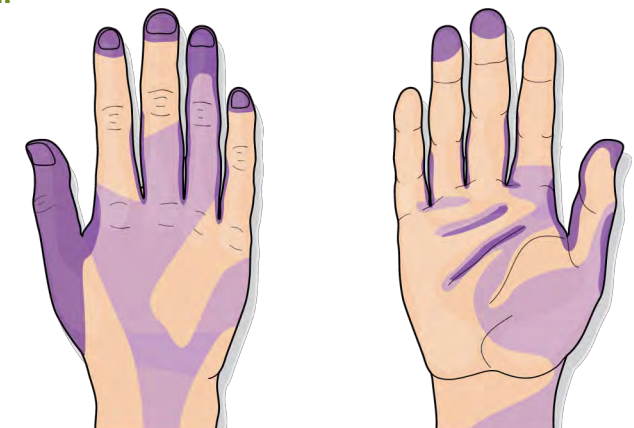
Normal human skin is colonized with bacteria. There are two types on the hands:

1. Transient flora, which colonizes the superficial layers of the skin, is more susceptible to removal by simple hand washing. This type of flora is what is typically acquired by health care workers during direct contact with patients, or through contact with con-taminated surfaces in close proximity of the patient. And so this is the type flora most frequently associated with healthcare-associated infections (HAIs). The hands of some health care workers may become persistently colonized by pathogenic flora, such as *S. aureus*, gram neg bacilli, or yeast.<sup>(6,7)</sup>

## World Health Organization (WHO) Good Hand Washing Technique

1. Wet hands with water.
2. Apply enough soap to cover the entire surface of the hand.
3. Rub hands palm to palm.
4. Rub right palm over left dorsum (back of left hand) and vice versa.
5. Wash palm to palm with interlaced fingers.
6. Rub the backs of fingers to opposing palms with fingers interlocked.
7. Rotationally rub thumbs with the opposing hand's palm.
8. Rotationally rub backwards and forwards with clasped fingers of right hand in the left palm and vice versa.
9. Rinse hands with soap and water.
10. Dry hands using a single-use towel. (Dry thoroughly – wet hands aid in transfers).
11. Use the towel to turn off the faucet.

The entire hand treatment procedure, whether with soap, a hand hygiene product or a positive control should take 40 to 60 seconds, with steps 2 through 7 taking 15 to 20 seconds. However, most studies show the average duration of hand cleansing by health care workers is less than 15 seconds. Many areas of the hand are often missed during hand sanitization. Rushed or incomplete hand washing is another barrier to good hand hygiene and **leads to many areas of the hand being missed.**





## Disadvantages of Alcohol-Based Hand Sanitizers

While alcohols are rapidly germicidal when applied to skin, they have no appreciable persistent, or residual activity, so that regrowth of bacteria can occur. However, this bacterial regrowth has been seen to occur slowly, and addition of agents such as chlorhexidine, quaternary ammonium compounds, octenidine or triclosan to alcohol-based formulations can result in persistent activity.

Allergic contact dermatitis or contact urticaria syndrome caused by hypersensitivity to alcohol or to various additives present in some alcohol-based hand rubs occurs rarely.

Alcohols are not good cleansing agents, and their use is not recommended when hands are dirty or visibly contaminated with proteinaceous materials. You need to wait for the agent to dry on the skin. Alcohols have virtually no activity against bacterial spores or protozoan oocysts and very poor activity against some non-enveloped (non-lipophilic) viruses. In fact, alcohol preserves spores and is used in the laboratory to select *C. diff* spores from stools.<sup>(12)</sup> Although alcohol-based hand rubs may not be effective against *C. diff*, they have not been shown to trigger the rise of *C. diff*-associated disease.

## World Health Organization (WHO) Good Hand-Rub Technique

- Apply palmful of the product in your cupped hand.
- Rub hands palm to palm.
- Lace fingers of one hand to the back of the other to apply in between fingers and vice versa.
- Then do the same palm to palm.
- Rub the backs of fingers to opposing palm and vice versa.
- Clasp the left thumb with right hand palm and rub rotationally and vice versa.
- Rotationally rub backwards and forwards each palm with the fingers of the other hand.
- Once dry, the hands are safe.

**Duration of this procedure is 20 to 30 seconds.**

2. Resident flora attaches to deeper layers of the skin and are more resistant to removal but less likely to be associated with HAIs. Resident flora serves protectively to prevent microbial antagonism.<sup>(6,7)</sup>

## Transmission Sequence of Healthcare-Associated Pathogens

According to the CDC, among patients and health care personnel, microorganisms are spread to others through four common routes of transmission: contact (direct and indirect), respiratory droplets, airborne spread and common vehicle.

The sequence of events involved in the transmission of healthcare-associated pathogens taken directly from The Morbidity and Mortality Weekly Report from October 25, 2002 on hand washing, is:

1. Organisms on the patient's skin or shed from skin onto an inanimate object (e.g., patient gowns, bed linens, table tray, bed rails, etc.) are transferred to the hands of the health care worker.
2. These organisms must be capable of surviving at least several minutes on the hands of personnel.
3. The hand washing or hand antisepsis by the worker must be inadequate or omitted entirely, or the agent used for hand hygiene must be inappropriate.
4. Finally, the contaminated hands of the caregiver must come direct contact with another patient, or with an inanimate object that will come into contact with the patient.

**Even "clean" activities such as lifting a patient, taking a patient's pulse or blood pressure or touching a patient can result in a worker contaminating hands.** Similarly, wearing gloves reduces hand contamination but does not fully protect from acquisition of bacteria during patient care. Therefore, the glove surface is contaminated, making cross-transmission through contaminated gloved hands likely.<sup>(7)</sup>

## Soap and Hand Washing

Plain soaps are detergent-based products with limited anti-microbial activity, unless anti-microbial agents are added to the product. Soaps are recommended for removing visible dirt and soil from hands, but have limited anti-microbial activity. Soap and water have been shown to be more effective than hand sanitizers at removing or inactivating certain parasites such as:

1. **Norovirus** is a very contagious virus. You can get it from an infected person, contaminated food or water or by touching contaminated surfaces. Norovirus is the most common cause of acute gastroenteritis in the United States. Norovirus is also the most common cause of food borne-disease outbreaks in the United States. <sup>(5)</sup>
2. ***Clostridium difficile*, or *C. diff***, is a spore-forming, gram-positive anaerobic bacillus that produces two exotoxins: toxin A and toxin B. It is a common cause of antibiotic-associated diarrhea (AAD). It accounts for 15 to 25 percent of all episodes of AAD. <sup>(5)</sup>

*C. diff* is shed in feces. Any surface, device or material (e.g., commodes, bathing tubs, electronic rectal thermometers) that becomes contaminated with feces may serve as a reservoir for the *C. diff* spores. *C. diff* spores are transferred to patients mainly via the hands of health care personnel who have touched a contaminated surface or item.

## Disadvantages of Soap & Water

Soap and water are often seen by hospital workers as inconvenient, especially if sinks are not readily available. Health care staff have also reported feeling too overwhelmed by other tasks to wash their hands with soap and water. Also, some soap products are considered unacceptable for reasons such as smell, consistency or are thought to cause skin irritation and dryness. <sup>(6, 7,13,14)</sup>

If using non-antimicrobial soaps, these plain soaps have been known to become contaminated, which in one case led to colonization of personnel with gram-negative bacilli. <sup>(6,7)</sup> In many cases, plain soap and water may not protect against the spread of many types of bacterial and viral infections (e.g., Hepatitis B and C viruses), and alcohol-based cleansing agents are preferred. <sup>(13)</sup>

In most studies on hygienic hand antisepsis that included plain soap, alcohols were shown to be more effective than soap. <sup>(7)</sup> Finally, concerns have been raised about the use of anti-microbial soaps and the development of bacterial resistance. <sup>(7,14)</sup>

## Alcohol-Based Hand Sanitizers

Alcohols are preferred hand antiseptics due to their denaturing properties, they destroy proteins irreversibly breaking bonds that give proteins their shape. Because of this, alcohol-based antiseptics work well against both gram-positive and gram-negative bacteria, including drug-resistant pathogens such as MRSA and VRE. <sup>(7,14)</sup>

Certain enveloped viruses (e.g. herpes simplex virus, HIV and the influenza virus) are also susceptible to alcohols. While Hepatitis B was less susceptible, both Hepatitis B and C were killed by 60 to 70 percent alcohol (the water in the alcohol is necessary for the denaturing process). The hand-rub process is faster and likely to have greater compliance over the recommended hand washing. <sup>(6,7)</sup>

