Hand Hygiene: Performing Antiseptic Handwashing

What is Hand Hygiene and Antiseptic Handwashing?

› Hand hygiene (also known as hand antisepsis) refers to a set of practices that are at the core of standard precautions (formerly called universal precautions), which are first-line infection control measures that also involve the use of appropriate personal protective equipment (PPE), safe injection practices, respiratory hygiene/cough etiquette, and proper disposal of contaminated materials. Standard precautions should be followed when providing care for all patients, regardless of whether the patient has a known communicable disease or infection. (For more information, see Nursing Practice & Skill ... Standard Precautions: Following)

• What: Antiseptic handwashing (AH), as defined by the World Health Organization (WHO), requires washing hands with a detergent or soap that contains an antiseptic agent (e.g., alcohols, chlorhexidine, hexachlorophene, iodine and iodophors, chloroxylenol [PCMX], quaternary ammonium compounds, or triclosan) to reduce or inhibit the growth of microorganisms. In the clinical setting, hand antisepsis is the process of reducing or inhibiting microorganisms, visible dirt, and toxic substances on the surface of the hands and is necessary to eliminate transient organisms (i.e., flora that survive a short time on the skin surface, which are typically anaerobic, gram-negative organisms such as Escherichia coli. Transient microorganisms are distinguished from resident colonizing flora, which reside in deeper layers of the skin and usually include aerobic, gram-positive organisms such as Staphylococcus epidermidis and which are not necessarily affected by use of an antiseptic detergent. Hand antisepsis can also be performed using an alcohol-based (at least 60% ethanol or isopropanol) antimicrobial hand sanitizer, which is commonly called a handrub (HR); however, hand antisepsis using HRs is not as effective as AH in removing visible dirt and body fluids from hands and in destroying certain infectious pathogens (e.g., Clostridium difficile, norovirus).

(For details about the use of alcohol-based HRs, see Nursing Practice & Skill ... Hand Hygiene: Antisepsis Using an Alcohol-based Rub – Performing)

–AH is known as hand disinfection in some parts of the world, but because disinfection often refers to the decontamination of inanimate surfaces and objects, the term hand disinfection is not be used in the information that follows. The term hand asepsis is not used in the information that follows because asepsis is defined as the absence of infectious organisms, and resident colonizing flora cannot be eliminated with AH

• How: The procedure for performing AH involves using a modification of the 6-step approach that is known as the Ayliffe Technique to systematically cleanse all surfaces of the hands, including between the fingers and under nail beds. AH should be performed frequently and be well integrated in all patient care activities

• Where: AH is a necessary component of patient care in all healthcare settings

• Who: All healthcare personnel perform AH. Patients, family members, and visitors should be educated on the importance of AH and encouraged to perform AH to support infection control
What is the Desired Outcome of Performing Antiseptic Handwashing?
› The desired outcome of performing AH is to prevent the spread of infection. This component of patient care should not be minimized and is especially important in the care of patients who are critically ill and/or immunocompromised

Why is Performing Antiseptic Handwashing Important?
› According to guidelines from the U.S. Centers for Disease Control and Prevention and the Healthcare Infection Control Practices Advisory Committee (CDC/HICPAC), performing AH is important to prevent the spread of disease because the hands are the most common mode of transmission of disease-producing organisms and substances (CDC, 2011)
• AH is the single most effective method to prevent the transmission of infection by reducing the number of organisms on the hands and reducing the number of organisms that are transmitted to patients, equipment, the environment, and other clinicians (CDC/HICPAC, 2002)
• AH is at the core of standard precautions in health care, which are mandated by the Occupational Safety and Health Administration (OSHA)
• In the absence of visible dirt, blood, or other body fluids, after using the toilet, and if exposure to potential spore-forming pathogens is suspected or proven, the use of alcohol-based HRs is the preferred method of AH during the performance of general patient care according to the CDC and the WHO. This recommendation is made because alcohol has a broad spectrum antimicrobial effect and because alcohol-based HRs can be used quickly and are less irritating to hands, which improves adherence to hand hygiene protocols
› Hospitalized patients are vulnerable to infection due to their impaired immune status and their confinement with individuals who are infected with pathogens. In the U.S. in 2011, the annual number of healthcare-associated infections (HAIs) reached 1.7 million patients, resulted in ~ 99,000 deaths, and accounted for up to $33.8 billion in direct medical costs to hospitals (Harne-Britner et al., 2011). The previously cited figures represent a substantial increase from the 2009 information published by the CDC, in which 1.29 million infections were reported that resulted in ~ 88,000 deaths and represent $23.5 billion in direct medical costs to hospitals (CDC, 2009). HAIs that are commonly associated with inadequate hand hygiene include infection with
  • *Enterobacteriaceae*
  • *Pseudomonas*
  • *Klebsiella*
› Improper hand hygiene technique places the healthcare worker at risk for viral and bacterial infection
  • Viral infections include
    – hepatitis A, B, C, and D
    – chickenpox
    – human immunodeficiency virus (HIV)
  • Bacterial infections include
    – *Streptococcus*
    – *Staphylococcus*

Facts and Figures
› Healthcare facilities have used triclosan handwashing washing products for many years. Investigators did a study to assess the use of chlorhexidine gluconate (CHG) and its effectiveness, skin compatibility and user’s satisfaction. The results of the study showed that CHG was a better choice for skin compatibility and user’s showed a preference over the regular triclosan hand wash. Efficacy of CHG was already verified by the FDA. (Edmonds-Wilson et al., 2016)
› The total bacterial count on the hands of the typical healthcare worker is $3.9 \times 10^4$–$4.6 \times 10^6$; the skin on the hands of healthcare workers can become persistently colonized with pathogenic resident flora such as *Staphylococcus aureus*, gram-negativebacilli, and yeast (CDC, 2002)
› In many clinical studies, investigators have found that a majority of nurses, physicians, and other healthcare workers do not consistently perform adequate hand hygiene when providing patient care (Erasmus et al., 2010)
• Poor compliance of proper hand hygiene among healthcare workers contributes significantly to healthcare –associated infections (HAI). It has been reported that 40% of HAIs are from improper handwashing in health care facilities. (Sitlo et al., 2016)
  – In the home care setting, investigators found that individual healthcare worker adherence to hand hygiene practices was 36.4–86.4%, with a mean rate of 59%. Healthcare workers were most likely to practice hand hygiene following exposure to body fluids or after performing an aseptic procedure, and least likely to perform hand hygiene after touching the
patient’s surroundings. The specific hand hygiene measure that was the least consistently performed was the action of vigorously rubbing or lathering the hands (Felembam et al., 2012)

- Infection control educational programs improve adherence to hand hygiene behaviors in the healthcare setting (Karaaslan et al., 2014)
  - At a tertiary care facility, implementation of a multimodal program that involved a multimedia communication campaign, healthcare worker education, leadership engagement, environmental modification, team performance measurement, and the use of undercover observers improved compliance with hand hygiene practices 2-fold among all hospital disciplines and units (Karaaslan et al., 2014)

### What You Need to Know Before Performing Antiseptic Handwashing

- Prior to undertaking handwashing, the nurse clinician should be knowledgeable about the following:
  - Anatomy of the skin, including the location of resident and transient flora. The layers of skin, in descending order from external to internal, are epidermis, dermis, and subcutis/hypodermis. Transient microorganisms survive for a short time on the epidermis. Resident skin flora is typically located on the epidermis, in the stratum corneum (i.e., the outermost layer of the epidermis), in the infundibulum of the sebaceous glands, and in the hair follicles. The infundibulum and hair follicles are both located in the dermis.[Figure 1](image)

![Layer of skin](image)

**Figure 1:** Anatomic diagram of layers of skin. Copyright © Madhero88. Licensed under Creative Commons Attribution-Share Alike 3.0 Unported License

- Standard precautions for infection control and the use of PPE (e.g., gloves, gown, eye protection)
- The role of hand antisepsis in preventing the spread of infection
  - Because hands are routinely in contact with body fluids, excretions, skin, equipment, and surfaces, all of which may be contaminated with pathogens, they play an important role in contact transmission of infection
- The recommendations published by the WHO in 2009, *Guidelines on hand hygiene in health care: First global patient safety challenge: Clean care is safer care*, including that
  - hands should be washed with soap (i.e., surfactant composed of hydrophilic and lipophilic components) and water when visibly dirty or soiled with blood or other body fluids or after using the toilet
  - if exposure to potential spore-forming pathogens is suspected or proven, including outbreaks of *C. difficile*
if hands are not visibly soiled, hands should be cleaned with an alcohol-based HR in certain clinical situations (for details, see Nursing Practice & Skill... Hand Hygiene: Antisepsis Using an Alcohol-based Rub—Performing, referenced above)

- hands should be washed with either water and plain or antimicrobial soap, or, when applicable, an alcohol-based HR
- soap and alcohol-based HR should not be used together

The WHO has provided summary information about instances when hand hygiene should be performed in the Five Moments for Hand Hygiene, as follows (Figure 2):

- Moment 1: Before touching the patient
- Moment 2: Before clean/aseptic procedures
- Moment 3: After body fluid exposure risk
- Moment 4: After touching a patient
- Moment 5: After touching patient surroundings

![Figure 2: Five opportunities for hand hygiene. Copyright©2014, EBSCO Information Services](image-url)

- The correct technique for performing AH in order to cleanse all surfaces of the hands, including the backs of the hands, between fingers, and under the tips of fingernails
- In order to remove surface microorganisms, hands must be washed for a minimum of 15–20 seconds. The WHO recommends that the duration of the entire handwashing procedure—wetting hands with water, application of soap, rubbing hands, rinsing, drying, and turning off faucet—last 40–60 seconds
- The Ayliffe Technique is a systematic method of cleansing all surfaces of the hands (Ayliffe et al., 1978). (For a description of modified Ayliffe Technique, see How to Perform Antiseptic Handwashing, below)

- Other key aspects of hand hygiene
- Avoid wearing artificial fingernails (e.g., gel overlays or polish, acrylics) or fingernail extenders when working with high-risk patients (e.g., surgical patients, patients in the ICU). Ideally, artificial fingernails should be avoided in all patient care areas. Natural nails should be kept short (e.g., < 1/4 in [0.6 cm] long), unpolished, and neatly filed because chipped nail polish, artificial nails, and jewelry can harbor bacteria
- Although the CDC/HICPAC makes no recommendation regarding wearing rings in the healthcare setting, research results show that wearing rings increases risk tenfold for bacterial contamination of the hands (Trick et al., 2003). Ideally, rings and other jewelry should be kept to a minimum
- Follow standard precautions to minimize exposure to blood and body fluids. Wear gloves when contact with blood and body fluids, nonintact skin, or mucous membranes could occur, change gloves during the provision of patient care if the focus of care changes from a contaminated area to a clean area, and remove gloves after providing patient care

Preliminary steps that should be performed prior to hand hygiene include:

- Review the facility/unit protocol for hand hygiene, if one is available
  – Maintain short fingernails and adhere to facility/unit requirements regarding use of artificial fingernails
  – Remove jewelry from the wrists and hands (e.g., rings, bracelets, watches) or move a watch well above the wrist on the arm
- Review the patient’s medical history/medical record for
  – any allergies (e.g., to latex gloves or other procedure materials); use alternative materials, as appropriate
conditions that may affect the choice of hand hygiene method (e.g., confirmed or suspected \textit{C. difficile} infection, which would necessitate that handwashing be performed instead of using HRs)

• Become familiar with facility protocols for the choice of antimicrobial hand soap and PPE and the manufacturer directions for use

• Gather or verify availability of supplies at the sink, which are minimal and include the following:
  • Antiseptic soap
  • Single-use disposable towels
  • A sterile, plastic, single-use, disposable nail cleaner, if available, which is useful for thoroughly cleaning the subungual area (i.e., area beneath the nail that is between the nail and the fingertip), which has been identified as harboring the highest number of microorganisms in the area of the hand and forearm (Association of Surgical Technologists, 2008)
  – Orangewood sticks should not be used because they have been found to harbor \textit{Pseudomonas} organisms and the wood has a tendency to splinter

\textbf{How to Perform Antiseptic Handwashing}

• Without allowing clothing or hands to touch the sink, turn on the water (ideally with a foot pedal or motion sensor that activates water flow) and adjust the temperature so that it is warm, but not hot. (Hot water increases the risk of developing irritant dermatitis)

• Hands and clothing may become contaminated if they are allowed to touch the sink

• Wet hands thoroughly

• Apply 3–5 mL of antiseptic soap (ideally from an automatic dispenser) to cover all hand surfaces
  • The 2009 WHO recommendations permit the use of liquid, bar, leaf, or powdered forms of antiseptic soap; however, the guidelines emphasize that if bar soap is used, small bars of soap should be used and placed in racks that facilitate drainage to reduce the risk that the moist environment harbors pathogens

• Lather well by applying the antiseptic soap over hands in a circular motion

• Systematically cleanse all surfaces of the hands and wrists by vigorously scrubbing them using a modification of the 6-step Ayliffe Technique (The WHO publishes a helpful chart of the steps at \textit{How To HandWash Poster.pdf}). Each step should be performed by scrubbing 5 strokes backward and forward, and the entire procedure should require 40–60 seconds (Figure 3) (Figure 4) as follows:
  • Rub hands together, palm to palm
  • Rub the right palm over the dorsum (i.e., back) of left hand and rub left palm over the dorsum of right hand
  • Rub hands together, palm to palm, with fingers interlaced
Figure 3: Systematically cleanse hands using steps 1–3 of the Ayliffe Technique. Copyright©2014, EBSCO Information Services

- Interlock hands and rub the backs of fingers against the opposite hand
- Clasp the left thumb in the right palm and rub in a rotational pattern; repeat with right thumb in the left palm
- Clasp the fingers of the left hand together and rub the tips of the fingers rotationally, against the right palm; repeat with the fingers of the right hand against the left palm
Figure 4: Systematically cleanse the hands using steps 4–6 of the Ayliffe Technique. Copyright © 2014, EBSCO Information Services

- Some healthcare facilities require that each wrist be cleansed (e.g., clasp the right wrist in the left palm; repeat with the opposite wrist); however, this step is not part of the WHO guidelines for AH
- If a wedding band has not been removed, move the band up and down the finger during handwashing to cleanse beneath the band
- Clean the nail beds with a sterile, plastic, single-use, disposable nail cleaner, if available
- Hold hands under the faucet and rinse under running water for 15 seconds or longer according to facility/unit protocol
  - Keep hands above elbow level such that contaminated water does not run down from the uncleansed area of your arms to the hands
  - Allow excess water to drip in the sink
- Wash hands a second time using the above method if your hands are heavily contaminated
- Gently pat the hands dry with a single-use towel. Do not forcefully rub the towel over the hands because doing so can cause abrasion and chapping. Begin drying at the fingertips and end at the wrists (or forearm if also wet) until hands are completely dried
  - Hands should be dried completely because bacteria can proliferate on damp hands
- Stop the flow of water with the foot pedal or by gripping the faucet with a dry, single-use towel. Do not recontaminate hands; take care not to touch the sink or faucet handle or the area of the towel that has touched the faucet handle
- Discard the single-use towel in the appropriate waste receptacle

Other Tests, Treatments, or Procedures That May be Necessary Before or After Antiseptic Handwashing

- Follow standard precautions in the care of all patients (for details, see Nursing Practice & Skill ... Standard Precautions: Following referenced above)
- For more information, see the series of Nursing Practice & Skills about implementing various types of precautions and review facility protocol for isolation precautions (e.g., contact, airborne, and droplet precautions)
What to Expect After Antiseptic Handwashing

› Hand antisepsis will be performed systematically and in accordance with facility protocols
› The patient will remain free of infection from contaminated hands, and the risk of spreading pathogens to other patients or healthcare workers by manual contact will be reduced

Red Flags

› Gloves do not take the place of appropriate hand hygiene. It is important to perform hand antisepsis before and after using gloves
› Verify that hands are thoroughly dry before donning gloves because the moisture will promote the growth of microorganisms
› Warm water, not hot water, should be used for handwashing because repeated exposure to hot water can cause irritant dermatitis, in which the hands become dry, cracked, and irritated, and can change the normal skin flora and increase risk for bacterial colonization
› Wash hands with soap and water per facility protocol when caring for patients with confirmed or suspected C. difficile or Bacillus anthracis and do not use an alcohol-based HR when caring for these patients because alcohol will not kill these organisms

What Do I Need to Tell the Patient/Patient’s Family?

› Explain the importance of handwashing in controlling the spread of infection, educate regarding appropriate techniques for handwashing, and encourage use of these techniques by patients and visiting family members
› Encourage patients to ask all clinicians if they have completed hand hygiene before they initiate care
› Teach your pediatric patients that the correct length of time for actual handwashing is 15–20 seconds (approximately the amount of time it takes to sing the “Happy Birthday” song twice or the “ABC” song once) and 40–60 seconds for the entire procedure. Henry the Hand Foundation is a good resource for educating pediatric patients about the importance of handwashing and can be accessed at http://www.henrythehand.com/

References


