

51 Hand Hygiene Facts You Could be Washing Off

To celebrate World Hand Hygiene Day with all our selfless and fearless healthcare professionals this year, we thought we'd publish a mammoth list on hand hygiene facts. Discussed to death, yes, but with compliance remaining below the dismal 50% threshold around the world, we figured an in-depth analysis could help. This list hopes to surface 51 hand hygiene facts to encourage understanding and eventually drive compliance among people who care. So, if you need to make this your bedtime reading, do it, but space out the reading and allow time for each point to sink. You are bound to come across a handful of facts you never knew.



1 Thick-skinned

We are not exactly thick-skinned, but the human skin is divided into stratum corneum, viable epidermis, dermis and hypodermis from the outer-most to the inner-most layer. It is naturally colonised by bacteria and it is known as bacterial skin flora. Transient flora, which colonise the outer-most layers are removed through regular handwashing. Microbes on this layer are often acquired through direct contact with patients or contaminated surfaces and is frequently associated with healthcare associated infections (HAI). Resident flora which colonise the inner-most layers, are more resistant to removal but they are less likely to be associated with HAI compared to transient flora.

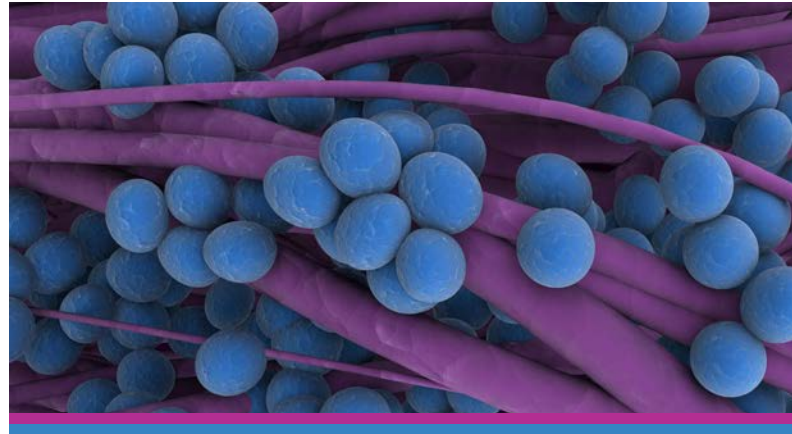
2 Saving your skin

As the earlier point illustrates, it is almost impossible for the skin to be completely free of microbes. Even after washing or disinfecting with antimicrobial products, hands only remain superficially clean for a short time. Our skin is constantly accumulating microbes from the air and other external surfaces. Microbes such as *Staphylococcus aureus* and *Klebsiella* can be present on intact skin in numbers ranging from 100 to 1000,000 per square cm. Not only does the skin gather microbes both good and bad, it also provides the perfect environment for them to thrive through body heat and sweat. Transient flora however, do not usually multiply on the skin. So, you may not be catching a disease when taking a pulse or walking towards a patient, but you are exchanging and carrying potentially dangerous microbes until they are transferred to a susceptible host.

3 Hands that heal can kill

According to World Health Organisation (WHO), if you are a healthcare worker, these are some of the microbes you could be spreading through your hands:

- Staphylococcus aureus (including MRSA)
- Streptococcus pyogenes (Group A Strep)
- Vancomycin-resistant Enterococcus (VRE)
- Klebsiella
- Enterobacter
- Pseudomonas
- Clostridium difficile
- Candida
- Rotavirus
- Adenovirus
- Hepatitis A virus
- Norovirus



The hands of healthcare workers can become contaminated after performing even the most seemingly harmless procedures such as:

- Taking a pulse
- Taking blood pressure readings
- Taking a temperature
- Touching a patient's hand or shoulder

Several studies have proven that microbes are able to survive on our hands for hours if not cleaned.

4 Further evidence hands that heal can kill

This is for the most unbelieving among us. WHO estimates there are over 1.4 million cases of HAI at any given time, although it predicts the number to be a lot more in reality. In 2013, University of North Carolina Hospitals implemented a new hand hygiene program. The hand hygiene compliance data and number of overall HAI, HAI with multidrug-resistant organisms (MDRO), and healthcare-associated Clostridium difficile infection (HA-CDI) was used to estimate the overall association between hand hygiene and HAI rates. The study was carried out for 17 months with 140,000 observations by over 4,000 unique observers. A significant increase in overall hand hygiene compliance rate was seen with a significant decrease in overall HAI rate. The program resulted in 197 fewer infections and an estimated 22 fewer deaths. This produced an overall savings of approximately US\$5 million. Yes, let's take a minute to let that sink in.

5 Karma's got nothing against killing good bacteria

Germes are everywhere. They are inside our bodies, on our skin, and on every surface we touch. Not all of them are bad. We need some of these germs to keep us healthy and our immune system strong. *Lactobacillus acidophilus* for example, helps in the digestion of food and produces lactic acid and hydrogen peroxide that prevents the growth of bad bacteria in the gut. Our hands also carry good germs that our bodies need to stay healthy. The most common bacteria found on the skin of our hands are of *Staphylococcus* family. Generally harmless, but problematic if they invade our bloodstream, lungs or heart. A study carried out at the University of California by Richard Gallo found that a type of molecule released by *Staphylococcus* called lipoteichoic acid (LTA), stopped some skin cells from releasing chemicals that trigger inflammation as part of the body's immune response. So, they're not all bad. The problem is, the good bacteria live side by side with the bad bacteria and both are killed during disinfection. You may be wondering if this will hurt you in the long run, but the answer is, no. Using a hand disinfectant is the preferred way to keep your hands clean. Although they kill both good and bad bacteria, the good bacteria return on your hands quickly.

6 Gloves no winner against hand washing



The Center for Disease Control and Prevention (CDC) confirms that gloves do not provide complete protection against hand contamination. Bacterial flora colonising patients may be recovered from the hands of $\leq 30\%$ of healthcare workers who wear gloves during patient contact. According to one study, the defect rates of latex gloves using water inflation test is significantly higher than the 2.5% acceptable quality level. The rate was higher than 20% in some brands. Gloves also do not provide complete protection against hepatitis B virus and herpes simplex virus. Viruses, which are significantly smaller in size than bacteria, can penetrate through microscopic holes in gloves and gain access to healthcare worker's hands.

It is also possible to contaminate hands during gloves removal. Washing and disinfecting hands before and after wearing gloves can help prevent any acquired microorganisms from infecting others.

7 Gloves no winner against hand washing

Wearing gloves might lead to a false sense of security among healthcare workers. This is especially dangerous when the gloves are not used correctly. To avoid causing harm to self and others, healthcare workers must practice vigilance before, during and after wearing them. Gloves only act as effective barriers when used as intended and for as long as they are intact. Some points to be aware of are:

- Use a fresh pair of gloves for each patient. Reusing the same pair of gloves can lead to an infection on both patient and you.
- Change your gloves regularly. As a rule, never wear a pair of gloves for more than 2 hours. One study suggests changing every 15 minutes.

- Examine gloves regularly to make sure they haven't become damaged or punctured.
- Remove gloves carefully and dispose of them correctly after use to avoid contaminating hands.
- Wash hands with soap before and after wearing gloves.
- Do not reach into glove boxes without washing hands first to avoid contaminating the box and unused gloves inside.
- Do not apply hand lotion immediately before wearing latex gloves because it may damage the latex and increase skin irritation probability.

8 When the gloves come off

Contaminated gloves can transfer contaminants to your hands if they are not removed correctly. The CDC has issued a gloves removal method that prevents the exposed section of the gloves from making contact with the skin. To remove contaminated gloves, point the thumb of one wrist up. Pinch that glove at the wrist, lift it and then roll it down until the glove is completely off your hand. Ball the removed glove in the palm of the gloved hand. Slide an exposed finger down and inside the outer glove on the gloved hand and pull it off until it wraps around the first glove. Dispose of both gloves. When done correctly, there is little risk of transferring contaminants from gloves to hands. Nevertheless, wash hands after removing gloves every single time.

How to disinfect/wash your hands

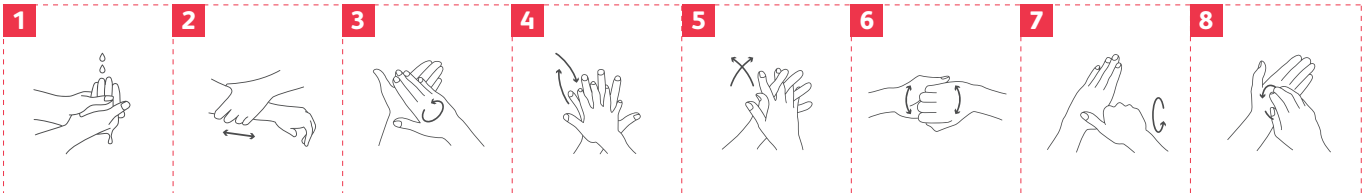


Diagram 1

9 A slap on the wrist

When wearing gloves, pull the rims to cover the wrists on both hands. The wrists are least strategically located. They are prone to neglect during hand washing and disinfection but, perilously close to fingers and palms to get contaminated during patient care. Select gloves that fit at the wrist and avoid using those that do not for treatments with extensive patient contact. In addition to covering the wrists, pay extra attention to the area when washing and disinfecting hands. Accumulating dirt and germs on the wrists over a 10-hour shift can be dangerous for you, your patients and your family.

10 Double the gloves, double the protection

Much research has been done on surgical gloves to focus on holes created during surgery. One study reported a puncture rate of 11.5% during surgery while other studies point to increased puncture rates in gloves worn longer than three hours. A number of studies have been carried out to measure the efficacy of double gloving and several studies in the surgical environment recommend the practice of double gloving. A 1992

study involving 284 people reported 51% hand contamination rate among those who wore single gloves versus 7% contamination rate among those who wore double gloves. Other reports have emphasised the high failure rates of gloves while in-use. One study reported that surgical gloves worn double, tested every 15 minutes, had leaks 25% of the time while single surgical gloves had leaks 59% of the time. Studies have also shown that double gloving reduces the risk of exposure to patient blood by as much as 87% in the event of a puncture in the outer glove. Double gloving is just a suggested practice, but healthcare workers might want to heed the risks of wearing single gloves and try double gloving.

11 Latex woes

Latex gloves can trigger allergic reaction in some. The allergy is a reaction to certain proteins found in natural latex, acquired from the sap of rubber trees. Latex may cause itchy skin, hives and even anaphylaxis in some people. Skin irritation when caused by sensitivity to latex or other hand hygiene products, can reduce hand hygiene compliance. Most people are reluctant to subject hands to further washing, drying and disinfection when the skin is already showing signs of distress. The obvious solution to latex sensitivity is to change to nitrile gloves. But this can be taken further by recognising when hands begin to show signs of dryness, cuts or other irritations and addressing them quickly. Attending to the needs of the skin before it becomes critical, helps avoid sidestepping proper hand hygiene at work. Love your hands and keep them healthy. They save lives.



12 Second-hand gloves

In a study, 1500 used pairs of latex and nitrile gloves were collected for two months in two ICUs. The gloves were analysed for the presence of microscopic holes using the water-proof-test. Of the gloves, only 26% were worn for more than 15 minutes. The total perforation rate was 10.3%. The researchers also noted significant deterioration in gloves' integrity between different brands. Activities such as wound dressing and patient washing increased the risk of perforation. As the study indicates, holes and defects in gloves appear and steadily increase from the minute they are worn depending on the activity performed. And they are usually not visible to the naked eye. Due to this reason, gloves should not be worn beyond two hours and certainly not reused to prevent cross-infection. Even when the gloves are washed, water and soap are not able to remove all microbes especially those trapped in the microscopic fissures. And if disinfecting gloves sound like a good idea, it is not. Most hand disinfectants contain some amount of gel and the gelling agent causes gloves to become sticky. Even if water-based, there is a very high chance that some spots will be missed.

13 Penny wise and plague foolish

Not using enough hand wash liquid or disinfectant is just as bad as not washing or disinfecting hands at all. The recommended amount for hand wash is 1 – 1.5ml of liquid soap. The amount should be sufficient to cover and remove the oils and dirt from both hands entirely. Otherwise, it is just water trying to do the job, largely ineffective. It is also equally important to rinse off the soap completely to prevent skin allergy and soap residue from counteracting hand disinfectant. European standard EN1500 hygienic handrub method recommends 3ml of disinfectant for hygienic hand disinfection and 2 x 5ml for surgical hand and forearm disinfection. The amount is sufficient for complete coverage and takes about thirty seconds to evaporate. Feeling yucky with extra product and thinking about rinsing or wiping it off? Don't. You'll just be contaminating your hands again.

14 CDC or WHO?

You might be aware that the CDC recommends a four-step approach to hand washing while WHO recommends an eight-step approach. The CDC recommends scrubbing hands for at least 20 seconds whereas WHO recommends spending 40-60 seconds to complete the entire wash cycle. For healthcare workers, it does not matter which approach is embraced but at Hygiene360, we recommend the method outlined by WHO. The basic tenet of proper hand washing is ensuring all areas of the hands are scrubbed with soap and rinsed. The WHO guideline to hand washing addresses this by providing detailed steps to clean every part of the hand including the nails, between fingers and thumbs. Refer to Diagram 1 on page 4.



PROSEPT® Gel

15 Concentrate on the concentration

Hand disinfectants are intended to be used as is without further dilution or mixing. The water on wet hands will dilute the preparation tremendously and cause the product to become ineffective in killing microorganisms. While washing removes visible soil on hands, disinfection kills invisible microbes. For a disinfectant to work effectively, wash hands if necessary and dry them with a disposable towel thoroughly before applying disinfectant. Observe the contact time indicated on the label and do not rinse or wipe hands after applying disinfectant.

16 Touch-me-not dispensers

In most hospitals, hand disinfectants are dispensed through automated or manual dispensers. In some places, PET bottles and EURO bottle are still used. Automated dispensers typically dispense set amounts of liquid when a hand is placed close to the sensor. Manual dispensers may include a foot pedal, button or lever to dispense solution. While a foot pedal prevents hands from coming in contact with the dispenser, a PET bottle, EURO bottle, dispenser button or hand lever will require contaminated hands to make contact with the dispenser. This is risky in healthcare settings where a great many people including healthcare professionals, patients and visitors use disinfectants, depositing microbes on the surface of the dispenser and/or bottle. Since it is safe to say that

dispensers and bottles are not disinfected frequently, we suggest healthcare facilities to upgrade to automatic dispensers to prevent contact during disinfection.

17 The jury is still out on the ring-wearing verdict

There is no conclusive evidence to prove rings increase cross-infection, but some studies have proven the skin underneath rings are more heavily colonised with *Staphylococcus aureus* and Gram-negative bacilli than areas of skin on fingers without rings. In a Norwegian study comparing the hand flora of 121 healthcare workers, there was no significant difference in the total bacterial load on hands between those wearing a single plain ring and those wearing no rings. But healthcare workers wearing rings were more likely to carry Enterobacteriaceae. Even if there is no compelling evidence, healthcare workers are advised against wearing rings at work to prevent the growth of fungus and tearing during donning on and off gloves. Rings also impede effective removal of soap during hand washing, which could lead to skin irritation.



myArtiso AS-3 and MS-3 dispenser.

18 Blood on your hands

When hands are visibly soiled with dirt, blood or other bodily fluids, wash and dry them before applying disinfectant. Moist and dry organic matter can act as a barrier to disinfectants, preventing the active ingredients from fully interacting with the microbes. This obviously limits the effectiveness of the disinfectant. Inspect hands visually to make sure hands are free from any physical dirt and only then apply hand disinfectant.



19 Adding fuel to the fire

Healthcare workers may wash their hands from any number of times to as many as 30 times per shift. This is excluding the application of hand disinfectant, which could possibly be higher. The continuous stripping of moisture and application of chemical-based disinfectant can result in drying, peeling and skin irritation. This condition, known as contact dermatitis, is quite common in healthcare settings and it is worse among those with naturally sensitive skin. What's even worse however, is that the medical industry cannot afford to grant concessions to healthcare workers affected by this condition. Hands must be washed and disinfected even when the skin is sensitive or damaged. One workaround is to apply hand lotion from time to time to revive the moisture level of the skin and keep it healthy. The infection control committee must also consider purchasing hand wash and disinfectants that contain emollients, moisturisers and vitamins to care for the healing hands of its workforce.



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20 A time for everything

Many make the mistake of applying hand moisturiser or lotion immediately before or after disinfecting/washing hands. But these are not the best times for skin moisturisation. Apply lotion right before washing hands and you risk washing it off. Apply it after disinfecting hands and you risk re-contaminating them. Apply it right before disinfection and you risk the effectiveness of both the moisturiser and the disinfectant. Hand moisturisers should be allowed some time to be absorbed before other products are applied to skin. So, when exactly is the right time? Generally, healthcare workers are advised to apply hand lotion before long breaks, at the end of the working day and before going to bed at night. If more is needed, apply after washing hands when there are no patients to be attended to for at least 30 minutes. This time allows the lotion to be absorbed by the skin before you need to wash or use a disinfectant.



21 Dry as a bone

Wet hands are not only the hotbed of germs, but they are also prone to attract contaminants quickly. In addition to getting re-contaminated, wet hands easily transfer contamination through dripping and smearing. When drying hands, always use disposable towels to prevent straggling microbes from being transferred to the next individual. Use the disposable towel to turn off the faucet after drying hands and throw it into a trash receptacle to prevent cross-contamination. When using disposable towels, dab the skin as opposed to rubbing it to avoid chafing the skin. Cloth towels that can be used multiple times by multiple people in healthcare facilities, are no less than endemic-bombs waiting to go off.

22 Blowing hot air

Just to be clear, healthcare facilities typically do not have hot air dryers installed for hand drying. Not even in the lavatories. And for good reasons too. For one, it's faster and easier for time-strapped healthcare workers to dry hands with disposable towels. On the other hand, hand dryers do more harm than good despite the environmental-friendly spiel it is commonly associated with. In a study conducted at the University of Connecticut, researchers found that petri dishes exposed to hot air from a bathroom hand dryer for 30 seconds grew up to 18 to 60 colonies of bacteria compared to one colony of bacteria or none at all from petri dishes exposed to bathroom air for two minutes with the hand dryers turned off. The researchers concluded that hand dryers draw bacteria from the washroom air and deposit them on newly washed hands. While the average person may not be affected by this, a person with weak immune system may acquire an infection. Regarding the more advanced hand dryers equipped with UV light, one study concluded that hot air drying of stationary hands for 30 seconds with UV light was more effective at removing bacteria than using disposable towels. The only downside is that it requires busy healthcare workers to keep their hands stationary under UV light for 30 seconds for the process to be effective. A disposable towel can dry hands in 10 seconds, with no discernible harm to themselves or patients.

23 Electronic devices, boon and bane

Typical healthcare facilities are increasingly aided by modern electronic devices such as tablets and smart phones. In most cases, it is to view lab results, photographic images of patient condition and appointment registration. Repeated use of these devices in healthcare environments can result in the accumulation of dirt and microbes which are then transferred to others through skin and surface contact. A paper published in 2015 reviewed 39 studies from 10 years prior focusing on contamination of mobile phones in healthcare. One common finding was that healthcare workers' cell phones are frequently contaminated with bacteria that cause HAIs. In a study carried out in 2017, the majority of infection prevention professionals who responded to a survey, reported no policy regarding the cleaning and disinfection of mobile devices, hand hygiene before or after use of mobile devices and the use of mobile devices while wearing gloves. If there are no protocols regarding the use and disinfection of electronic handheld devices in healthcare settings in your facility, talk to your infection control committee and establish one. Disinfect all electronic devices in patient area with a suitable surface disinfectant. Disinfect hands before and after using these devices to reduce cross-contamination and refrain from touching patients right after handling these devices.



24 Hot water theory holds no water

WHO cautions healthcare professionals against using hot water for handwashing as it can increase the likelihood of skin damage. A study carried out in 2017 to examine the effects of soap volume, water temperature, lather time and washing efficacy of soap made a conclusive finding. The study among other things, concluded that the temperature of water did not significantly affect bacterial load reduction whether it was at 38°C or 16°C. To conserve energy and prevent the risk of dermatitis due to repeated exposure, avoid using hot water for handwashing. The ideal temperature is 32°. Anything above 40°C will affect the lamellar layer in the stratum corneum and significantly reduce the skin's effectiveness as a barrier. It can take one or two hours for the skin to return to normal.



25 Don't skip the soap

Soap whether in liquid or solid form, is an excellent cleaner because of its emulsifying ability. As water and oil (which attracts dirt) do not mix, water is not able to expel dirt effectively. Soap however, is made up of hydrophilic and hydrophobic components. The hydrophilic component interacts with water and the hydrophobic component interacts with oil. This creates a bond

that suspends oil and dirt in water which aids their removal. Water alone, is only able to suspend a limited amount of dirt and oil and they largely remain on hands even with rigorous rubbing or drying. As microbes attach themselves to dirt and oil, soap is necessary to float and rid them off hands. So, always use soap and as mentioned previously, use the correct amount for hand washing to be effective.

26 The thing with bar soap

Bar soaps are not used in most healthcare facilities. The reason behind it is that microbes can grow on moist bar soaps and spread from one user to another. In WHO's guidelines for hand hygiene, it is stated that liquid, bar, leaf or powdered forms of soap are acceptable in the medical area. But when soap bars are



PROSEPT® Hand Wash

used, they must be in small sizes and kept in racks that facilitate drainage to allow the bars to dry. Additionally, small soap bars are only recommended for single occupancy suites. Some however, argue that standard sized soap bars might not really be agents of infection. A rigorous study carried out and published in 1965 found that bacteria were not transferred to the next user of a contaminated bar soap. It further concluded that "the level of bacteria that may occur on bar soap, even under extreme conditions does not constitute health hazard". It is worth highlighting that the study was only carried out on bacteria. Should more virulent microbes such as viruses, fungi and bacterial spores had been included, the study may have yielded a different result. To minimise the risk of cross-infection, practice caution and use only liquid soap in healthcare facilities.

27 Another nail in the coffin

Long nails are not permitted in healthcare. This is hardly news to anyone in the medical profession but for some reason, the idea doesn't catch on. So, we thought we'd rehash it. Long nails are not permitted for several reasons. First of all, they have a high propensity to cause injury to self and others. From the infection control point of view, fingernails usually harbour high concentration of microbes under and around them. The longer the nails, the more spacious the assembly area for germs. They also complicate hand washing and disinfection process as most healthcare workers are overworked to spend additional time washing or disinfecting long fingernails. Long nails can also puncture gloves and subject you and your patient to harm. While on the subject, we might as well add that artificial nails and nail polish are not encouraged among healthcare workers as both can harbour microbes especially when chipped. According to the CDC, "healthcare workers who wear artificial nails are more likely to harbor gram-negative pathogens on their fingertips than are those who have natural nails, both before and after handwashing".



28 The devil is in the percentage

The CDC suggests that "washing hands with soap and water is the best way to reduce the number of microbes on them in most situations. If soap and water are not available, use an alcohol-based hand sanitiser that contains at least 60% alcohol". It further states that sanitisers with alcohol concentration between 60-95% are more effective at killing germs. As a rule, we recommend using alcohol-based hand disinfectants with at least 70% alcohol content. Some non-enveloped viruses cannot be killed effectively with alcohol content below 70%. When there is a known disease caused by non-enveloped virus circulating, it is best to read the label of the product and ensure effectiveness against the specific virus or at least adenovirus, norovirus and poliovirus.

29 Medical vs. commercial

Hand sanitisers available commercially in pharmacies and supermarkets are not suitable for use in hospital settings. According to European Norm EN 1500, hand disinfectants for use in the medical area must be able to kill 99.999% bacteria. Based on the norm, the product is further tested against E. coli to ensure it is not inferior to the antimicrobial properties of 60% isopropanol. This is merely for hygienic and not surgical hand disinfectants. Surgical hand disinfectants are subjected to even more rigorous tests according to EN 12791 to ensure the product is effective in the highly aseptic environment of operating theatres. Commercial hand sanitisers are most likely not tested as stringently and they do not list the exact microbes they are able to kill. At most, they state '99.99% effective against bacteria'. In a healthcare setting, the miniscule 0.009% variance is the difference between life and death. One other key information missing from the labels of commercially available hand sanitisers is the contact time. The contact time is necessary for healthcare professionals to carry out their hand hygiene protocols effectively.

30 Contact times mean something



The contact time is important when using any type of disinfectants in the medical area including hand disinfectants. It indicates how long a product must remain saturated or moist on the skin or surface for the active ingredients to effectively kill and inactivate microbes. One common occurrence in understaffed but overcrowded hospitals around the world is healthcare workers hurriedly squirting hand disinfectant on their way to the next patient without paying attention to the time their hands remain moist. Most do not know or even read the label for the contact time. The practice, when complied to in busy hospitals, have become a habit rather than a conscious action. With fancy dispensers, the contact time on the product label is further obscured, making it easy for people to disregard it altogether. For starters, we encourage

healthcare professionals to read the label every time a product is changed and ensure hands remain moist throughout the contact time.

31 Beware the active substance

Alcohol is not the only ingredient of choice among manufacturers of hand disinfectants. Some use chlorhexidine. Chlorhexidine has been in use since the 1950s especially in skin antiseptic preparations. But chlorhexidine is also a known contact allergen. A rash or irritation can develop on the area of skin that has come into contact with chlorhexidine. In 2017, the Food and Drug Administration (FDA) in the US released an alert requesting manufacturers of over-the-counter chlorhexidine products add a warning about allergic reactions. More alarming however, is that studies have shown that exposure to sub-lethal chlorhexidine gluconate concentration in hand disinfectants may enhance resistance in *Acinetobacter*, *K. pneumoniae* and *Pseudomonas*, species well known for emerging antibiotic resistance. In a study, researchers tested strains of *K. pneumoniae* typically found in healthcare settings and exposed them to increasing concentrations of chlorhexidine. While some strains died from the exposure, others survived and some developed resistance against colistin, a last-resort antibiotic. As hand hygiene is an important component of infection prevention, the risk of hand disinfectants losing their potency against resistant bacteria is highly disturbing. And even more so if the ingredients used in hand products promote antibiotic resistance in bacteria. To prevent escalating an already dire situation against superbugs, always choose alcohol-based hand disinfectants instead.



32 Wipeout



Hand washing with water and soap and hand disinfection have been discussed extensively as we all know. But how about antimicrobial hand wipes? How do they fare and are they recommended for use in health-care facilities? The CDC highlights one study that found “cleaning hands with antimicrobial wipes containing a quaternary ammonium compound was about as effective as using plain soap and water for handwashing”. Another study proved that antimicrobial hand wipes can clean hands just as well as soap and water. In the study, the hands of 20 volunteers were artificially contaminated with *E. coli* and air-dried before washing with soap and water, a control wipe (without antimicrobial agents) and a test wipe (with antimicrobial agents). The antimicrobial hand wipe achieved 3.7-log reduction compared to 3.5-log reduction in washing with soap and water. Log reduction refers to the extent to which a product is capable of reducing the number of microbes. For example, a product that is 99.9% effective against a certain microbe is said to have achieved 3-log reduction against that microbe. In another study, researchers tested the effectiveness of 3 liquid soaps that contained 4% chlorhexidine gluconate, 1% triclosan and no antiseptic ingredients respectively, and a 30% ethyl alcohol-impregnated hand wipe. Chlorhexidine gluconate achieved the highest log reduction followed by triclosan, but both resulted in skin irritation in subjects. Alcohol hand wipe came in third place but with less skin irritation. Repeated cleaning with alcohol wipes however, reduced bacteria to a level comparable with non-medicated soap. In other words, the reduction was sufficient to prevent microbial transmission by healthcare workers’ hands in most health care settings. This suggests that alcohol-based hand wipes may be considered as an alternative to washing hands with non-antimicrobial soap and water.

33 The virtue of alcohol

No introduction necessary here. Alcohol-based hand disinfectants are better because:

- It’s more effective at killing potentially deadly microbes on hands
- At the right concentration, it prevents bacteria from acquiring resistance
- It has short contact time
- It causes less skin irritation than the alternatives

34 Alcohol's got nothing on bacterial spores

Many have the perception that hand disinfectants kill all microbes, making them 100% safe on patients. It is true that alcohol-based hand disinfectants intended for use in the medical area are typically effective against a wide range of microbes, but alcohol is not capable of destroying bacterial spores such as *C. difficile* and *B. cereus*. *C. difficile*, when transmitted, can cause diarrhea and colon inflammation that can be fatal. The only method available to rid hands of bacterial spores is through hand washing. The soap, even when it's antibacterial, does not kill spores but merely removes them. This is why hand washing and hand disinfection work together to minimise the risk of cross-contamination and cross-infection. Hand washing is critical especially when attending to known *C. difficile* infection cases.

35 Open wound, open snare

Open wounds, even small ones can become infected when exposed. In healthcare settings where the risk of contracting pathogens such as MRSA, *Staphylococcus* and *Streptococcus* is higher, healthcare workers are advised to cover open wounds. Broken skin makes the whole body susceptible and offers an ideal environment for microbes to proliferate. Once infected, the wound can transfer microbes to others through direct contact. So, if working in healthcare institutions, seal open wounds with water-resistant plasters. Change the plaster if wet or compromised and refrain from exposing wounds in high-risk environments.



36 If it gets under your skin

There are two types of skin reaction associated with hand hygiene. The most common is irritant contact dermatitis and symptoms include dryness, irritation, itching and in some cases, cracking and bleeding. The condition ranges in frequency from 25% to 55% among nurses. Frequent and repeated use of hand hygiene products such as soaps, alcohol-based disinfectants and detergents can cause irritant contact dermatitis. The products damage skin by denaturing stratum corneum proteins, depleting or reorganising lipid moieties in intercellular lipids, decreasing corneocyte cohesion and decreasing stratum corneum water-binding capacity. The main concern is the depletion of lipid barrier. During dry seasons and in individuals with dry skin, this lipid depletion occurs faster. Damage to the skin also changes the skin flora, resulting in more frequent colonization by staphylococci and Gram-negative bacilli. Although alcohols are safer than detergents, they can cause dryness and skin irritation. Ethanol tends to be less irritating than n-propanol or isopropanol. However, several studies confirm that alcohol-based formulations are well tolerated and often associated with better acceptability compared to other active ingredients. The second type of skin reaction, allergic contact dermatitis, is rare and represents an allergy to some ingredient in a hand hygiene product. It is sometimes difficult to differentiate between the two conditions and as such a visit to the skin specialist is recommended when symptoms occur.

37 Prevent hand hygiene gold standard from crumbling

Of growing concern is the evolution of bacteria to gain resistance to alcohols used in hand sanitisers. In a study conducted in Melbourne, Australia, a newer, more resistant strain of *Enterococcus faecium* was able to survive for longer periods of time after being exposed to alcohol. In fact, it was about 10 times more tolerant to alcohol than the earlier strain. It took 70% alcohol mixture to kill the bacteria completely, slightly higher than CDC's recommendation of 60% and higher than the alcohol content of a typical hospital grade hand disinfectant. The situation is not yet alarming but it's best to take precautions before it gets worse. We are already at a critical stage of antibiotic resistance with some bacteria. And we cannot afford to add to the burden with increased resistance to alcohol-based hand disinfectants. To prevent increasing bacterial tolerance to alcohol, use hand disinfectants that contain at least 70% alcohol and kill bacteria fully. Avoid using hand disinfectants containing chlorhexidine. If the alcohol content of your disinfectant is not known, ask and find out. And continue washing hands at proper times.

38 License to kill

With so many types of microbes around, what must hand disinfectants be able to kill? Ideally, as many types as possible ranging from bacteria to non-enveloped viruses. Not all hand disinfectants in the market can achieve this, however. According to the European standard EN1500, hygienic hand disinfectants must be able to kill 99.999% bacteria. And this is accepted as sufficient to meet the dangers of cross-infection in healthcare settings. It is not compulsory to display virucidal activity, but if it says so on a label, the must have been proven effective in inactivating 99.99% disinfectants today however, kill more than bacteria and growing number of transferrable diseases. Check out the effective your hand disinfectant is against pathogens.



CONTACT TIMES	
Bactericidal (1)	15 sec
Antibiotic-resistant bacteria (2)	15 sec
Tuberculocidal (3)	30 sec
Mycobactericidal (3)	30 sec
Yeasticidal (4)	15 sec
Antibiotic-resistant yeasts (5)	15 sec
Limited spectrum virucidal (6,9)	15 sec
BVDV (9)	15 sec
Coronavirus (7,9)	15 sec
Hepatitis B virus (9)	15 sec
Hepatitis C virus (8,9)	15 sec
Herpes simplex virus type 1 (9)	15 sec
Human immunodeficiency virus (9)	15 sec
Influenza A virus H3N2 (9)	15 sec
Vaccinia virus strain Ankara (MVA) (9)	15 sec
Norovirus MNV (9)	60 sec

for it product viruses, no less. Most hand yeasts to keep up with the product label to see how

PROSEPT® Med

39 Soap opera

Similar to hand disinfectants above, display antimicrobial effects. Accord-hygienic hand wash products must hands. Again, there is no dramatrobes but this not crucial as the to remove dirt and oil on skin. As washing technique is employed, as bacterial spores should with the soils. For the cept bacterial main, a dose of should take



soap used for hand washing in healthcare settings must ing to European Norm EN 1499, at minimum, be able to reduce 99.9% of bacteria present on ic reduction requirement for other types of mi- primary purpose of hand washing is long as the correct hand critical microbes such be washed off along stubborn lot (ex- spores) that re- hand disinfection care of them.

40 The A-B-C of hand hygiene

Quite possibly, the five moments for hand hygiene is one of the most basic and most widely promoted concept when it comes to infection prevention and yet, it is often forgotten or deliberately neglected. So, let's go through it again. Say it with us: The five moments for hand hygiene are:

- Before touching a patient
- Before clean/aseptic procedure
- After body fluid exposure risk
- After touching a patient
- After touching patient surroundings

It's not that you don't know these, we just want you to practice them consistently because you are a champ!

41 Numbers don't lie

You are a meticulous healthcare professional with respect for lives. You do your job diligently and you are committed to save lives daily. Great. Do you know what is the hand hygiene compliance rate in your facility? Are you interested in knowing how your unit is faring compared to others? Are you interested to help improve the statistics? If the answer to either question is 'no' or 'I'm not sure', then hand hygiene compliance could just be a requirement of the establishment and not a live-saving one in your subconscious. If you seem to have gradually developed this healthcare myopia, please remember that hand hygiene compliance has always been higher in institutions where healthcare workers are committed to the hand hygiene agenda. And you are only truly saving lives when you participate in the hand hygiene cause fully.



42 Hawthorne effect

Hawthorne effect is the alteration of behaviour by the subjects of a study due to their awareness of being observed. Often evidenced during hand hygiene compliance audit, healthcare workers comply to hand hygiene when observed and forsake the practice as soon as the auditors turn their backs. Hawthorne effect was proven during a study conducted in Santa Clara Valley Medical Center in the US. Healthcare workers in the facility diligently washed their hands during the 6-month period. But researchers found they were 30% more likely to comply with hand hygiene because they knew they were being watched. In other words,

there was a 30% disparity in the actual compliance rate. Around the world, compliance rate typically hovers at or below 40% on average and increasing the rate has been quite a challenge. The Hawthorne effect is difficult to detect unless the subject is observed without their knowledge. So, even if you manage to wangle the hand hygiene statistic in your unit, take it with a grain of salt and keep promoting the habit.

43 Washing works hand in glove with disinfection

Both hand washing and hand disinfection are necessary when caring for patients. Hands must be washed when they are visibly soiled, at the start and end of the workday, after coughing or sneezing and before and after long work breaks. Hands must be disinfected before and after every treatment, before and after work breaks and after contact with potentially contaminated devices, instruments and surfaces.



44 Blind spot bind

Even by correctly following hand washing or hand rubbing techniques, certain areas can still be missed. According to WHO, some areas frequently missed by healthcare workers when using soap or hand disinfectants are thumbs, finger tips and between fingers. The bright side is that hand washing or rubbing techniques can be improved with training. With practice, we become more conscious of the areas that we commonly miss and improve our techniques to cover all areas. For help in evaluating the effectiveness of your hand washing or disinfecting techniques, try one of the many UV light and glow cream training kits available in the market today. The cream contains simulated germ particles that glow under UV light, exposing areas of hands not washed properly.

45 Put more green into it



Yes, we need to invest in what could save lives sometimes. Touch-free technology is a great idea for healthcare facilities because high touch zones and hard surfaces are significant cross-infection points. One study conducted in four British hospitals showed that high-contact surfaces such as manual faucet handles, manual soap dispensers and manual paper-towel dispensers act as reservoirs for microbes and contaminate hands immediately after washing. In view of the findings, it makes sense to convert to touch-free dispensers for soap, paper towel and hand disinfectants. Some of the advantages of automatic dispensers include:

- The elimination of contact points – product is automatically dispensed when sensor is triggered, eliminating physical contact.
- Ease of use – anyone can use it, from healthcare workers to young visitors, encouraging hand hygiene. Interestingly, in a study carried out in Greenville Memorial Hospital found children

and young adults were more likely to use hand disinfectant dispensers than their elders by about 50%.

One study found that touch-free dispensers are used more often compared to manual dispensers, increasing compliance.

46 It's all about location, location, location



So, we know we need touch-free dispensers. The next question is, where do we put them? A study published in the American Journal of Infection Control found visitors to Greenville Memorial Hospital were most likely to use hand disinfectant when a dispenser was placed in the middle of the hospital lobby floor by the entrance. The dispensers placed near the information desk and to the side of the lobby were not frequented as much. Other studies have found that an optimised dispenser location can increase use by more than 50%. It has also been found that strategic and highly visible placement of dispensers has a bigger impact on use compared to increased number of dispensers. Some suggested areas for placement include hospital entrances, patient rooms and nurse stations. Most importantly, keep dispensers highly visible along walkways and away from obstructions such as behind doors, large fixtures and stacked up files.

47 And it's not about the money

When evaluating a hand product for use facility-wide, the best approach is to test the product with a team of healthcare workers who will eventually be using the product long-term. They will be able to provide valuable insight into how keen the rest of the team will be in using the product when it is finally acquired. This will affect compliance in the long run. For example, if a hand disinfectant leaves too much residue for a nurse to keep her gloves on without losing dexterity and tactile sensibility, someone with actual patient contact would highlight it. The following factors must be weighed during decision making in addition to the cost and effectiveness:

- Feel – how does the product feel to the skin immediately after use and after several hours.
- Fragrance – is the product pungent to the point that it is impossible for healthcare workers to carry out their duties.
- Skin tolerance – does the product cause allergic reaction in a large number of workers or does it have a long-term effect on the skin.

48 Excuses excuses

Most healthcare workers do not intentionally neglect hand hygiene. But it happens, and the following are the reasons that have been identified.



- Healthcare worker forgot
- Ineffective or inconvenient placement of hand rub dispenser or sink
- Broken dispenser or sink
- No hand rub in dispenser, no soap at sink
- Healthcare worker was distracted
- Perception that wearing gloves negated need for hand hygiene
- Proper use of gloves (for example, changing between rooms) slows down work process
- Ineffective or incomplete education
- Inadequate safety culture that does not stress importance of hand hygiene for all caregivers regardless of role
- Caregiver's hands were full (holding medications, supplies, linens, food trays); no convenient place to put supplies to facilitate hand hygiene
- Lack of accountability: staff do not remind each other to clean hands
- Isolation area: special circumstances related to gowning and gloving
- Skin irritation from hand cleaning product or disinfectant
- Lotion dispenser used instead of soap
- Following another person into or out of a patient room
- Equipment sharing between rooms requires frequent entry and exit from room
- Bedside procedure or treatment requires frequent entry to and exit from patient room
- Hand hygiene compliance data are not collected, are inaccurate, or reported infrequently

- Admitting or discharging patients requires frequent entry and exit from patient room
- Perception that excessive hand cleaning is required
- Hand cleaning product perceived as feeling unpleasant
- Healthcare worker was too busy
- Emergency situation
- Workflow not conducive to consistent hand hygiene



49 The more the merrier

This article will not be complete without some suggestions to increase hand hygiene compliance, so, here they are. Nearly every literature available on the topic recommends a multimodal approach. And for good reason. Because it works. The multi-modal approach, could include the following activities:

- Initiate hand hygiene campaign with audits
- Study the moment of and reason for lapses
- Review the location of hand hygiene product dispensers
- Review the quality and acceptance rate of hand hygiene products
- Supply hand lotion along with hand disinfectant
- Supply sufficient safe water supply, soap and towels
- Provide accessible alcohol-based hand disinfectant at the point of care
- Make hand hygiene training and education fun with glow cream and UV light
- Establish a campaign committee that monitors, prompt and remind healthcare workers of the importance of hand hygiene
- Create and display reminder posters
- Establish protocols for hand held electronic device use and disinfection in treatment rooms
- Conduct perception surveys on healthcare workers and senior management
- Monitor and report soap and disinfectant consumption
- Encourage positive reinforcement through recognition and awards
- Educate patients on their rights and duty in informing healthcare workers when not compliant

50 Tool box

Hand hygiene campaigns don't make any sense when it cannot be measured for success or failure. The tools for measuring compliance are not complicated. In fact, they are quite easy to use if you know where to look. Some tools we suggest are:

- Observation of hand hygiene quality and frequency among healthcare workers either by an actual person or through apps. Covert observations will reduce Hawthorne effect.
- Measuring the use of products such as soap and disinfectants to compare hand hygiene opportunities and missed opportunities.
- Monitoring through tagging system or sensors to provide administrators with data before contact with patient occurs.

51 A friend's eye is a good mirror

Hand hygiene non-compliance, as with all other transgressions, is easier to deal with when pointed out by a peer or friend. Friends make a bitter pill easier to swallow for kind intention precedes reproach. Not all in the workplace however, is a friend. Some are just professional rivals and a rebuke from one of them might stoke something else. So, a different tactic is better employed. In a clean hand initiative by Vanderbilt University Hospital, respect and professionalism was at the heart of the program. This, to give comfort to those lower in the food chain like a clerk, in reminding say the chief of surgeon to wash his hands. The only response allowed for the reminder was a polite 'thank you'. Display of irritation or condescension would result in an informal conversation with the observer and continued poor behaviour would lead to a formal discussion with the hospital's vice chancellor. The practice along with other measures, helped the hospital achieve 96.6% compliance in 2014 compared to 58% before the initiative started. The 'thank you' policy by Vanderbilt University Hospital certainly resulted in high compliance. Perhaps on a smaller scale, we can all establish a simpler form of 'thank you' policy where we ourselves form a group and assign our peers to observe and remind us of hand hygiene during work. They are after all, close to us in proximity. And to give it a real kick, agree within the group to restrict response to 'thank you'. It'll be better for everyone's psychology and health.

