**Hand Hygiene Technique with Soap and Water**

**Duration of the entire procedure:** 40-60 seconds

0. **Wet hands with water;**

1. **Apply enough soap to cover all hand surfaces;**

2. **Rub hands palm to palm;**

3. **Right palm over left dorsum with interlaced fingers and vice versa;**

4. **Palm to palm with fingers interlaced;**

5. **Backs of fingers to opposing palms with fingers interlocked;**

6. **Rotational rubbing of left thumb clasped in right palm and vice versa;**

7. **Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;**

8. **Rinse hands with water;**

9. **Dry hands thoroughly with a single use towel;**

10. **Use towel to turn off faucet;**

11. **Your hands are now safe.**
the type of water used, and emphasized the importance of maintaining a free chlorine residual of >0.1 ppm in tap water.\textsuperscript{247}

In many developing countries, tap water may be unfit for drinking. While drinkable water may also be ideal for handwashing, available evidence does not support the need for potable water for washing hands. In a resource-limited area of rural Bangladesh,\textsuperscript{248} education and promotion of handwashing with plain soap and available water significantly reduced the spread of diarrhoeal diseases across all age groups.\textsuperscript{248} A similar study in Pakistan corroborated these findings.\textsuperscript{249}

Nevertheless, if the water is considered potentially unsafe for handwashing, the use of antibacterial soap alone may not be adequate. Washed hands may require further decontamination with antiseptic handrubs, especially in areas with high-risk populations,\textsuperscript{250} while steps are initiated to improve water quality through better treatment and disinfection.

Health-care institutions in many parts of the developing world may not have piped-in tap water, or it may be available only intermittently. An intermittent water supply system often has higher levels of microbial contamination because of the seepage of contamination occurring while the pipes are supplied with treated water. On-site storage of sufficient water is often the only option in sites without a reliable supply. However, such water is known to be prone to microbial contamination unless stored and used properly and may require point-of-use treatment and/or on-site disinfection.\textsuperscript{251}

Containers for on-site storage of water should be emptied and cleaned\textsuperscript{252} as frequently as possible and, when possible, inverted to dry. Putting hands and contaminated objects into stored water should be avoided at all times. Storage containers should ideally be narrow-necked to facilitate proper coverage, with a conveniently located tap/faucet for ease of water collection.

CDC has developed guidelines for safe water systems and hand hygiene in health care in developing countries,\textsuperscript{253} which were field-tested in Kenya and have been adapted to other countries in Africa and in Asia.\textsuperscript{254} According to the recommendations included in this document, drinkable water should be used for handwashing.

### 11.1.4 Water temperature

Apart from the issue of skin tolerance and level of comfort, water temperature does not appear to be a critical factor for microbial removal from hands being washed. In contrast, in a study comparing water temperatures of 4 °C, 20 °C and 40 °C, warmer temperatures have been shown to be very significantly associated with skin irritation.\textsuperscript{255} The use of very hot water for handwashing should therefore be avoided as it increases the likelihood of skin damage.

### 11.1.5 Hand drying

Because wet hands can more readily acquire and spread microorganisms, the proper drying of hands is an integral part of routine handwashing. Careful hand drying is a critical factor in determining the level of bacterial transfer associated with touch-contact after hand cleansing. Care must also be taken to avoid recontamination of washed and dried hands.\textsuperscript{256} Recognition of this fact could significantly improve hand hygiene practices in clinical and public health sectors.\textsuperscript{75}

Paper towels, cloth towels, and warm air dryers are commonly used to dry washed hands. One study compared four methods of hand drying: cloth towels from a roller; paper towels left on a sink; warm air dryer; and letting hands dry by evaporation;\textsuperscript{256} no significant difference in the efficacy of the methods was reported. Reusing or sharing towels should be avoided because of the risk of cross-infection.\textsuperscript{257} In a comparison of methods to test the efficiency of hand drying for the removal of bacteria from washed hands, warm air drying performed worse than drying with paper towels.\textsuperscript{258} This is in contrast to another study, which found warm air dryers to be the most efficient with compared with paper and cloth towels.\textsuperscript{257} However, air dryers may be less practical because of the longer time needed to achieve dry hands,\textsuperscript{258} with a possible negative impact on hand hygiene compliance. Furthermore, one study suggested that some air dryers may lead to the aerosolization of waterborne pathogens.\textsuperscript{258} Further studies are needed to issue recommendations on this aspect. Ideally, hands should be dried using either individual paper towels or hand driers which can dry hands effectively and as quickly as it can be done with paper towels, and have been proven not to be associated with the aerosolization of pathogens.

When clean or disposable towels are used, it is important to pat the skin rather than rub it, to avoid cracking. Skin excoriation may lead to bacteria colonizing the skin and possible spread of bloodborne viruses as well as other microorganisms.\textsuperscript{79} Sore hands may also lead to decreased compliance with hand hygiene practices (see also Part I, Section 15).

### 11.2 Plain (non-antimicrobial) soap

Soaps are detergent-based products that contain esterified fatty acids and sodium or potassium hydroxide. They are available in various forms including bar soap, tissue, leaf, and liquid preparations. Their cleansing activity can be attributed to their detergent properties which result in the removal of lipid and adhering dirt, soil, and various organic substances from the hands. Plain soaps have minimal, if any, antimicrobial activity, though handwashing with plain soap can remove loosely adherent transient flora. For example, handwashing with plain soap and water for 15 seconds reduces bacterial counts on the skin by 0.6–1.1 log\textsubscript{10}, whereas washing for 30 seconds reduces counts by 1.8–2.8 log\textsubscript{10}.\textsuperscript{44} In several studies, however, handwashing with plain soap failed to remove pathogens from the hands of HCWs.\textsuperscript{68,110,260} Handwashing with plain soap can result in a paradoxical increase in bacterial counts on the skin.\textsuperscript{200,205-206} Because soaps may be associated with considerable skin irritation and dryness,\textsuperscript{200,206,216} adding humectants to soap preparations may reduce their propensity to cause irritation. Occasionally, plain soaps have become contaminated, which may lead to the colonization of HCWs hands with Gram-negative bacilli.\textsuperscript{206} Nevertheless, there is some evidence that the actual hazard of transmitting microorganisms through handwashing with previously used soap bars is negligible.\textsuperscript{265,266}
1. Definition of terms

Hand hygiene. A general term referring to any action of hand cleansing (see below "Hand hygiene practices").

**Hand hygiene products**

**Alcohol-based (hand) rub.** An alcohol-containing preparation (liquid, gel or foam) designed for application to the hands to inactivate microorganisms and/or temporarily suppress their growth. Such preparations may contain one or more types of alcohol, other active ingredients with excipients, and humectants.

**Antimicrobial (medicated) soap.** Soap (detergent) containing an antiseptic agent at a concentration sufficient to inactivate microorganisms and/or temporarily suppress their growth. The detergent activity of such soaps may also dislodge transient microorganisms or other contaminants from the skin to facilitate their subsequent removal by water.

**Antiseptic agent.** An antimicrobial substance that inactivates microorganisms or inhibits their growth on living tissues. Examples include alcohols, chlorhexidine gluconate (CHG), chlorine derivatives, iodine, chloroxylenol (PCMX), quaternary ammonium compounds, and triclosan.

**Antiseptic hand wipe.** A piece of fabric or paper pre-wetted with an antiseptic used for wiping hands to inactivate and/or remove microbial contamination. They may be considered as an alternative to washing hands with non-antimicrobial soap and water but, because they are not as effective at reducing bacterial counts on HCWs' hands as alcohol-based handrubs or washing hands with an antimicrobial soap and water, they are not a substitute for using an alcohol-based handrub or antimicrobial soap.

**Detergent (surfactant).** Compounds that possess a cleaning action. They are composed of a hydrophilic and a lipophilic part and can be divided into four groups: anionic, cationic, amphoteric, and non-ionic. Although products used for handwashing or antiseptic handwash in health care represent various types of detergents, the term "soap" will be used to refer to such detergents in these guidelines.

**Plain soap.** Detergents that contain no added antimicrobial agents, or may contain these solely as preservatives.

**Waterless antiseptic agent.** An antiseptic agent (liquid, gel or foam) that does not require the use of exogenous water. After application, the individual rubs the hands together until the skin feels dry.

**Hand hygiene practices**

**Antiseptic handwashing.** Washing hands with soap and water, or other detergents containing an antiseptic agent.

**Antiseptic handrubbing (or handrubbing).** Applying an antiseptic handrub to reduce or inhibit the growth of microorganisms without the need for an exogenous source of water and requiring no rinsing or drying with towels or other devices.

**Hand antisepsis/decontamination/degeming.** Reducing or inhibiting the growth of microorganisms by the application of an antiseptic handrub or by performing an antiseptic handwash.

**Hand care.** Actions to reduce the risk of skin damage or irritation.

**Handwashing.** Washing hands with plain or antimicrobial soap and water.

**Hand cleansing.** Action of performing hand hygiene for the purpose of physically or mechanically removing dirt, organic material, and/or microorganisms.

**Hand disinfection** is extensively used as a term in some parts of the world and can refer to antiseptic handwash, antiseptic handrubbing, hand antisepsis/decontamination/degeming, handwashing with an antimicrobial soap and water, hygienic hand antisepsis, or hygienic handrub. Since disinfection refers normally to the decontamination of inanimate surfaces and objects, this term is not used in these Guidelines.

**Hygienic hand antisepsis.** Treatment of hands with either an antiseptic handrub or antiseptic handwash to reduce the transient microbial flora without necessarily affecting the resident skin flora.

**Hygienic handrush.** Treatment of hands with an antiseptic handrub to reduce the transient flora without necessarily affecting the resident skin flora. These preparations are broad spectrum and fast-acting, and persistent activity is not necessary.

**Hygienic handwash.** Treatment of hands with an antiseptic handwash and water to reduce the transient flora without necessarily affecting the resident skin flora. It is broad spectrum, but is usually less efficacious and acts more slowly than the hygienic handrub.

**Surgical hand antisepsis/surgical hand preparation/ presurgical hand preparation.** Antiseptic handwash or antiseptic handrub performed preoperatively by the surgical team to eliminate transient flora and reduce resident skin flora. Such antisepsics often have persistent antimicrobial activity. **Surgical handscrub(bing)/presurgical scrub** refer to surgical hand preparation with antimicrobial soap and water. **Surgical handrub(bing)** refers to surgical hand preparation with a waterless, alcohol-based handrub.
Associated terms

**Cumulative effect.** Increasing antimicrobial effect with repeated applications of a given antiseptic.

**Efficacy/efficacious.** The (possible) effect of the application of a hand hygiene formulation when tested in laboratory or in vivo situations.

**Effectiveness/effective.** The clinical conditions under which a hand hygiene product has been tested for its potential to reduce the spread of pathogens, e.g. field trials.

**Excipient.** Inert substance included in a product formulation to serve as a vehicle for the active substance.

**Health-care area.** Concept related to the “geographical” visualization of key moments for hand hygiene. It contains all surfaces in the health-care setting outside the patient zone of patient X, i.e. other patients and their patient zones and the health-care facility environment.

**Humectant.** Ingredient(s) added to hand hygiene products to moisturize the skin.

**Medical gloves.** Disposable gloves used during medical procedures; they include examination (sterile or non-sterile) gloves, surgical gloves, and medical gloves for handling chemotherapy agents (chemotherapy gloves).

**Patient zone.** Concept related to the “geographical” visualization of key moments for hand hygiene. It contains the patient X and his/her immediate surroundings. This typically includes the intact skin of the patient and all inanimate surfaces that are touched by or in direct physical contact with the patient such as the bed rails, bedside table, bed linen, infusion tubing and other medical equipment. It further contains surfaces frequently touched by HCWs while caring for the patient such as monitors, knobs and buttons, and other “high frequency” touch surfaces.

**Persistent activity.** The prolonged or extended antimicrobial activity that prevents the growth or survival of microorganisms after application of a given antiseptic; also called “residual”, “sustained” or “remnant” activity. Both substantive and non-substantive active ingredients can show a persistent effect significantly inhibiting the growth of microorganisms after application.

**Point of care.** The place where three elements come together: the patient, the HCW, and care or treatment involving contact with the patient or his/her surroundings (within the patient zone). The concept embraces the need to perform hand hygiene at recommended moments exactly where care delivery takes place. This requires that a hand hygiene product (e.g. alcohol-based handrub, if available) be easily accessible and as close as possible – within arm’s reach of where patient care or treatment is taking place. Point-of-care products should be accessible without having to leave the patient zone.

**Resident flora (resident microbiota).** Microorganisms residing under the superficial cells of the stratum corneum and also found on the surface of the skin.

**Substantivity.** An attribute of some active ingredients that adhere to the stratum corneum and provide an inhibitory effect on the growth of bacteria by remaining on the skin after rinsing or drying.

**Surrogate microorganism.** A microorganism used to represent a given type or category of nosocomial pathogen when testing the antimicrobial activity of antiseptics. Surrogates are selected for their safety, ease of handling, and relative resistance to antiseptics.

**Transient flora (transient microbiota).** Microorganisms that colonize the superficial layers of the skin and are more amenable to removal by routine handwashing.

**Visibly soiled hands.** Hands on which dirt or body fluids are readily visible.
The *patient zone, health-care area, and critical sites* with inserted time-space representation of "My five moments for hand hygiene" (Figure 1.21.5b).
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Figure 1.7.4
Incorrect hand cleansing*

Inappropriate handwashing can result in hands remaining contaminated; in this case, with Gram-positive cocci. Reprinted from Pittet, 2006\textsuperscript{885} with permission from Elsevier.

* The figure intentionally shows that long-sleeved white coats may become contaminated by microorganisms during patient care. Although evidence to formulate it as a recommendation is limited, long sleeves should be avoided.
Figure 1.7.3
Organism survival on HCWs' hands

(A) Microorganisms (in this case Gram-positive cocci) survive on hands. Reprinted from Pittet, 2006 with permission from Elsevier.

(B) When growing conditions are optimal (temperature, humidity, absence of hand cleansing, or friction), microorganisms can continue to grow. Reprinted from Pittet, 2006 with permission from Elsevier.

(C) Bacterial contamination increases linearly over time during patient contact. Adapted with permission from Pittet, 1999.14

* The figure intentionally shows that long-sleeved white coats may become contaminated by microorganisms during patient care. Although evidence to formulate it as a recommendation is limited, long sleeves should be avoided.
The doctor is in close contact with the patient. He touched the urinary catheter bag previously and his hands are contaminated with Gram-negative rods from touching the bag and a lack of subsequent hand cleansing. Direct contact with patients or patients' devices would probably result in cross-transmission. Reprinted from Pittet with permission from Elsevier, 2006.

* The figure intentionally shows that long-sleeved white coats may become contaminated by microorganisms during patient care. Although evidence to formulate it as a recommendation is limited, long sleeves should be avoided.
Figure 1.7.5b
Failure to cleanse hands results in between-patient cross-transmission*

(B) The doctor is now going to have direct contact with patient B without cleansing his hands in between. Cross-transmission of Gram-positive cocci from patient A to patient B through the HCW’s hands is likely to occur. Reprinted from Pittet, 2006 with permission from Elsevier.

* The figure intentionally shows that long-sleeved white coats may become contaminated by microorganisms during patient care. Although evidence to formulate it as a recommendation is limited, long sleeves should be avoided.
Figure I.7.5a
Failure to cleanse hands results in between-patient cross-transmission*

(A) The doctor had a prolonged contact with patient A colonized with Gram-positive cocci and contaminated his hands. Reprinted from Pittet, 2006 with permission from Elsevier.

* The figure intentionally shows that long-sleeved white coats may become contaminated by microorganisms during patient care. Although evidence to formulate it as a recommendation is limited, long sleeves should be avoided.
Figure I.7.2
Organism transfer from patient to HCWs' hands

Contact between the HCW and the patient results in cross-transmission of microorganisms. In this case, Gram-positive cocci from the patient's own flora transfer to HCW's hands. Reprinted from Pittet, 2006 with permission from Elsevier.
Figure 1.7.1
Organisms present on patient skin or the immediate environment

A bedridden patient colonized with Gram-positive cocci, in particular at nasal, perineal, and inguinal areas (not shown), as well as axillae and upper extremities. Some environmental surfaces close to the patient are contaminated with Gram-positive cocci, presumably shed by the patient. Reprinted from Pittet, 2006 with permission from Elsevier.