Proper Hand Washing Protocols

Critical for Preventing Nosocomial Infections

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When it comes to hospital infection control, hand washing is the single most important procedure for preventing nosocomial infections. Yet study after study has shown that large numbers of health care workers fail to comply. A 1994 study conducted by the Centers for Disease Control and Prevention (CDC) found that hand washing takes place in health care settings much less often than is required, with hand washing rates for physicians at 14% to 59% and nurses at 25% to 45%.

Considering that the main cause of nosocomial (ie, hospital-acquired) infections is transmission of microorganisms from the hands of health care workers, low compliance with hand washing protocols clearly is a matter of concern. In 1995, nosocomial infections cost US hospitals an estimated $4.5 billion and contributed to more than 88,000 deaths, or one death every six minutes. These infection rates are growing, having risen 36% during the past two decades to 9.8 per 1,000 patient days in 1995.

The risks posed by improper hand washing in surgical settings also are a matter of great concern. Surgical wound infections are the second most frequent nosocomial infection in most hospitals and are an important cause of morbidity, mortality, and excess hospital costs. Staff members often are the cause of an infected surgical wound in hospitalized patients via exogenous contamination. While this contamination may come from a hospital source or something in the environment, direct contact with the wound by the surgical team generally is “the final pathway for spread of most such contamination.” In fact, “most surgical wound infections appear to result from contamination acquired in the operating room.”

Surgical wounds also can be contaminated and infected if they are touched by contaminated hands after a procedure, especially if the wound is open or if a drain is used. Thus, it is critical that proper hand washing techniques be observed to reduce the risk of infection. The CDC has published guidelines that state that staff members should wash their hands before and after taking care of a surgical wound and should not touch an open or fresh wound unless they are wearing sterile gloves or use no-touch technique.

Given the importance of hand washing, why do so many health care workers not comply? Many factors can influence hand washing compliance, including lack of knowledge about its importance, under-staffing, and inconveniently located sinks. One major reason why health care workers may not comply may be concerns about skin damage from frequent hand washing.

Contact Dermatitis and Hand Washing

Contact dermatitis, an inflammation that can occur from frequent hand washing, can cause skin to become red, swollen, tender, hot, painful, or itchy. In addition, there may be some scaling as skin heals. Skin affected for several weeks by dermatitis tends to thicken and change to a deeper color. Such dermatitis causes pain or discomfort, and in severe cases, the affected person cannot work for long periods of time.

According to the National Institute for Occupational Safety and Health (NIOSH), allergic and irritant dermatitis (contact dermatitis) is overwhelmingly the most important cause of occupational skin diseases, which account for 15 to 20% of all reported occupational diseases.

The US Bureau of Labor Statistics reports that occupational skin diseases are the second most common type of occupational disease. In 1997, there were approximately 58,000 reported cases of occupational skin diseases, accounting for slightly more than 13% of all occupational diseases. More of these cases were reported than were cases of dust diseases in the lungs, respiratory conditions due to toxic agents, poisonings, and disorders due to physical agents combined. The NIOSH reports that estimated total annual costs associated with occupational skin disease may reach as much as $1 billion annually when lost workdays and loss of productivity are taken into account. The institute is so concerned with
occupational skin diseases that it has identified contact dermatitis as one of its top research agenda priority issues. Dermatitis and other related skin conditions are more commonly reported among hospital workers than all other civilian workers.1

Without question, hand washing is a critical element of infection control and prevention in all health care environments, and in particular in surgical settings. What follows is a review of hand washing techniques and procedures, the use of gloves and hand washing, the types of soaps needed for different health care situations, and how to increase hand washing compliance.

**When to Wash Hands**

In health care settings, hand washing is of the utmost importance. Through contact with body secretions, health care workers' hands can carry bacteria, viruses, and fungi that may be potentially infectious to themselves and others. “Proper handwashing in the operating room is so critical that a growing number of health care facilities now mandate it as part of their employee performance review.12

According to guidelines published by the Association for Professionals in Infection Control and Epidemiology, Inc. (APIC), the decision regarding when hand washing should occur in health care environments depends on

- the intensity of patient contact,
- the degree of contamination that is likely to occur with that contact,
- the susceptibility of patients to infection, and
- the procedure to be performed.13

In health care settings, APIC recommends that hands be washed thoroughly with soap and water or that they be cleaned through hand antisepsis before and after patient contact, especially when caregivers' hands have had contact with mucous membranes, blood and body fluids, and secretions or excretions; after contact with a source of microorganisms; and after removing gloves.14

These guidelines also recommend using hand antisepsis that uses antimicrobial soaps or alcohol-based rubs before the performance of invasive procedures, when persistent antimicrobial activity on the hands is desired, and when it is important to reduce the number of resident skin flora and transient microorganisms.15

For general patient care, APIC guidelines recommend using plain, nonantimicrobial soap.

For surgical hand scrubs, APIC now recommends applying an "antimicrobial agent to wet hands and forearm with friction for at least 120 seconds."16 As for alcohol-based hand rubs,
the guidelines state that, in addition to following manufacturer's recommendations, "application should last for at least 20 seconds."

The APIC guidelines further state that

the optimum duration of surgical scrub is unclear, although research indicates that it may be age dependent. Also unclear is whether scrubs for subsequent consecutive cases may be shorter than the first case.

The APIC recommendations are based on the 1990 position of the American College of Surgeons, which says that a surgical scrub of 120 seconds, including brushing the nail and fingertip areas, is adequate.

Guidelines published by the CDC also recommend that the surgical team "scrub their hands and arms to the elbows with an antimicrobial surgical hand scrub preparation before each operation."

Gloves and Hand Washing

Gloves routinely are worn in health care settings as a safety barrier between skin-borne microorganisms and patients; however, bacteria and viruses can leak through gloves. According to APIC, gloves should be used as an adjunct to, not a substitute for, hand washing. It is also extremely important for caregivers to wash their hands after gloves are removed, or when the integrity of gloves is in doubt. Keep in mind that the use of petroleum-based creams and lotions may cause deterioration of gloves and cause increased permeability.

Choosing the Right Skin Cleanser

There are a variety of skin cleansers on the market for hand washing, including:

- Plain or non-antimicrobial soap,
- Antimicrobial soap,
- Special hand care hand washes,
- Alcohol gel instant hand sanitizers, and
- Alcohol gel moisturizing instant hand antiseptics.

The APIC recommendations say that, as a general rule of thumb, a plain non-antimicrobial soap should be used for removing soils or transient microorganisms.

Plain soaps are detergent-based cleansers in bar, liquid, leaflet, or powder forms that are used for the primary purpose of physical removal of dirt and contaminating microorganisms. These soaps work principally by mechanical action and remove transient bacteria from skin. They do not kill the bacteria released by the shedding of skin scales, nor do they promote their dispersion.

Antimicrobial soaps are products that contain an ingredient that is active against skin flora. Published studies indicate that antimicrobials increase the likelihood of killing disease-producing bacteria. In addition, certain antimicrobials offer more persistent activity on the skin than plain soap, as they have been shown to bind to the stratum corneum. Most are considered drugs because they are intended to kill or inhibit microorganisms on the skin when present in certain concentrations.

Antimicrobial soaps are desirable in an environment where gloves are worn, when it is not possible to wash the hands during procedures, or when continued chemical activity on the skin is advantageous. Good work practice suggests that antimicrobials should be used for:

- Hand washing before caring for newborns,
- Between seeing patients in high-risk units, and
- During the performance of invasive procedures (eg, placement and care of invasive devices).

In general, antimicrobials should be used in situations in which a maximum reduction of bacterial count is needed, such as during surgery and before contact with patients who have immune defects or damage to intact skin (eg, burns, pressure ulcers, wounds). Hand washing with a plain soap may fail to remove all transient microorganisms, especially when contamination is heavy in these high-risk situations.

There are several types of antimicrobial cleansers, including:

- General purpose cleansers,
- Health care hand washing cleansers,
- Alcohol-based cleansers, including moisturizing instant hand sanitizers; and
- Chlorhexidine gluconate cleansers.

When selecting an antimicrobial agent, determine what characteristics of a topical antimicrobial agent are desired, then choose an ingredient that has these characteristics. Review and evaluate evidence of safety and efficacy in reducing microbial counts. Also consider whether health care workers will accept the product and the costs involved in using the product.

General Purpose Cleansers. General purpose antibacterial products often contain either triclosan or chloroxylenol (PCMX) at less than 0.5%. Both provide broad spectrum activity against gram positive and most gram negative bacteria. They are used when some antimicrobial action is required in addition to cleansing. Examples of these cleansers include antibiotic, antiseptic, and antimicrobial cleansers.

Health Care Hand Washing Cleansers. These cleansers are broad spectrum antimicrobial preparations that are fast-acting, non-irritating, and designed for frequent use. Health care personnel hand washing cleaners typically contain up to 1% triclosan or 2% parahydroxybenzyl alcohol (eg, PCMX), which are especially effective against the tubercle bacillus, some fungi, and viruses. Because they contain higher concentrations of triclosan and PCMX than do general purpose cleansers, they provide more effective disinfecting as they reduce the number of transient flora on intact skin to a baseline level.

Alcohol-based Cleansers. Alcohol gel products, also referred to as waterless instant hand sanitizers, do not require water or hand drying with a towel. They usually contain 60% to 65% ethyl alcohol and rapidly kill germs on skin. Alcohol instant hand sanitizers and hand antiseptics generally are...
effective against most gram positive and negative microorganisms and provide good activity against tubercle bacillus. They also act against many fungi and viruses.

While alcohol-based products are used for surgical scrubbing in Europe, they have been less widely accepted in the United States, possibly because of concerns about skin damage. While traditional alcohol-based hand sanitizers may cause drying or do little to relieve the stress on skin from soap and water hand washing, new alcohol-based products with moisturizers and emollients actually can condition and soften skin. In fact, a study of skin irritation and dryness associated with alcohol hand gel versus standard soap and water hand washing found that nurses who washed with alcohol gels did not experience dryness in their hands and actually showed a slight improvement. One epidemiologist said that

this small study suggests that alcohol gel regimens that contain emollients actually do not result in more irritation and dryness, and may be tolerated better than a lot of the soaps and detergents.

Alcohol-based agents are available in a variety of forms (e.g., hand rinses, gels, foams). New moisturizing formulations can help prevent the dry skin associated with frequent hand washing, while killing a large percentage of germs in a short period of time. Alcohol-based hand sanitizers are recommended as a supplement to regular hand washing when soap and water are not readily available or when frequent hand washing results in dry, itchy, irritated skin. According to APIC guidelines, alcohols are effective as a surgical hand scrub, though they do not recommend them for use when hands are soiled with dirty or organic material, including blood.

**Chlorhexidine Gluconate Cleansers.** These products achieve significant antimicrobial effectiveness in immediate, persistent, and residual circumstances. For this reason, they are often chosen for use in intensive care settings, with children and adolescents recovering from surgery, and at selected nurses stations that are involved in high-risk activities, though they can be used with any patients. Chlorhexidine gluconate cleansers typically are available in 2% or 4% formulations, but there appears to be little difference in efficacy. According to the APIC guidelines, several clinical studies report good reductions in flora after a 15-second hand wash.

**Other Hand Washing Concerns**

Skin cleansers and antimicrobials themselves can become contaminated or support the growth of microorganisms. Therefore, storage and delivery of skin care products is an important consideration for effective use and contamination control. In one hospital, an outbreak of *Serratia marcescens* in the neonatal intensive care unit was attributed to extrinsic contamination of 1% chloroxylenol soap. This was caused by health care workers carrying individual soap bottles in their pockets for hand washing. Soap bottles often were left standing inverted, balanced with their soap lids directly on work surfaces or on sink areas that invariably were wet to allow the last remnants of soap at the bottom to drain to the spout. The report concluded that “*S. marcescens*, which flourishes in moist environments, can contaminate solutions and devices and can lead to severe nosocomial infections.”

It therefore is important that liquid cleansers be stored in closed containers and dispensed either from disposable containers or containers that are washed and dried thoroughly before refilling. To wash hands, use a paper towel or an elbow to pump the cleaner onto hands. This may decrease the potential for contamination.

Hand lotions, which should be used to ease the dryness resulting from frequent hand washing, also can become contaminated in much the same way, supporting bacterial growth. Therefore, APIC suggests that to avoid contaminations and the growth of microorganisms, lotions be dispensed in small, individual use containers or from pump dispensers that are not opened or refilled.

**What to Do After Hand Washing**

While proper hand washing is critically important, what happens afterwards also can have an effect on infection rates for patients and health care workers. It is important to use a clean, dry paper towel to dry hands, preferably one that is dispensed from a hands-free dispenser. When no-touch faucets are not available, the paper towel also should be used to shut off the faucet. This helps caregivers avoid recontaminating hands. Recently, six workers in a microbiology laboratory at one hospital came down with a diarrhea illness contracted from a laboratory specimen. Though all the workers had washed their hands, only some had used a paper towel as a barrier between their hands and the faucet handle when turning off the water. Those who did not use a paper towel barrier became infected. It was reported that the faucet handle was the source of minute quantities of an infectious agent.

**Improving Hand Washing Compliance**

Given the benefits and importance of proper hand washing in health care settings, the reasons for compliance have been the subject of much investigation. Lack of motivation and lack of knowledge about its importance are two reasons for poor compliance. Other obstacles, real and perceived, are under-staffing, inconveniently located hand washing facilities, unacceptable hand washing products, or dermatitis from hand washing itself. Some suggested methods for improving compliance include:

- education through literature, videotapes, and demonstrations;
- feedback on infection rates;
- direct observation of health care workers and regular feedback;
- conveniently located hand washing facilities;
- a sink or sinks in or just outside all patient rooms and
rooms where health care procedures are performed;
- accessible, adequately supplied, and properly functioning soap and towel dispensers;
- no-touch faucets or foot, wrist, or knee operated handles;
- waterless antiseptic agents readily available in wall-mounted dispensers;
- hand washing products that have a high level of acceptability by staff members; and
- lotions to prevent skin dryness, supplied in small non-refillable containers (lotions should be compatible with antiseptic products and the potential effect on glove integrity should be checked).}

**What It All Means**

Hand washing needs to be carried out correctly and in the recommended circumstances for it to work as a preventive measure against the spread of infection. A committed and thoughtful approach will best drive proper hand washing compliance. The frequency and amount of time spent during each hand washing session combined with correct hand washing products are paramount to ensuring proper hygiene in surgical and other hospital settings.

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1. Guideline for Handwashing and Hospital Environmental Control (Atlanta: Centers for Disease Control, 1985).
5. Ibid.
7. Ibid.
8. Ibid.
10. Ibid.
15. Ibid.
16. Ibid.
17. Ibid.
18. Ibid.
19. Ibid.
20. Ibid.
23. Ibid.
24. Ibid.
25. Ibid.
26. Ibid.
27. Ibid.
28. Ibid.
29. Ibid.
30. Ibid.
31. Ibid.
32. Ibid.
33. Ibid.
34. Ibid.
35. Ibid.
36. Ibid.
37. Ibid.
38. Ibid.
39. Ibid.
40. Ibid.
41. Ibid.
42. Ibid.
43. Ibid.
44. Ibid.
45. Ibid.
47. Internal study performed for Kimberly-Clark Corp, Roswell, Ga.
49. Ibid.
50. Ibid.
51. Ibid.
53. L K Archibald et al, “Seratia marcescens outbreak associated with extrinsic contamination of 1% chloroxylenol soap,” Infection Control and Hospital Epidemiology 18 (October 1997) 704-709.
54. Ibid.
57. Ibid.

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