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NEWS LETTER

FROM THE DESK OF EDITORIAL BOARD

EDITORIAL BOARD

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Dear Friends,

We have finished talking about the sterilisation part with the 9th issue. Hope you got more insight into the sterilisation activity and it will help you take better care of the same in your day-to-day activities. Your feedback are most welcome.

Before going onto the other topic, we thought, we will look into the hand hygiene part. Hand hygiene plays a crucial role in reducing hospital acquired infections – HAIs. Internationally, it is agreed that if we can teach good hand hygiene practices to our staff, HAI can be reduced by more than half with this single intervention. At the same time, let us understand that even in the western world, the compliance to hand hygiene requires major improvement. However, that does not mean that we should not go after hand hygiene in our hospital / clinic.

For us, hand hygiene will assume greater importance inside the OT among circulating staff and in the wards while doing dressings. We may unknowingly be passing on organisms from one patient to the other OR from health care worker to the patient and even vice versa. All our staff needs to be trained in good hand hygiene practices and hand wash and handrub posters should be displayed at appropriate places. This will encourage our staff to follow the same. Making handrub available at all the workstations OR with each worker will go a long way in improving compliance. Non availability or distance have been cited as the most common reasons for non-compliance.

There is a 120 pages booklet from CDC, Atlanta on hand hygiene. There are posters on hand hygiene readily available from WHO. There are power point presentations available on the same topic from WHO and many other experts on the internet for free. We can make use of all this material.

Our colleague, Dr. Parth Joshi has taken a lot of trouble to dig into the subject and prepare this article. We are thankful to him for all the hard work.

Once again, we hope that this article will be an eye opener for many of us. Feedback from the readers are welcome.

Dr. Uday Gajiwala **Dr. Amish Patel**

CLEAN CARE IS SAFER CARE

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Patient safety has become the touchstone of contemporary medical care. Medical errors and adverse events keep occurring with distressing frequency. “To err is human”. Health care associated infections (HCAIs) is second only to medication errors as a cause of adverse events in hospitalised patients. The magnitude and scope of the HCAI burden worldwide appears to be very important and greatly underestimated. While HCAI surveillance is already a challenging task in highly resourced settings, it may often appear an unrealistic goal in everyday care in developing countries. The burden of HCAI is also much more severe in high-risk populations such as adults housed in ICUs and neonates. Hand hygiene is a core element of patient safety for the prevention of HCAIs and the spread of antimicrobial resistance.

HCAIs CAN CAUSE

- more serious illness;
- prolongation of stay in a health-care facility;
- long-term disability;
- excess deaths;
- high additional financial burden; and,
- high personal costs for patients and their families

Hand hygiene is of paramount importance in effectively reducing the incidence of HCAIs. For centuries, handwashing with soap and water has been considered a measure of personal hygiene[1,2] but the link between handwashing and the spread of disease has only been established in the last 200 years. In the mid-1800s, studies by Ignaz Semmelweis in Vienna and Oliver Wendell Holmes in Boston established that hospital-acquired diseases, now known to be caused by infectious agents, were transmitted via the hands of healthcare workers (HCWs). In the community, hand hygiene has been acknowledged as an important measure to prevent and control infectious diseases[3] and can significantly reduce the burden of disease, in particular among children in developing countries[4,5]. In the health-care setting, a prospective controlled trial conducted in a hospital nursery[6] and investigations conducted during the past 40 years have confirmed the important role that contaminated HCWs' hands play in the transmission of health care-associated pathogens.

When it comes to physiological considerations, normal bacterial flora on hands could be divided into two categories namely, transient and resident. The resident flora consists of microorganisms residing under the superficial cells of the stratum corneum, and can also be found on the surface of the skin.[7] *Staphylococcus epidermidis* is the dominant species,[8] and oxacillin resistance is extraordinarily high, particularly among HCWs.[9] Other resident bacteria include *Staphylococcus hominis* and other coagulase-negative staphylococci, followed by coryneform bacteria (propionibacteria, corynebacteria, dermobacteria, and micrococci).[10] Among fungi, the most common genus of the resident skin flora, when present, is Pityrosporum (Malassezia) spp.[11] In general, resident flora is less likely to be associated with infections, but may cause infections in sterile body cavities, in the eyes, or on non-intact skin.[12] Transient flora, which colonizes the superficial layers of the skin, is more amenable to removal by routine handwashing. Transient microorganisms do not usually multiply on the skin, but they survive and

sporadically multiply on skin surface.[13]They are often acquired by HCWs during direct contact with patients or contaminated environmental surfaces adjacent to the patient, and are the organisms most frequently associated with HCAIs. The transmissibility of transient flora depends on the species, the number of microorganisms on the surface and the skin moisture.[14,15]The hands of some HCWs may become persistently colonised by pathogenic flora such as *S. aureus*, Gram-negative bacilli, or yeast.[16]

TRANSMISSION OF HEALTHCARE-ASSOCIATED PATHOGENS FROM ONE PATIENT TO ANOTHER VIA HCWS' HANDS REQUIRES FIVE SEQUENTIAL ELEMENTS:

I. Organisms are present on the patient's skin, or have been shed onto inanimate objects immediately surrounding the patient
ii. Organisms must be transferred to the hands of HCWs
iii. Organisms must be capable of surviving for at least several minutes on HCWs' hands
iv. Hand washing or hand antisepsis by the HCW must be inadequate or entirely omitted or the agent used for hand hygiene is inappropriate
v. The contaminated hand or hands of the care giver must come into direct contact with another patient or with an inanimate object that will come into direct contact with the patient

REVIEW OF PREPARATIONS USED FOR HAND HYGIENE

WATER

Routine handwashing is the removal of dirt, organic material and transient microorganisms. The purpose of handwashing for routine patient care is to remove microbial contamination acquired by recent contact with infected or colonised patients or with environmental sources and to remove organic matter from the hands. Water is a good solvent for a large number of substances, has a high boiling point and has very high surface tension, an important characteristic for cleansing soiled hands. Because of its properties, water cannot directly remove soils such as fats, oils and proteins which are common components of organic soil. Soaps and detergents are able to dissolve fats and oils; they loosen them and disperse them into the water and also ensure that soils are kept in suspension so that they can be flushed away with the water. Since soaps may be associated with considerable skin irritation and dryness,[17, 18, 19]adding humectants to soap preparations may reduce their propensity to cause irritation. During hand washing, friction and thorough rinsing are the most important factors for clean hands. The cleansing effect is probably the result of the friction while spreading the product over the hands and rinsing afterwards.

HAND DRYING

Hand drying is an essential step in hand cleansing and should be done in such away that hand recontamination does not occur. Compared to a dry environment, wet hands (being a wet environment), provide better conditions for the transmission of microorganisms.[15] Careful hand drying is a critical factor determining the level of bacterial transfer associated with touch contact after hand cleansing. Common hand drying methods include paper towels, cloth towels and hot air dryers. Ideally, drying of hands should be done by using individual paper towels. Nevertheless, the bacterial counts on palm and fingers after handwash may not significantly differ after drying with paper towel.[20] When clean or disposable towels are used, it is important to pat the skin, rather than rub it.

ALCOHOLS

Most alcohol-based hand antiseptics contain ethanol, isopropanol, n-propanol or a combination of two of these products. The antimicrobial activity of alcohols results from their ability to denature proteins.[21] Alcohol solutions containing 60% to 80% alcohol are most effective, with higher concentrations being less potent.[22,23] This paradox results from the fact that proteins are not denatured easily in the absence of water.[21] Alcohols have excellent *in vitro* germicidal activity against Gram-positive and Gram-negative vegetative bacteria (including multidrug - resistant pathogens such as MRSA and VRE), *M. tuberculosis*, and a variety of fungi.[21-23,24-29] However, they have virtually no activity against bacterial spores and

protozoan oocysts, and very poor activity against some non-enveloped (non-lipophilic) viruses. Alcohols are rapidly germicidal when applied to the skin, but have no appreciable persistent (residual) activity. However, re-growth of bacteria on the skin occurs slowly after use of alcohol-based hand antiseptics, presumably because of the sub-lethal effect alcohols have on some of the skin bacteria.[30,31] Addition of chlorhexidine, quaternary ammonium compounds, octenidine or triclosan to alcohol-based formulations can result in persistent activity.[1] A synergistic combination of a humectant (octoxyglycerine) and preservatives has resulted in prolonged activity against transient pathogens.[32]Alcohols are not good cleansing agents and their use is not recommended when hands are dirty or visibly contaminated with proteinaceous materials. However, when relatively small amounts of proteinaceous material (e.g. blood) are present, ethanol and isopropanol may reduce viable bacterial counts on hands,[33] but do not obviate the need for handwashing with water and soap whenever such contamination occurs.[34] Even well tolerated alcohol-based hand rubs containing humectants may cause a transient stinging sensation at the site of any broken skin (cuts, abrasions). Glycerin is added to the formulation, as a humectant, to increase the acceptability of the product because of its 'feel'. Alcohol-based hand rub preparations with strong fragrances may be poorly tolerated by a few HCWs with respiratory allergies. 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. The availability of bedside alcohol-based solutions seems to increase compliance with hand hygiene among HCWs.[35-38]

CHLORHEXIDINE

The antimicrobial activity of chlorhexidine appears to be attributable to the attachment to and subsequent disruption of cytoplasmic membranes, resulting in precipitation of cellular contents.[1,39] Chlorhexidine's immediate antimicrobial activity is slower than that of alcohols. It has good activity against Gram-positive bacteria, somewhat less activity against Gram-negative bacteria and fungi, and minimal activity against mycobacteria.[1,39,40] Chlorhexidine is not sporicidal.[1,40] It has *in vitro* activity against enveloped viruses such as herpes simplex virus, HIV, cytomegalovirus, influenza and RSV, but significantly less activity against non-enveloped viruses such as rotavirus, adenovirus and enteroviruses.[41,42,43] The antimicrobial activity of chlorhexidine is not seriously affected by the presence of organic material, including blood. Chlorhexidine has significant residual activity.[30,44,45,46]Addition of low concentrations (0.5 to 1%) of it to alcohol-based preparations results in significantly greater residual activity than alcohol alone.[30,47]

IODINE AND IODOPHORS

Iodine has been recognised as an effective antiseptic since the 1800s. However, because iodine often causes irritation and discolouring of skin, iodophors have largely replaced iodine as the active ingredient in antiseptics. Iodine molecules rapidly penetrate the cell wall of microorganisms and inactivate cells by forming complexes with amino acids and unsaturated fatty acids, resulting in impaired protein synthesis and alteration of cell membranes.[48] Combining iodine with various polymers increases the solubility of iodine, promotes sustained-release of iodine and reduces skin irritation. The most common polymers incorporated into iodophors are polyvinyl pyrrolidone (povidone) and ethoxylated non-ionic detergents (poloxamers).[48,49] Iodine and iodophors have bactericidal activity against Gram-positive, Gram-negative and some spore-forming bacteria (clostridia, Bacillus spp.) and are active against mycobacteria, viruses, and fungi.[39,48,50-53] However, in concentrations used in antiseptics, iodophors are not usually sporicidal.[54] Most iodophor preparations used for hand hygiene contain 7.5% to 10% povidone iodine.

THE WHO RECOMMENDS AN ALCOHOL-BASED FORMULATION FOR THE FOLLOWING REASONS:

- To benefit from its evidence-based intrinsic advantages: fast-acting and broad-spectrum activity, excellent microbicidal characteristics, and lack of potential emergence of resistances.
- To overcome the lack of accessibility to sinks or other facilities (including clean running water in some poor and remote areas) to perform hand cleansing actions that require the use of water (hand washing and hand antisepsis using a formulation different from a waterless agent).
- To improve compliance with hand hygiene by reducing the time required to perform it and the convenience of the method.
- To reduce costs: the annual cost of hand hygiene performed with an alcohol-based hand rub may not exceed 1% of HCAI costs.

SELECTION FACTORS

Factors to be taken into consideration during user acceptability testing include dermal tolerance and skin reactions; aesthetic preferences of HCWs and patients such as fragrance, colour, texture, and ease of use; ability to prevent contamination; and cost issues.

ADHERENCE TO HAND CLEANSING

The average frequency of hand hygiene episodes fluctuates with the observed compliance and the setting where the observations were held, and ranges from 0.7 to 12 episodes per hour. The average number of opportunities for hand hygiene per HCW varies markedly between hospital wards.

Adherence of HCWs to recommended hand hygiene procedures has been unacceptably poor. Predicting variables included professional category, hospital ward, time of day/week and type and intensity of patient care, defined as the number of opportunities for hand hygiene per hour of patient care. Perceived barriers to adherence with hand hygiene practice recommendations include skin irritation caused by hand hygiene agents, inaccessible hand hygiene supplies, interference with the HCW-patient relationship, patient needs perceived as a priority over hand hygiene, wearing of gloves, forgetfulness, lack of knowledge of guidelines, insufficient time for hand hygiene, high workload and understaffing, and the lack of scientific information showing a definitive impact of improved hand hygiene on health care-associated infection rates.[55-62]

Time constraint is said to be the major obstacle for hand hygiene, but it is important to note that adequate handwashing with water and soap requires 40 to 60 seconds and hand rubbing with an alcohol-based solution requires 20 to 30 seconds.

To achieve maximum effect of the agents and optimal compliance of HCWs with hand hygiene, products should be easily available, either through dispensers placed close to the point of care or in small individual bottles to be carried in a pocket.[38-63] Healthcare settings currently using commercially-available, alcohol-based hand rubs, liquid soaps and skin care products, sold in disposable bottles should continue this practice.

POTENTIAL TARGET AREAS TO ENABLE IMPROVED COMPLIANCE INCLUDE

Education, motivation, reinforcement of appropriate hand hygiene behaviour, cues to action, such as cartoons and even alcohol-based rub itself, as well as organising educational programme to promote hand hygiene.

FINGERNAILS AND ARTIFICIAL NAILS

Numerous studies have documented that subungual areas of the hand harbour high concentrations of bacteria, most frequently coagulase-negative staphylococci, Gram-negative rods (including *Pseudomonas* spp.), *Corynebacteria* and yeasts.[64,65] Freshly applied nail polish does not increase the number of bacteria recovered from periungual skin, but chipped nail polish may support the growth of larger numbers of organisms on the fingernails.[66,67] Even after careful handwashing or surgical scrubs, HCWs often harbour substantial numbers of potential pathogens in the subungual spaces.[68,69,70] In particular, the presence of fingernail disease may reduce the efficacy of hand hygiene and result in the transmission of pathogens.

MONITORING HAND HYGIENE COMPLIANCE

Compliance with hand hygiene can be evaluated directly or indirectly. Direct methods include observation, patient assessment or self-report. Indirect methods include monitoring consumption of products, such as soap or hand rub, and electronic monitoring of the use of hand wash basins.

SURGICAL HAND PREPARATION

Historically, Joseph Lister (1827 to 1912) demonstrated the effect of disinfection on the reduction of surgical site infections.[71] The recommended time for surgical hand preparation decreased from over 10 minutes to 5 minutes.[72,73] Even today, 5-minute protocols are common[74] but considering the Indian climate, a scrubbing time of 7 minutes is recommended.

OBJECTIVES OF SURGICAL HAND PREPARATION

Surgical hand preparation aims to reduce the release of skin bacteria from the hands of the surgical team for the duration of the procedure in the event of an unnoticed puncture of the surgical glove releasing bacteria to the open wound.[75] In contrast to the hygienic hand wash or hand rub, surgical hand preparation must eliminate the transient and reduce the resident flora.[76,77] It should also inhibit growth of bacteria under the gloved hand. Rapid multiplication of skin bacteria occurs under surgical gloves if hands are washed with a non-antimicrobial soap, whereas it occurs more slowly following preoperative scrubbing with a medicated soap. The skin flora (mainly coagulase-negative *Staphylococci, Propionibacterium* spp. and *Corynebacterium*) are rarely responsible for surgical site infections, but in the presence of a foreign body or necrotic tissue even inoculum as low as 100 CFU can trigger such infections.[78]

Most guidelines prohibit any jewellery or watches on the hands of the surgical team.[79,80] Artificial fingernails are an important risk factor that should be prohibited for the surgical team, and in the operating theatre.[64,81] They are associated with changes in the normal flora and impede proper hand hygiene.[81]

SURGICAL HAND ANTISEPSIS USING MEDICATED SOAP

The most commonly used products for surgical hand antisepsis are soaps containing chlorhexidine gluconate or povidone iodine. The most active agents (in order of decreasing activity) are chlorhexidine gluconate, iodophors, triclosan, and plain soap.[82-87] Application of chlorhexidine or povidone iodine result in similar initial reductions of bacterial counts (70 to 80%), increasing to 99% after repeated application. Rapid regrowth occurs after application of povidone iodine, but not after use of chlorhexidine.[88] Hexachlorophenepovidone iodine remains one of the most widely-used products for surgical hand antisepsis,despite both *in vitro* and *in vivo* studies demonstrating that it is less efficacious than chlorhexidine, induces more allergic reactions and does not show similar residual effects.[89,90] Surgical hand antisepsis with medicated soap requires clean water to rinse the hands after application of the medicated soap. However, *Pseudomonas* spp., specifically *P. aeruginosa*, is frequently isolated from water taps in hospitals.[91] Almost all studies discourage the use of brushes.

STEPS BEFORE STARTING SURGICAL HAND PREPARATION

- Keep nails short and pay attention to them when washing your hands – most microbes on the hands come from beneath the fingernails.
- Do not wear artificial nails or nail polish.
- Remove all jewellery (rings, watches, bracelets) before entering the operating room (OR).
- Wash hands and arms with a non-medicated soap before entering the OR area or if hands are visibly soiled.

PROTOCOL FOR SURGICAL SCRUB WITH A MEDICATED SOAP

Principle: To scrub from a clean area (hand) to less clean area (forearm)

Aim: To minimise transient flora on the skin

Effective scrubbing is mandatory to protect the patient and the medical team from infection before and after performing surgery. The purpose of the surgical hand scrub is to reduce transient skin flora (bacteria) to a minimum. Because resident bacteria are firmly attached to the skin, they are difficult to remove. However, their growth is inhibited by the antiseptic action of the scrub detergent used. Transient bacteria are usually acquired by direct contact and are loosely attached to the skin. These bacteria are easily removed by soap and by the friction created by the scrubbing procedure. Proper hand scrubbing and the wearing of sterile gloves and a sterile gown provide patient with the best possible barrier against pathogenic bacteria from the surgical team. It is followed prior to any surgical intervention.

MATERIAL TO BE USED FOR SCRUBBING

- Use purified water from a water purifier. If distilled water can be used, it is the best. If this is not possible, one can boil the water on the previous evening and allow it to cool and use it the next day. Minimum requirement is to chlorinate the tank water daily and use it.
- Liquid soap is considered better.
- One must use surgical hand scrub solution either povidone iodine 7.5% or chlorhexidine 4%.
- Machine or brushes are not recommended any more for scrubbing.
- The tap should be either foot-operated or elbow-operated.

METHODS:

Step 1: (3 minutes)

- Prior to hand washing, all the jewellery on the hand as well as wrist watch should be removed. The nails should be short and should be free of nail polish.
- The tap should be turned on using the elbow or an unsterile person should do it. The flow of water should always be from the fingertips to the elbow.
- Clean under the fingernails for the first scrub of the day. This step need not be repeated for subsequent scrubs in the same session.
- Scrub the hand with a liquid soap and then with a hand scrub such as povidone iodine or chlorhexidine. Lather should be worked up to 3 cm above the elbow. Scrub each hand with the other. Scrub in a circular motion all surfaces, starting from the nails, forearm and up to approximately 3 cm above the elbow. Special attention should be paid to the webspaces, nails and subungal area.
- Hands should be rinsed thoroughly under running filtered water after scrubbing. If filtered water is not available, boiled and cooled water can be used. In such a case, the nurse should pour the water from a jug. The hands should be held up with the elbows below.
- The above-mentioned procedure should be repeated twice – take one minute each time.

Figure 1: Auto-dispenser with povidone iodine

Figure 2: Scrub area with Aquaguard filters

Adapted from Taylor L(1978). An evaluation of hand washing techniques-I. Nursing Times,12 January, pp54-55)

Step 2: (4 minutes)

- The next step is scrubbing of the hands with a hand scrub like povidone iodine (7.5%) or chlorhexidine (2.5%). Scrub each hand with the other. Scrub all surfaces in a circular motion, starting from the nails, then moving to the forearms and up to approximately 3 cm above the elbows. A special attention should be paid to web spaces between the fingers, nails and the subungal area.
- Hands should be rinsed thoroughly under running filtered water after scrubbing. If filtered water is not available, boiled and cooled water can be used. In such a case, the nurse should pour the water from a jug. The direction of water flow must be from the fingertips to the elbow. After rinsing, the hands should be held up away from the body, with elbows slightly flexed and hands and forearms higher than the elbows.
- The above-mentioned procedure should be repeated twice – take two minutes each time.

Step 3:

- After rinsing, the hands should be held up in front of and away from the body, with elbows slightly flexed and hands and forearms higher than the elbows.
- The tap should be closed with the elbow or a nurse should turn it off.
- The hands should be dried with a sterile towel. Begin with the hands, wrists and then proceed to the forearms. The same section of the towel should not be reused. If required, a second towel can be used. Drying is not done all the way up to the elbow to prevent contamination.
- A minimum of 3 minutes of scrubbing is considered the shortest acceptable duration for hand washing prior to surgery.
- Based on the years of experience and looking at the needs of the country, one should re-scrub after every 2 to 5 surgeries for 3 minutes (if we do not touch elsewhere) and circulating staff should remove the scrubbed person's gown. (The highest ideal is to rescrub after each surgery).

WHO GUIDELINES

The 1980s represented a landmark in the evolution of concepts of hand hygiene in health care. The first national hand hygiene guidelines were published in the 1980s,[92,93] followed by many others in more recent years. It can be seen that hand hygiene concepts have much evolved over the past two decades. The WHO publications addressing infection control measures to restrain the spread of pathogens in health care settings have emphasised hand hygiene as a key measure.[94-96] Two recent WHO infection control guidelines provide a more detailed description of the hand rubbing technique and suggest that hand hygiene be performed by either hand washing or hand rubbing, but without stating any advantages of one over the other.[95,96]

The **WHO Advanced Draft Guidelines for Hand Hygiene in Health Care** provide HCWs, hospital administrator and health authorities with a thorough review of evidence on hand hygiene in healthcare and specific recommendations to improve practices and reduce transmission of pathogenic microorganisms to patients and HCWs. The present guidelines are intended to be implemented in any situation in which healthcare is delivered either to a patient or to a specific group in a population. Therefore, this concept applies to specific healthcare facilities, to community settings, and to other settings where healthcare is occasionally performed, such as home care by birth attendants.

YOUR 5 MOMENTS FOR HAND HYGIENE

1. **BEFORE TOUCHING A PATIENT:** Clean your hands before touching a patient when approaching him/her to protect the patient against harmful germs carried on your hands.
2. **AFTER TOUCHING A PATIENT:** Clean your hands after touching a patient and his/her immediate surroundings, when leaving the patient's side, to protect yourself and the healthcare environment from harmful patient germs.
3. **AFTER TOUCHING PATIENT SURROUNDINGS:** Clean your hands after touching any object or furniture in the patient's immediate surroundings, when leaving – even if the patient has not been touched - to protect yourself and the healthcare environment from harmful patient germs.
4. **BEFORE CLEAN/ASEPTIC PROCEDURE:** Clean your hands immediately before performing a procedure to protect the patient against harmful germs, including the patient's own, from entering his/her body.
5. **AFTER BODY FLUID EXPOSURE RISK:** Clean your hands immediately after an exposure risk to body fluids (and after glove removal) to protect yourself and the healthcare environment from harmful patient germs.

RECOMMENDATIONS

INDICATIONS FOR HAND WASHING AND HAND ANTISEPSIS

A. Wash hands with soap and water when visibly dirty or contaminated with proteinaceous material, or visibly soiled with blood or other body fluids, or if exposure to potential spore-forming organisms is strongly suspected or proven or after using the restroom.[21,34,40,97-105]

B. Preferably, use an alcohol-based hand rub for routine hand antisepsis if hands are not visibly soiled.[37,63,76,106-110] Alternatively, wash hands with soap and water.[37,111-113]

C. When to perform hand hygiene:
   a. before and after having direct contact with patients.[6,114-119]
   b. after removing gloves.[114,120-124]
   c. before handling an invasive device for patient care, regardless of whether or not gloves are used.[115,125]
   d. after contact with body fluids or excretions, mucous membranes, non-intact skin, or wound dressings.[119]
   e. if moving from a contaminated body site to a clean body site during patient care.[114,115,118,126,127]
   f. after contact with inanimate objects (including medical equipment) in the immediate vicinity of the patient.[114,118,126-130]

D. Wash hands with either plain or antimicrobial soap or water or rub hands with an alcohol-based formulation before handling medication or preparing food.[100-105]

E. When alcohol-based hand rub is already used, do not use antimicrobial soap concomitantly.[131]

HAND HYGIENE TECHNIQUE

A. Apply a palmful of the product and cover all surfaces of the hands. Rub hands until hands are dry. [132,133]

B. When washing hands with soap and water, wet hands with water and apply the amount of product necessary to cover all surfaces. Vigorously perform rotational hand rubbing on both hand palms and backs, interlacing and interlocking fingers to cover all surfaces. Rinse hands with water and dry thoroughly with a single-use towel. Use running and clean water whenever possible. Use the towel to turn off the tap. [17,134-137]

C. Make sure your hands are dry. Use a method that does not re-contaminate the hands. Make sure that the towels are not used multiple times or by multiple people[15,138-142]. Avoid using hot water, as repeated exposure to hot water may increase the risk of dermatitis. [141,143]

D. Liquid, bar, leaf or powdered forms of plain soap are acceptable when washing hands with a non-antimicrobial soap and water. When a bar soap is used, small bars of soap in racks that facilitate drainage should be used. [144-147]

RECOMMENDATIONS FOR SURGICAL HAND PREPARATION

A. If hands are visibly soiled, wash hands with plain soap before surgical hand preparation.Remove debris from underneath fingernails using a nail cleaner, preferably under running water. [148,149]

B. Sinks should be designed to reduce the risk of splashes. [150,151]

C. Remove rings, wrist watch, and bracelets before beginning the surgical hand preparation. [152-154] Artificial nails are prohibited. [64,68,70,81,155]

D. Surgical hand antisepsis should be performed using either an antimicrobial soap or an alcohol-based hand rub, preferably with a product ensuring sustained activity, before donning sterile gloves. [82,90,156-159]

E. If the quality of water is not assured in the operating theatre, surgical hand antisepsis using an alcohol-based hand rub is recommended before donning sterile gloves when performing surgical procedures. [82,90,156-159]

F. When performing surgical hand antisepsis using an antimicrobial soap, scrub hands and forearms. [84,161-167]

G. When using an alcohol-based surgical hand rub product with sustained activity, apply the product on dry hands only. [168-170] Do not combine surgical hand scrub and surgical hand rub with alcohol-based products sequentially. [131]

H. When using an alcohol-based product, use sufficient product to keep hands and forearms wet with the hand rub throughout the procedure. [171,172]

I. After application of the alcohol-based product as recommended, allow hands and forearms to dry thoroughly before donning sterile gloves. [74,90,158,171,172]

SELECTION AND HANDLING OF HAND HYGIENE AGENTS

A. Provide health-care workers with efficacious hand hygiene products that have low irritancy. [17,19,107,173,174]

B. To maximise acceptance of hand hygiene products by HCWs, solicit their input regarding the feel, fragrance and skin tolerance of any products under consideration. [17,55,106,107,175-177]

C. When selecting hand hygiene products:

   a. determine any known interaction between products used to clean hands, skin care products, and the types of gloves used in the institution; [178,179]

   b. solicit information from manufacturers about the risk of contamination; [180-182]

   c. ensure that dispensers are accessible at the point of care; [38]

   d. ensure that dispensers function adequately and reliably and deliver an appropriate volume of the product; [37,183]

e. ensure that the dispenser system for alcohol-based formulations is approved for flammable materials;

f. solicit information from manufacturers regarding any effect that hand lotions, creams or alcohol-based hand rubs may have on the effects of antimicrobial soaps being used in thein stitution.[178,184,185]

D. Do not add soap to a partially empty soap dispenser. If soap dispensers are reused, follow the institution recommended procedures for cleansing.[186,187]

USE OF GLOVES

A. The use of gloves does not replace the need for hand cleansing by either hand rubbing or handwashing.[114,120-122,188-190]

B. Wear gloves when it can be reasonably anticipated that contact with blood or other potentially infectious materials, mucous membranes, and non-intact skin will occur.[191]

C. Remove gloves after caring for a patient. Do not wear the same pair of gloves for the care of more than one patient.[114,120,121,122,192]

D. When wearing gloves, change or remove gloves during patient care if moving from a contaminated body site to a clean body site within the same patient. Change or remove gloves after touching a contaminated site and before touching a clean site or the environment.[120,121]

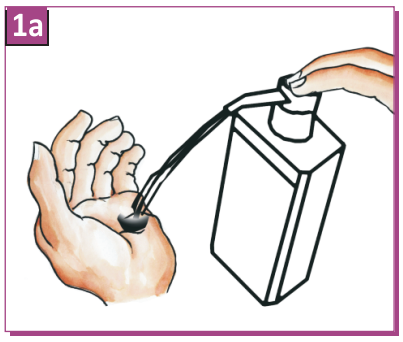
E. Avoid the reuse of gloves.[193] If gloves are re-used, implement an adequate reprocessing method to ensure glove integrity and microbiological decontamination.

OTHER ASPECTS OF HAND HYGIENE

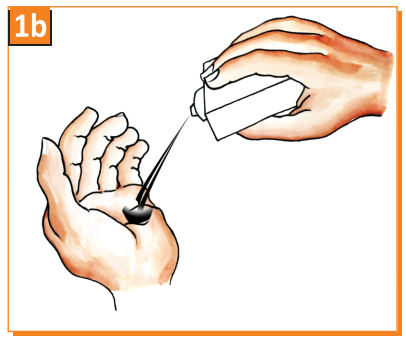
A. Do not wear artificial fingernails or extenders when having direct contact with patients.[81,194,195,196,197]

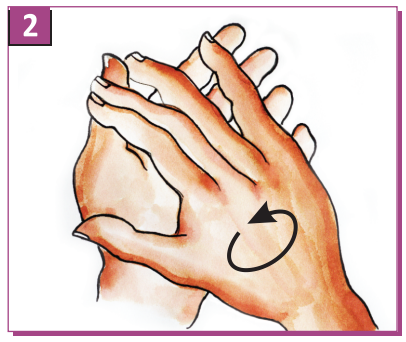
B. Keep natural nails short (tips less than 0.5 cm long).[196]

HAND HYGIENE TECHNIQUE WITH ALCOHOL-BASED FORMULATION

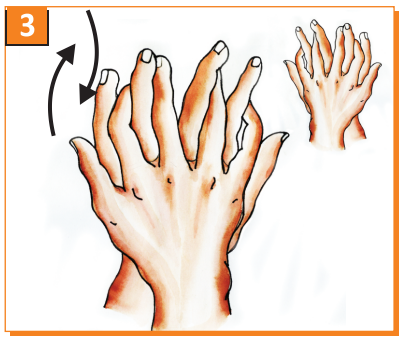


Apply a palmful of the product in a cupped hand, covering all surfaces

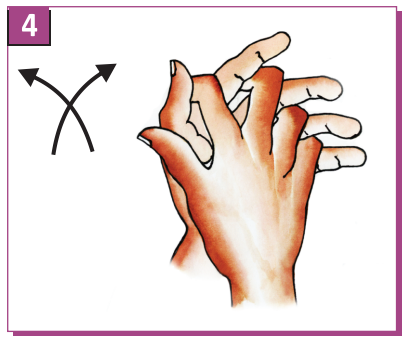




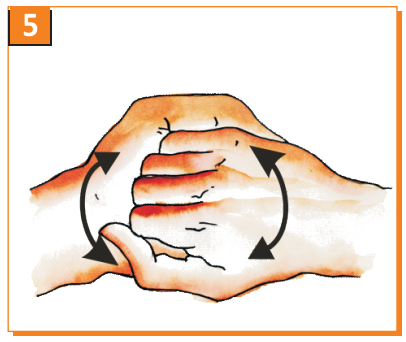
Rub hands palm to palm



Right palm over left dorsum with interlaced fingers and vice versa

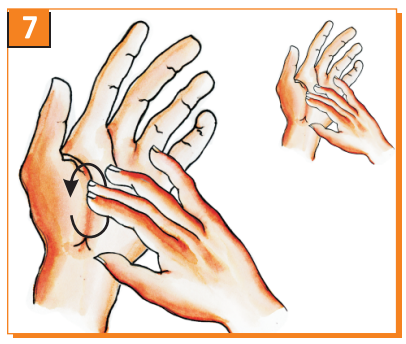


Palm to palm with fingers interlaced

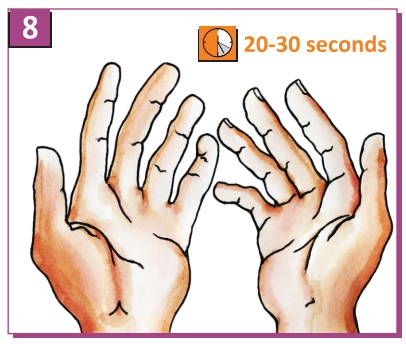


Backs of fingers to opposing palms with fingers interlocked

Rotational rubbing of left thumb clasped in right palm and vice versa



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



Once dry, your hands are clean

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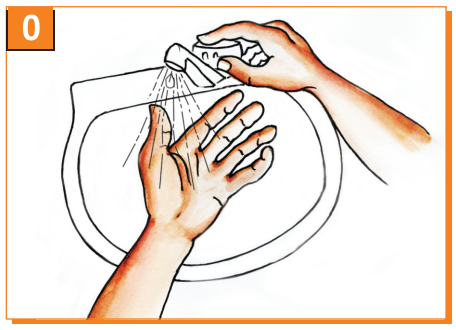
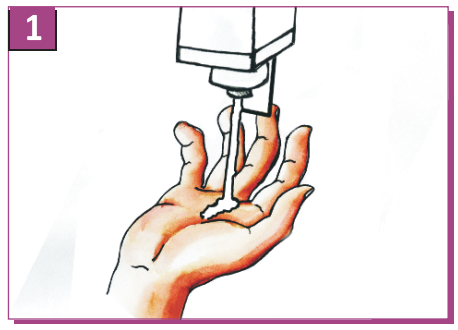
HANDWASHING TECHNIQUE WITH SOAP AND WATER

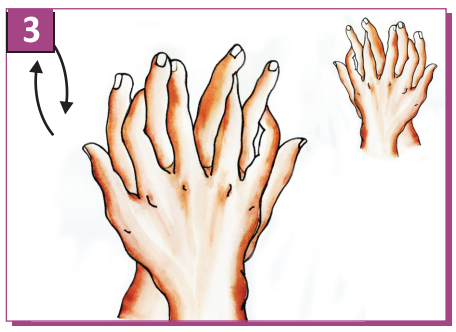


Wet hands with water

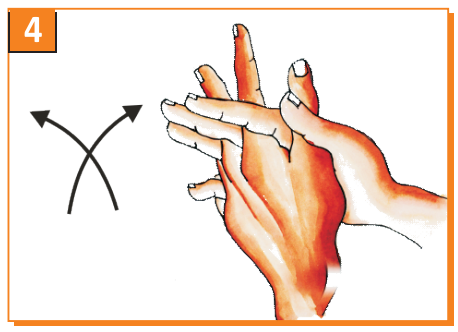


Apply enough soap to cover all hand surfaces

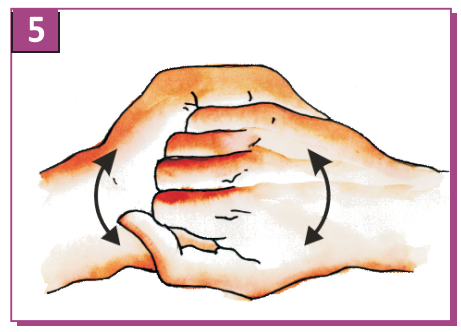
Rub hands palm to palm



Right palm over left dorsum with interlaced fingers and vice versa

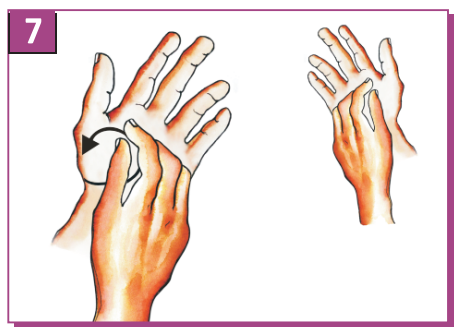


Palm to palm with fingers interlaced

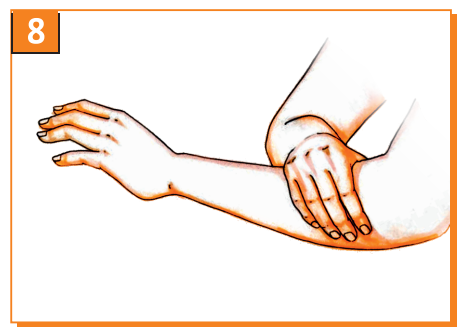


Backs of fingers to opposing palms with fingers interlocked

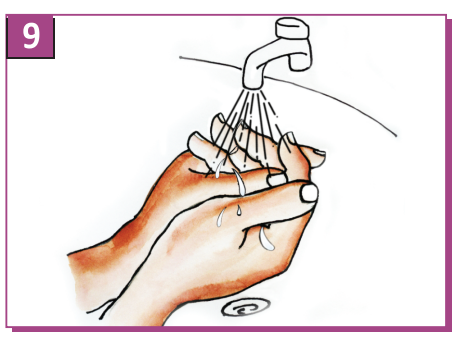
Rotational rubbing of left thumb clasped in right palm and vice versa



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

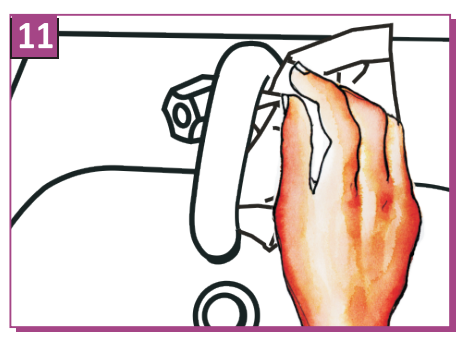


Continue with rotating action down opposing arms, working upto 3 cms. beyond the elbows



Rinse hands with water

Dry hands thoroughly with a single use towel



Use towel to turn off faucet

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