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## Recommended Practices for Hand Hygiene in the Perioperative Setting

The following recommended practices were developed by the AORN Recommended Practices Committee and have been approved by the AORN Board of Directors. They were presented as proposed recommendations for comments by members and others. They are effective March 9, 2009.

These recommended practices are intended as achievable recommendations representing what is believed to be an optimal level of practice. Policies and procedures will reflect variations in practice settings and/or clinical situations that determine the degree to which the recommended practices can be implemented. AORN recognizes the various settings in which perioperative nurses practice. These recommended practices are intended as guidelines adaptable to various practice settings. These practice settings include traditional operating rooms, ambulatory surgery centers, physician's offices, cardiac catheterization laboratories, endoscopy suites, radiology departments, and all other areas where surgery and other invasive procedures may be performed.

### Purpose

These recommended practices provide guidance for hand hygiene for surgical and other invasive procedures. Microorganism transfer from the hands of health care workers to patients is an important factor in health care-associated infections and has been recognized since the observations of Ignatz Semmelweis and others more than 100 years ago. Skin is a major potential source of microbial contamination in the surgical environment.

Hand hygiene has been recognized as a primary method of decreasing health care-associated infections.<sup>1</sup> Prevention of health care-associated infections is a priority of all health care personnel. Health care-associated infections can result in untoward outcomes such as escalating cost of care, increased morbidity and mortality, longer length of stay, as well as the pain and suffering a patient may experience.<sup>2</sup> Hand hygiene, hand washing, and surgical hand scrubs are the most effective way to prevent and control infections and represent the least expensive means of achieving both.<sup>3</sup>

The normal skin flora on the hands include transient and resident microorganisms. The transient flora are microorganisms that colonize the superficial layers of the skin. These microorganisms are acquired by health care personnel while caring for patients and from coming in contact contaminated surfaces where patients reside. Transient bacteria are easier to remove during hand washing. Resident flora are bacteria seated in the deeper layers of skin and are more difficult to remove. The transient and resident bacteria usually maintain a constant level on individuals' hands.<sup>4,5</sup>

The term *hand hygiene* is used to describe all measures related to hand condition and decontamination. Decontamination of hands can be done by one or more methods:

#### ◆ hand washing using

- soap and water,
- antiseptic and water, or
- antiseptic hand rub if visible soil is not present; or

#### ◆ surgical hand scrub using

- water-aided brushless surgical antiseptics;

- waterless, brushless surgical antiseptics; or
- traditional surgical hand scrub using a sponge.<sup>4,5</sup>

### Recommendation I

**All health care personnel should follow established hand hygiene practices for maintaining healthy skin and fingernail condition and regarding the wearing of jewelry in the perioperative setting.**

A direct route of transmission of microorganisms occurs when person-to-person contact results in transmission of microorganisms from a person who is infectious or colonized to a susceptible host. An indirect route of transmission of microorganisms occurs when inanimate objects such as a contaminated surface, instrument, or health care personnel's hands transfer microorganisms to a susceptible host.<sup>6,7</sup> An example of an outbreak involved a cardiac surgeon's infected fingernail. When cultured, it grew *Pseudomonas aeruginosa*. Two patients treated by the surgeon developed a surgical site infection with the same strain of *P. aeruginosa*.<sup>8</sup>

I.a. Health care personnel should keep natural fingernails no more than one-quarter inch (0.64 cm) long.<sup>4,9,10</sup>

The subungual area of fingernails has the largest number of microorganisms on the hands.<sup>5,11,12</sup>  
Pathogens most frequently

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isolated from the subungual area are coagulase-negative staphylococci, gram-negative rods (including *Pseudomonas* spp), corynebacteria, and yeasts.<sup>13</sup>

Long fingernails pose a risk of developing tears in gloves and also the possibility of injuring a patient during positioning and caring for the patient. There is also the concern that hand washing, hand rub, and surgical hand scrubbing may not be performed as well due to the health care personnel protecting their fingernails.<sup>14</sup>

Short fingernails collect less debris, and debris is more easily removed when fingernails are short. Short fingernails have a decreased risk of being colonized with *Pseudomonas aeruginosa* compared to health care personnel with long or artificial fingernails. Long fingernails make washing and drying hands difficult and may result in hand colonization.<sup>10</sup>

- I.b. Chipped fingernail polish should be removed prior to entry into the restricted area of the perioperative environment.

Fingernail polish that is chipped may harbor pathogens in large numbers.<sup>5,9,13</sup> It has been shown that fingernail polish becomes chipped by the fourth day of wear.<sup>13</sup> Chipped fingernail polish should be removed to prevent possible contamination of the environment or the patient.<sup>5,9</sup> Glove tears occasionally occur during a surgical procedure; chipped fingernail polish could be deposited on the sterile field or in the wound.

- I.c. Artificial fingernails should not be worn by health care personnel in the perioperative environment.

Any fingernail enhancement or resin bonding product is considered artificial. Fingernail extensions or tips, gels and acrylic overlays, resin wraps, or acrylic fingernails constitute types of artificial fingernails.<sup>15</sup> Over time, gel or acrylic fingernails can become chipped and lift from the nail plate if moisture gets under the overlay. Adding artificial fingernails to an area of fingernails that is colonized may increase the microorganisms on the native fingernails.<sup>14</sup> The greater the length of time artificial fingernails are worn, the greater the number of microorganisms isolated.<sup>14</sup> Health care personnel who wear artificial fingernails may also limit hand hygiene and surgical hand scrub practices as a result of a need to protect their manicure.<sup>14,16</sup>

Patients at risk of infection may be at increased risk of exposure to pathogens that have been known to be colonized on artificial fingernails of health care personnel.<sup>14,16</sup> Studies have shown the correlation of microorganisms from health care personnel's hands to patients that result in surgical site infections. One such study showed three patients who developed a surgical site infection with *Candida albicans*; the strains isolated were identical. It was found that the surgical technician who scrubbed on all three cases had long artificial fingernails at the time of the patients' surgery. A throat culture of the surgical technician later grew *C. albicans*.<sup>4,17</sup>

- I.d. Rings should not be worn by health care personnel in the perioperative setting.

Studies have shown that wearing rings may result in colonization of the hands with pathogens such as gram-negative and gram-positive pathogens.<sup>4,5,18,19</sup>

With an increased number of rings worn, the number of pathogens recovered also may increase.<sup>5</sup> In one study, isolates recovered from swabbing the area adjacent to the ring included coagulase-negative staphylococci, other skin flora, gram-negative cocci, *Pseudomonas* spp and *Staphylococcus aureus*.<sup>20</sup>

There is a strong link between wearing rings and contamination of hands by health care personnel; removing rings will decrease the potential for pathogens remaining on hands before and after hand hygiene.<sup>21</sup>

- I.e. Watches and bracelets should be removed prior to washing hands.<sup>4,18,19,22</sup>

One study found that persons wearing watches or bracelets wash the wrist area less. Removing watches

and bracelets allows for thorough hand hygiene.<sup>19,22</sup>

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I.f. Health care organization-approved hand lotions should be readily available and used frequently to maintain good hand skin condition following surgical hand hygiene.

Skin irritation and dermatitis from frequent hand washing can increase the risk of infection for both the health care worker and the patient.<sup>23</sup> Failure to follow practices that maintain intact skin may create breaks in intact epithelium, which compromises the barrier properties of the skin and presents the opportunity for microbial transmission into the tissues.<sup>24</sup>

I.f.1. Lotions selected for use in the perioperative setting should be evaluated and approved by an interdisciplinary group that has the designated authority to evaluate and select hand lotions.

I.f.2. Hand lotions used in the perioperative setting should

- be compatible with antiseptics and barrier products in use,
- list water as the first ingredient on the label,<sup>25</sup>
- contain no anionic-based materials or chemicals, and
- contain no petroleum or other ingredients with a demonstrated detrimental effect on the barrier properties of gloves in use.

Many lotions found in over-the-counter products contain an anionic-based ingredient that interferes with the residual effect of chlorhexidene gluconate and chloroxylenol. Chlorhexidene gluconate and chloroxylenol are in many hand antiseptic products used in health care organizations for their antiseptic properties.<sup>4,25</sup> Petroleum may affect the barrier properties of latex gloves that may be worn by health care personnel.<sup>26</sup> A study on latex glove compatibility has shown petroleum to have adverse effects on the integrity of latex gloves.<sup>27</sup> Some gloves have been demonstrated to be compatible with some lotions.

I.g. Health care personnel with cuts, abrasions, weeping dermatitis, or fresh tattoos on exposed skin should not provide direct patient care. Health care personnel should not have patient contact until these conditions are healed and they have been cleared by an infection preventionist, employee health nurse, occupational health nurse, or other health care personnel with specialized knowledge in making a determination regarding the safety of the employee returning to work in the perioperative setting.<sup>26</sup>

Health care personnel with breaks in their skin integrity may be at risk for acquiring or transmitting infection to patients.

## Recommendation II

**A standardized procedure for hand washing should be followed.**

The purpose of hand washing is to

- ◆ remove soil, organic material, and transient microorganisms from fingernails, hands, and forearms;
- ◆ decrease the resident microorganism count to a minimum; and
- ◆ inhibit the rapid rebound of microorganisms.<sup>4</sup>

Application technique, length of exposure to the product, and correct concentration of the product impact the effectiveness of hand washing.<sup>28</sup> Inconsistent compliance with recommended procedures may result in the transmission of pathogens to patients.

II.a. A hand wash should be performed

- upon arrival at the health care facility,

- before and after every patient contact,
- before putting gloves on and after removing gloves or other personal protective equipment,
- any time there is a possibility that there has been contact with blood or other potentially infectious materials or surfaces,
- before and after eating,
- before and after using the restroom,
- before leaving the health care facility, and
- when hands are visibly soiled.<sup>4,29</sup>

Hand washing remains one of the most important measures in maintaining patient and health care personnel safety. Following these hand washing practices will prevent transmission of infection and reduce health

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care-associated infections for the patient and health care personnel.<sup>29</sup> Contamination of hands may occur

- as a result of holes or tears in gloves that are not visible,
- when gloves are removed, and
- when continuing to wear gloves following the care of a patient, which may lead to transmission of microorganisms from patient to patient.

Wearing gloves will not replace hand hygiene.<sup>30</sup> One study found a 15% rate of colonization from MRSA-positive patients to health care personnel's hands after removal of gloves. Another study found a 17% rate of colonization from MRSA-colonized patients to gloves of health care personnel.<sup>31,32</sup>

**II.a.1. Hands should be washed with soap and water for at least 15 seconds.**

Hand washing for 15 seconds has been shown to reduce soil, spores, and microorganism counts on the hands.<sup>4,23,29,33-35</sup>

**II.a.2. Hand washing with soap and water should be performed in the following order:**

- (1) Remove jewelry from hands and forearms.
- (2) Adjust water to a comfortable temperature.
- (3) Wet hands thoroughly with water.
- (4) Follow manufacturer's directions for application of soap.
- (5) Rub hands covering all surfaces, including the backs of hands, fingertips, inner webs, and palms.
- (6) Wash for at least 15 seconds.
- (7) Rinse well to remove all soap.
- (8) Dry hands thoroughly with an absorbent, non-abrasive, disposable towel.<sup>29</sup>
- (9) Use a disposable towel to turn the water off and open the door if hands-free controls are not available.<sup>4</sup>

Drying hands thoroughly assists in removing soil, stratum corneum, and microorganisms that have been loosened during the process of hand washing. Touching faucet handles provides an opportunity for cross contamination.<sup>36</sup> Moisture remaining on the hands can create a transfer of microorganisms remaining on the hands to surfaces in the environment.<sup>36</sup>

**II.b. Hand-washing stations should be placed in convenient locations according to local and state building codes.**

Hand-washing stations located close to patient care areas, medication preparation areas, and food storage and dispensing areas encourage health care personnel to wash their hands. Convenient hand-washing stations result in a higher frequency of hand washing.<sup>37</sup>

**II.b.1. Water temperature at the faucet should be controlled between 105° to 120° F (40° to 49° C).<sup>37</sup>**

Dermatitis can be prevented by using tap water that is adjusted to a comfortable temperature.

**II.b.2. Hand-washing stations in new or remodeled facilities should have hands-free water and soap dispensing controls.<sup>37</sup>**

Hands-free water and soap dispensing controls reduce the risk of cross-contamination.<sup>36</sup>

**II.b.3. Paper towel dispensers should be designed to prevent recontamination when removing towels.**

The towel dispenser should dispense cleanly without the need to touch the towel dispenser.<sup>38</sup>

Paper towel dispenser design is important as the process of drying hands is the final step in the hand washing, and ease of use is important in preventing recontamination of hands.<sup>38</sup> Towels that jam when the towel dispenser does not work properly can result in hands becoming contaminated by touching

the dispenser.<sup>38</sup>

II.c. Hand washing may be performed using an alcohol-based antiseptic hand rub when soil is not present on hands.<sup>4</sup> The hand rub manufacturer's written directions for the amount of product and technique for application should be followed.<sup>29</sup>

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Alcohol-based hand rubs are easy to use, fast-acting, and provide activity against most bacteria, most viruses, and fungi.<sup>39</sup>

II.c.1. Care should be taken in the placement of alcohol-based hand antiseptic product dispensers in areas where surgical and other invasive procedures are performed and where oxygen and ignition sources are present.<sup>40</sup> Dispensers should be installed following the 2004 National Fire Protection Association (NFPA) *Life Safety Code* as well as state and local regulations. Alcohol-based hand hygiene product dispensers should

- be at least four feet apart;
- only hold 1.2 L in rooms, corridors, and areas open to corridors; and
- not be placed over an electrical outlet or switch.<sup>29</sup>

Hand antiseptic product dispensers containing flammable antiseptics may be a fire hazard. Following the NFPA *Life Safety Code* will decrease the risk of fire.<sup>29,41</sup>

II.c.2. Hand rubs should be performed in the following manner:

- (1) Follow the manufacturer's written directions for use of product.
- (2) Use the recommended amount of hand rub product.
- (3) Rub hands covering all surfaces including the backs of hands, fingertips, inner webs, and palms.
- (4) Rub hands until they are dry.

A sufficient amount of product is required to ensure antimicrobial effect.

### Recommendation III

**A surgical hand scrub should be performed by health care personnel before donning sterile gloves for surgical or other invasive procedures. Use of either a US Food and Drug Administration (FDA)-approved antimicrobial surgical scrub agent intended for surgical hand antisepsis or an FDA-approved alcohol-based antiseptic surgical hand rub with documented persistent and cumulative activity that has been approved for surgical hand antisepsis is acceptable.**

The objective of a surgical hand scrub is the reduction of transient and resident flora, which also may reduce health care-associated infections.<sup>4,28</sup> Although the skin can never be rendered sterile, it can be made surgically clean by reducing the number of microorganisms. A surgical hand scrub will decrease transient and resident microorganisms on the hands and maintain the bacterial level below baseline.<sup>42</sup>

The mechanical action associated with hand scrubbing removes debris and microorganisms. This can be accomplished by rubbing the skin with or without a sponge to produce friction. With the addition of a health care organization-approved antiseptic soap, which acts as a surfactant, transient and some resident microorganisms can be lifted and flushed away under running water. Surgical hand antisepsis/hand scrubs are effective only if all surfaces are exposed to the mechanical cleaning and chemical antisepsis processes.

III.a. A multiuser scrub sink should be located near the entrance to the operating room. A multiuser scrub sink may serve two operating rooms to provide ready access to the adjacent operating rooms.<sup>37</sup>

III.b. A standardized surgical hand scrub using an FDA-approved alcohol-based surgical hand rub product with demonstrated persistence and cumulative activity should be performed according to the manufacturer's written directions for use. An alcohol and chlorhexidene product that is fast-drying and has residual effect is preferred.<sup>4</sup>

III.b.1. A standardized surgical hand scrub procedure using an alcohol-based surgical hand rub product

should include, but may not be limited to, the following:

- (1) Remove jewelry including rings, watches, and bracelets.
- (2) Don a surgical mask. If others are at the scrub sink, a surgical mask should be worn in the presence of hand scrub activity.
- (3) If visibly soiled, prewash hands and forearms with plain soap and water or antimicrobial agent.
- (4) Clean the subungual areas of both hands under running water using a disposable nail cleaner.

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- (5) Rinse hands and forearms under running water.
- (6) Dry hands and forearms thoroughly with a disposable paper towel.
- (7) Dispense the manufacturer-recommended amount of the surgical hand rub product.
- (8) Apply the product to the hands and forearms according to the manufacturer's written instructions.
- (9) Repeat the product application process as directed.
- (10) Rub thoroughly until completely dry.<sup>19,29</sup>
- (11) In the OR or other invasive procedure room, don a sterile surgical gown and gloves.

III.c. A traditional, standardized surgical hand scrub procedure should include, but may not be limited to, the following:

- (1) Remove jewelry including rings, watches, and bracelets.
- (2) Don a surgical mask. If others are at the scrub sink, a surgical mask should be worn in the presence of hand scrub activity.
- (3) If visibly soiled, wash hands and forearms with soap and running water immediately before beginning the surgical scrub.
- (4) Clean the subungual areas of both hands under running water using a disposable nail cleaner.
- (5) Rinse hands and forearms under running water.
- (6) Dispense the approved antimicrobial scrub agent according to the manufacturer's written directions.
- (7) Apply the antimicrobial agent to wet hands and forearms using a soft, nonabrasive sponge.
- (8) A three or five minute scrub should be timed to allow adequate product contact with skin, according to the manufacturer's written directions.
- (9) Visualize each finger, hand, and arm as having four sides. Wash all four sides effectively, keeping the hand elevated. Repeat this process for opposite fingers, hand, and arm.
- (10) For water conservation, turn water off when it is not directly in use, if possible.
- (11) Avoid splashing surgical attire.
- (12) Discard sponges, if used, in appropriate containers.
- (13) Hands and arms should be rinsed under running water in one direction from fingertips to elbows as often as needed.
- (14) Hold hands higher than elbows and away from surgical attire.
- (15) In the OR, dry hands and arms with a sterile towel before donning a sterile surgical gown and gloves.<sup>5</sup>

The use of a brush for surgical hand scrubs is not necessary for adequate reduction of bacterial counts. Scrubbing with a brush is associated with an increase in skin cell shedding. The skin on hands can become damaged with the use of brushes resulting in an increase in bacterial load. Use of a sponge or soft brush rather than a hard bristle brush will reduce damage to the epidermis.<sup>19,43,44</sup>

A study of the duration of surgical hand scrubs using ranges from three to five minutes showed that three-minute surgical hand scrubs are as effective as five-minute surgical hand scrubs.<sup>44</sup> Appropriate disposal of sponges, if used, prevents cross contamination of the surgical scrub sink area. Hands and forearms should be held higher than the elbows and away from surgical attire to prevent contamination and allow water to run from the clean to the less clean area down the arm. A sterile gown cannot be put on over wet or damp surgical attire without resultant potential contamination of the gown by strike-through moisture.

## Recommendation IV

**Surgical hand hygiene products should be selected following an analysis of product effectiveness,**

**application requirements, and user acceptance.**

Acceptability of products is a key factor in health care personnel compliance with good hand hygiene practices.<sup>23</sup>

**IV.a.** Surgical hand hygiene products and hand lotions should be approved by the organization's infection prevention and control committee or designated authority with specialized knowledge in hand products.

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The organization's infection prevention and control committee is made up of a multi-disciplinary team that includes the infection preventionist, epidemiologist, administrative staff, perioperative member, pharmacists, as well as other department representatives. This allows for a collaborative discussion on what products would be appropriate.<sup>4</sup> A health care facility that does not have an infection control committee should utilize guidance from health care personnel with specialized knowledge in infection prevention and control.

IV.a.1. Written criteria should be used to evaluate surgical hand hygiene products and their application. Criteria should include, but are not limited to,

- safety,
- purpose and use,
- ease of use,
- skin comfort and reaction,
- fragrance,
- consistency,
- color,
- compatibility with other products,
- patient and health care personnel outcomes,
- efficacy,
- regulatory control, and
- cost.<sup>23,45,46</sup>

IV.a.2. Health care personnel's selection of products should be made with the guidance of an infection preventionist or other health care personnel with specialized knowledge in infection prevention and control.

IV.a.3. End-user evaluations should be completed to determine acceptability prior to final selection of products. Some of the key concerns that can influence health care personnel regarding hand hygiene products include fragrance, consistency, and color.<sup>46,47</sup>

IV.a.4. Following the end-user evaluation of the products tested, written evaluations should be completed by the health care personnel and collected and reviewed by authorized personnel.<sup>48</sup>

Written questionnaires or evaluations give valuable validation on product acceptability. Written evaluations should be completed to verify acceptability.

IV.b. FDA-approved surgical hand hygiene products should be selected and used according to manufacturers' written instructions.<sup>47</sup>

IV.b.1. Antimicrobial surgical hand hygiene products should

- significantly reduce microorganisms on intact skin,
- contain emollients and humectants to prevent skin irritation,<sup>23</sup>
- be broad spectrum,
- be fast-acting, and
- have a persistent and cumulative effect.<sup>47</sup> (See Table 1.)

## **Recommendation V**

**Health care personnel should receive education, training, and competency validation on surgical**

**hand hygiene products and procedures.**

Competency assessment verifies that health care personnel have an understanding of the application and purpose for surgical hand hygiene in infection prevention and control. This knowledge is essential in reducing the risk of health care-associated infections. Health care personnel also understand the potential risk of their becoming colonized or infected by microorganisms from the patient and are better able to protect themselves and the patient.

V.a. Health care personnel should receive education and guidance on hand hygiene products and their application.

Health care personnel should be knowledgeable about surgical hand hygiene products and their application. This includes the indications, contraindications, and special precautions used when handling flammable antiseptic products.<sup>40,49</sup>

V.a.1. Health care personnel should receive education and guidance on the identification and reporting of symptoms of irritant contact dermatitis and allergic contact dermatitis.

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Table 1 ACTIVITY AND CONSIDERATIONS FOR HAND HYGIENE AGENTS

Antiseptic Agent	Mechanism of Action	Gram + bacteria	Gram - bacteria	Viruses	Rapidity of Action	Persistent/residual activity	Contraindications
Soap and water	Cleansing activity is due to detergent property of soap and water as a solvent. <sup>5</sup>	Minimal <sup>4</sup>	Minimal <sup>4</sup>	N/A	Limited	None <sup>1</sup>	N/A
Alcohol	Denatures proteins. <sup>1</sup>	Excellent <sup>1</sup>	Excellent <sup>1</sup>	Good <sup>1</sup>	Excellent; optimal concentration 60% to 80% <sup>2</sup>	None <sup>1</sup>	N/A
Chlorhexidine	Disrupts cell membrane. <sup>1</sup>	Excellent <sup>1</sup>	Good <sup>1</sup>	Good against enveloped viruses, less active against nonenveloped viruses <sup>1</sup>	Slower than alcohol <sup>1</sup>	Excellent <sup>1</sup>	Keep out of inner ears <sup>1</sup>
Chlorhexidine gluconate with alcohol	Disrupts cell membrane and denatures proteins. <sup>1,3</sup>	Excellent	Excellent	Good	Excellent	Excellent <sup>1</sup>	Keep out of inner ears <sup>1</sup>

Chloroxylenol	Inactivates bacterial enzymes, disrupts cell. <sup>1</sup>	Excellent <sup>1</sup>	Fair <sup>1</sup>	Fair <sup>1</sup>	Not as rapidly active as chlorhexidine or iodophors; <sup>1</sup> intermediate <sup>4</sup>	Good <sup>1</sup>	N/A
Iodine and Iodophors	Disrupts cell membrane. <sup>1</sup>	Excellent <sup>1</sup>	Excellent <sup>1</sup>	Good <sup>1</sup>	Intermediate <sup>1</sup>	Intermediate <sup>1</sup>	Sensitivity povidone i
Quaternary ammonium compounds	Believed to work by absorbing the cytoplasmic membrane, which creates leakage of the low molecular weight cytoplasmic components. <sup>2</sup>	Fair <sup>1,2</sup>	Good <sup>1,2</sup>	Fair <sup>1</sup>	Slow <sup>1</sup>	None	Incompatil anionic de
Triclosan	Affects the cytoplasmic membrane and synthesis of RNA, fatty acids, and proteins when it enters bacterial cells. <sup>1</sup>	Good <sup>1</sup>	Fair	Fair	Slow	Good <sup>1</sup>	N/A

**REFERENCES**

- Centers for Disease Control and Prevention. Guideline for hand hygiene in health-care settings. *MMWR* October 25, 2001.
- WHO Guidelines on Hand Hygiene in Health Care (Advanced Draft)*. World Health Organization. [http://www.who.int/patientsafety/information\\_centre/ghhad\\_download\\_link/en](http://www.who.int/patientsafety/information_centre/ghhad_download_link/en). Accessed February 26, 2009.
- Boyce JM, Kelliher S, Vallande N. Skin irritation and dryness associated with two hand-hygiene regimens: soap-and-water with an alcoholic hand gel. *Infect Control Hosp Epidemiol* 2000;21(7):442.
- Larson E. Guideline for use of topical antimicrobial agents. *Am J Infect Control* 1988;16(6):253.
- Sicherer SH. Risk of severe allergic reactions from the use of potassium iodide for radiation emergencies. *J Allergy Clin Immunol* 1999;103(2):133-139.
- Mayhall CG. Hospital epidemiology and infection control. In: Rotter ML, ed. *Hand Washing and Hand Disinfection*. 2nd ed. Wilkins; 1999:1339.

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Skin irritation conditions may be difficult to differentiate. Skin health is related to its lipid barrier, and the lipid barrier can be compromised by lipidemulsifying detergents and lipiddissolving alcohols.<sup>50,51</sup> Education to prevent skin irritation has proven to be effective. Research has shown that by providing educational theory, didactics, and evaluation of surgical hand hygiene practices, improvement in surgical hand hygiene compliance may be achieved.<sup>52</sup>

V.a.2. Health care personnel should participate in surgical hand hygiene product evaluation.

Participation in product evaluations assures health care personnel that they have input into choice of products. A higher level of compliance may be achieved in this manner.

V.b. Health care personnel should demonstrate proficiency in surgical hand hygiene practices and the use of surgical hand hygiene products periodically and when new products are

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introduced. Periodic performance monitoring also should take place.

Proficiency in surgical hand hygiene practices allows health care personnel to prevent the transmission of pathogens.

V.c. Fire safety education and training should be provided to all health care personnel working in the perioperative area where alcohol and alcohol-based hand hygiene products are used. Fire safety education should include periodic fire drills.

Alcohol and alcohol/combination hand products pose a fire safety concern.

V.c.1. All members of the perioperative surgical team should participate in fire drills.<sup>40</sup>

Fire drills assist the surgical team in promoting a culture of fire safety.<sup>4,40</sup> Conducting and participation in fire drills promotes and maintains a fire-safe environment.<sup>40</sup>

## Recommendation VI

**Policies and procedures for surgical hand hygiene should be written, reviewed annually, and readily available within the practice setting.**

Policies and procedures serve as a source of information for preventing health care-associated infections by delineating products to be used as well as the correct technique. Policies and procedures establish authority, responsibility, and accountability and serve as operational guidelines. Policies and procedures establish guidelines for performance improvement activities to be used when monitoring and evaluating surgical hand hygiene in the perioperative setting.

VI.a. Policies regarding hand hygiene should be developed in collaboration with the surgical team as well as the infection preventionist and employee health nurse.

A collaborative approach to policy development and the provision of access to policies for all health care personnel will result in a better team approach to appropriate hand hygiene. The health care organization's infection prevention and control committee should be made up of a multidisciplinary team that may include the infection preventionist, epidemiologist, perioperative registered nurse, pharmacist, administrative staff, as well as nursing and other department representatives. This allows informed discussion on what products would be appropriate.<sup>5</sup> Smaller facilities with no infection prevention and control committee may utilize individuals with specialized knowledge in infection prevention and control.<sup>23</sup>

VI.a.1. Hand hygiene policies should include but are not limited to

- standardized procedures for surgical hand scrub;
- removal of jewelry for hand rubs and surgical hand antisepsis;
- health care personnel education in the use of hand scrub products;
- health care organization-approved and FDA-approved hand antiseptic products;
- identification and reporting of irritant and allergic contact dermatitis;
- maintenance and location of material safety data sheets (MSDS);
- precautions when flammable antiseptics are used;
- proper storage of flammable hand antiseptic agents;
- reporting of adverse events; and
- performance monitoring.

VI.b. Policies and procedures should be introduced and reviewed in the initial orientation, when new products are introduced, and with ongoing education for health care personnel.

Access to policies and procedures allows health care personnel to have ongoing information. Review of policies and procedures assists health care professionals in the development of knowledge.

### **Recommendation VII**

**A quality management program should be in place to evaluate surgical hand hygiene procedures and to identify and respond to opportunities for improvement.**

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Quality control programs that enhance personal performance and monitor surgical hand hygiene practices are established to promote patient and health care personnel safety. It is the responsibility of professional perioperative registered nurses to ensure safe, high-quality nursing care to patients undergoing operative and invasive procedures.<sup>45</sup>

VII.a. Adverse events (eg, fire, bacterial contamination of multiuse containers) related to the use of hand products should be reported to the health care organization's quality review program.

Open communication is important in determining why adverse events occur. The use of a root cause analysis will facilitate the identification of the cause of the event and assist in determining steps to be taken to prevent future adverse events.

VII.b. Symptoms of irritant or allergic contact dermatitis should be identified and treated as soon as health care personnel report a concern.

Skin dryness, irritation, itching, cracking, and bleeding may be diagnosed as irritant contact dermatitis.<sup>23</sup> These symptoms should be identified and treated quickly to prevent further damage to health care personnel's hands. Allergic contact dermatitis results from an allergic reaction to ingredients in antiseptic products. Allergic contact dermatitis may be mild, localized, or severe, resulting in respiratory distress or possible anaphylaxis.<sup>23</sup> These symptoms should be determined quickly to prevent continued damage to health care personnel's hands and mitigation of anaphylaxis reactions. A change in hand hygiene product can prevent further allergic reactions.

VII.b.1. Cuts, abrasions, weeping dermatitis, or fresh tattoos should be documented in the employee's health record by the infection preventionist, employee health nurse, occupational health nurse, or other health care personnel with specialized knowledge in making a determination regarding the employee's returning to work in the perioperative setting.

VII.c. Barriers that may exist for surgical hand hygiene should be recognized and addressed.

Health care personnel hand washing practice studies note inadequate hand washing compliance.<sup>53</sup> However, another study notes that failure of health care personnel to wash their hands is not due to intentional negligence.<sup>54</sup> Removing barriers to hand hygiene will help improve adherence by health care personnel with these procedures. Some of the identified barriers are hand hygiene products causing irritation, sinks not conveniently located, lack of supplies, understaffing, and patient needs that take priority.<sup>1,55</sup>

VII.c.1. A study of usage patterns of surgical hand hygiene products should be done on an ongoing basis.

VII.c.2. FDA-approved antiseptic products for surgical hand hygiene that minimize skin irritation should be used.

Health care personnel compliance with the recommended use of antiseptic products is improved when the product does not irritate the skin.

VII.c.3. Staffing levels of health care personnel should be evaluated as a barrier to hand washing.

Staffing levels that are inadequate may result in cross contamination when health care personnel have an increased workload. A decrease in hand washing may result. Having the right level of health care personnel available enables personnel to be compliant with hand hygiene.<sup>56</sup>

VII.d. Hand hygiene practices should be measured to determine compliance.

Following hand hygiene policies and procedures is an important step in infection prevention and control in protecting health care personnel and patients. Measurement involves adhering to and following the manufacturer's written product directions. Studies have been conducted but may need to be expanded.<sup>56</sup>

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VII.d.1. Measures to evaluate surgical hand hygiene practices may include, but are not limited to,

- direct observation (considered the most effective measurement);
- measuring the amount of product used;
- monitoring by using technology plus scanning;
- electronically monitoring entrances and exits to rooms with the use of video surveillance;<sup>57</sup>
- electronically monitoring hand washing and surgical hand scrub dispensers;<sup>57</sup> and
- automated hand washing stations that read ID badges, record the length of time the process takes, and where the hand washing is performed.

Observational surveillance of surgical hand hygiene practices provides direct information on compliance by health care personnel.<sup>4</sup> Direct observation also can determine the areas of strengths and weaknesses in hand hygiene practices and allows for improvement in the process.<sup>1</sup>

A disadvantage of this method is that direct observation of hand hygiene can be labor-intensive and expensive. In addition, one study showed there was little clinical improvement because the direct observer viewed only 0.4% of the hand washing and hand scrubbing that was done.<sup>58</sup> The Hawthorne effect may result in health care personnel improving how they do hand hygiene while being observed.<sup>58</sup> Over time, however, health care personnel forget why the observer is there. The observation process, if kept simple, can monitor one type of hand hygiene at a time (eg, surgical hand scrub).<sup>5</sup>

Measuring the amount of hand hygiene product used requires less time and fewer productive hours to monitor but may not take into account patient case mix.<sup>5</sup> Studies have shown that this method may not be as effective as direct observation and may not change hand hygiene practices.<sup>5</sup> Therefore, this may not be a reliable method of monitoring hand hygiene or hand antisepsis.

Electronic monitoring can be an efficient and effective method of tracking hand hygiene compliance.<sup>57</sup> The advantages of video surveillance is that the camera is less obvious and may prevent the Hawthorne effect. Review of the recordings can be labor-intensive,<sup>57</sup> however, and electronic monitoring measures may not capture all of the possible times that hand hygiene should be performed. Automated hand washing stations that read badges and record the length of time the process takes and where hand washing is performed is a technology utilized in the food industry to measure hand hygiene practice compliance. This technology provides the ability to record and produce reports that can be evaluated for hand hygiene compliance. This method is beginning to be adopted in the health care arena. It is more expensive than other methods but may become another useful tool for monitoring hand hygiene practices within health care organizations.<sup>59</sup>

VII.e. The health care organization's financial plan should include sufficient funds for hand hygiene products, performance monitoring, and feedback, as well as periodic training on surgical hand hygiene and the use of surgical hand hygiene products.<sup>5</sup>

Health care personnel involvement in product selection and acceptance of the product can result in better hand hygiene and savings.<sup>5</sup> Motivating health care personnel to change and practice good hand hygiene will have no value if there are no resources to make these changes.<sup>60</sup>

## REFERENCES

1. Haas JP, Larson EL. Compliance with hand hygiene guidelines: where are we in 2008? *Am J Nurs* 2008; 108(8):40.

2. Kampf G. The six golden rules to improve compliance in hand hygiene. *J Hosp Infect* 2004;56 Suppl 2S3.
3. Pittet D, Stephan F, Hugonnet S, Akakpo C, Souweine B, Clergue F. Hand-cleansing during postanesthesia care. *Anesthesiology* 2003;99(3):530.

---

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This material is copyrighted. Violation of copyright law will be prosecuted.

4. Centers for Disease Control and Prevention. Guideline for hand hygiene in health-care settings. *MMWR* October 25, 2002;51(RR-16):1.
5. *WHO Guidelines on Hand Hygiene in Health Care* (Advanced Draft). World Health Organization. [http://www.who.int/patientsafety/information\\_centre/ghhad\\_download\\_link/en](http://www.who.int/patientsafety/information_centre/ghhad_download_link/en). Accessed February 26, 2009.
6. Friedman C, Petersen KH. *Infection Control in Ambulatory Care*. Boston: Jones and Bartlett Publishers; 2004.
7. *Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings 2007*. Centers for Disease Control and Prevention. [http://www.cdc.gov/ncidod/dhqp/gl\\_isolation.html](http://www.cdc.gov/ncidod/dhqp/gl_isolation.html). Accessed February 26, 2009.
8. Mermel LA, McKay M, Dempsey J, Parenteau S. *Pseudomonas* surgical-site infections linked to a healthcare worker with onychomycosis. *Infect Control Hosp Epidemiol* 2003;24(10):749.
9. Wynd CA, Samstag DE, Lapp AM. Bacterial carriage on the fingernails of OR nurses. *AORN J* 1994;60(5):796, 799.
10. Moolenaar RL, Crutcher JM, San Joaquin VH, Sewell LV, Hutwagner LC, Carson LA, Robison DA, Smithee LM, Jarvis WR. A prolonged outbreak of *Pseudomonas aeruginosa* in a neonatal intensive care unit: did staff fingernails play a role in disease transmission? 2000;21(2):80.
11. McGinley KJ, Larson EL, Leyden JJ. Composition and density of microflora in the subungual space of the hand. *J Clin Microbiol* 1988;26(5):950.
12. Hedderwick SA, McNeil SA, Lyons MJ, Kauffman CA. Pathogenic organisms associated with artificial fingernails worn by healthcare workers. *Infect Control Hosp Epidemiol* 2000;21(8):505.
13. Baumgardner CA, Maragos CS, Walz J, Larson E. Effects of nail polish on microbial growth of fingernails. Dispelling sacred cows. *AORN J* 1993;58(1):84.
14. Toles A. Artificial nails: are they putting patients at risk? A review of the research. *J Pediatr Oncol Nurs* 2002;19(5):164.
15. Porteous J. Artificial nails: very real risks. *Can Oper Room Nurs J* 2002;20(3):16.
16. McNeil SA, Foster CL, Hedderwick SA, Kauffman CA. Effect of hand cleansing with antimicrobial soap or alcohol-based gel on microbial colonization of artificial fingernails worn by health care workers. *Clin Infect Dis* 2001;32(3):367-372.
17. Parry MF, Grant B, Yukna M, Adler-Klein D, McLeod GX, Taddonio R, Rosenstein C. *Candida* osteomyelitis and diskitis after spinal surgery: an outbreak that implicates artificial nail use. *Clin Infect Dis* 2001;32(3):352-357.
18. Salisbury DM, Hutfilz P, Treen LM, Bollin GE, Gautam S. The effect of rings on microbial load of health care workers' hands. *Am J Infect Control* 1997;25(1):24.
19. Graves PB, Twomey CL. Surgical hand antisepsis: an evidence-based review. *Perioperative Nursing Clinics* 2006;1(3):235.
20. Kelsall NKR, Griggs RKL, Bowker KE, Bannister GC. Should finger rings be removed prior to scrubbing for theatre? *J Hosp Infect* 2006;62(4):450.
21. Trick WE, Vernon MO, Hayes RA, Nathan C, Rice TW, Peterson BJ, Segreti J, Welbel SF, Solomon SL, Weinstein RA. Impact of ring wearing on hand contamination and comparison of hand hygiene agents in a hospital. *Clin Infect Dis* 2003;36(11):1383-1390.
22. Field EA, McGowan P, Pearce PK, Martin MV. Rings and watches: should they be removed prior to operative dental procedures? *J Dent* 1996;24(1-2):65.
23. Larson E, Girard R, Pessoa-Silva CL, Boyce J, Donaldson L, Pittet D. Skin reactions related to hand hygiene and selection of hand hygiene products. *Am J Infect Control* 2006;34(10):627.
24. Dental services. In: *APIC Text of Infection Control and Epidemiology*, 2nd ed. Washington, DC: Association for Professionals in Infection Control and Epidemiology; 2005.
25. Marino C, Cohen M. Washington State hospital survey 2000: gloves, handwashing agents, and moisturizers. *Am J Infect Control* 2001;29(6):422.
26. Enforcement procedures for the occupational exposure to bloodborne pathogens, CPL 02-02-069. Occupational Safety & Health Administration. [http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=DIRECTIVES&p\\_id=2570](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=DIRECTIVES&p_id=2570). Accessed February 26, 2009.
27. Jones RD, Jampani H, Mulberry G, Rizer RL. Moisturizing alcohol hand gels for surgical hand preparation. *AORN J* 2000;71(3):584.
28. Widmer AE, Dangel M. Alcohol-based handrub: evaluation of technique and microbiological efficacy with

- international infection control professionals. *Infect Control Hosp Epidemiol* 2004;25(3):207.
29. Hand hygiene. In: *APIC Text of Infection Control and Epidemiology*, 2nd ed. Washington, DC: Association for Professionals in Infection Control and Epidemiology; 2005.
  30. Kim PW, Roghmann MC, Perencevich EN, Harris AD. Rates of hand disinfection associated with glove use, patient isolation, and changes between exposure to various body sites. *Am J Infect Control* 2003;31(2):97.
  31. Grundmann H, Hori S, Winter B, Tami A, Austin DJ. Risk factors for the transmission of methicillin-resistant *Staphylococcus aureus* in an adult intensive care unit: fitting a model to the data. *J Infect Dis* 2002; 185(4):481.
  32. McBryde ES, Bradley LC, Whitby M, McElwain DL. An investigation of contact transmission of methicillin-resistant *Staphylococcus aureus*. *J Hosp Infect* 2004; 58(2):104.
  33. Hubner NO, Kampf G, Kamp P, Kohlmann T, Kramer A. Does a preceding hand wash and drying time after surgical hand disinfection influence the efficacy of a propanol-based hand rub? *BMC Microbiol* 2006;657.
  34. Hubner NO, Kampf G, Loffler H, Kramer A. Effect of a 1 min hand wash on the bactericidal efficacy of consecutive surgical hand disinfection with standard alcohols and on skin hydration. *Int J Hyg Environ Health* 2006;209(3):285.
  35. Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR. *Guideline for Prevention of Surgical Site Infection, 1999*. Hospital Infection Control Practices Advisory Committee. 1999;20(4):250.

---

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This material is copyrighted. Violation of copyright law will be prosecuted.

36. Griffith CJ, Malik R, Cooper RA, Looker N, Michaels B. Environmental surface cleanliness and the potential for contamination during handwashing. *Am J Infect Control* 2003;31(2):93.
  37. AIA Academy of Architecture for Health, Facilities Guidelines Institute. *Guidelines for Design and Construction of Health Care Facilities*. Washington, DC: American Institute of Architects; 2006.
  38. Harrison WA, Griffith CJ, Ayers T, Michaels B. Bacterial transfer and cross-contamination potential associated with paper-towel dispensing. *Am J Infect Control* 2003;31(7):387.
  39. Hugonnet S, Pittet D. Hand hygiene—beliefs or science? *Clin Microbiol Infect* 2000;6(7):350.
  40. AORN guidance statement: Fire prevention in the operating room. In: Conner R, ed. *Perioperative Standards and Recommended Practices*. Denver, CO: AORN; 2009:195.
  41. National Fire Protection Association. *NFPA 99 standard for health care facilities*. Quincy, MA: National Fire Protection Association; 2005.
  42. Rotter ML, Kampf G, Suchomel M, Kundi M. Long-term effect of a 1.5 minute surgical hand rub with a propanol-based product on the resident hand flora. *J Hosp Infect* 2007;66(1):84.
  43. Gupta C, Czubytyj AM, Briski LE, Malani AK. Comparison of two alcohol-based surgical scrub solutions with an iodine-based scrub brush for presurgical antiseptic effectiveness in a community hospital. *J Hosp Infect* 2007;65(1):65.
  44. Hingst V, Juditzki I, Heeg P, Sonntag HG. Evaluation of the efficacy of surgical hand disinfection following a reduced application time of 3 instead of 5 min. *J Hosp Infect* 1992;20(2):79.
  45. Recommended practices for product selection in perioperative practice settings. In: Conner R, ed. *Perioperative Standards and Recommended Practices*. Denver, CO: AORN; 2009:387.
  46. Larson E, Leyden JJ, McGinley KJ, Grove GL, Talbot GH. Physiologic and microbiologic changes in skin related to frequent handwashing. *Infect Control* 1986;7(2):59.
  47. Department of Health and Human Services. Tentative final monograph for healthcare antiseptic drug products: proposed rules. *Fed Regist* 1994;59(116):31402.
  48. Ojajarvi J. The importance of soap selection for routine hand hygiene in hospital. *J Hyg (Lond)* 1981; 86(3):275.
  49. Recommended practices for a safe environment of care. In: Conner R, ed. *Perioperative Standards and Recommended Practices*. Denver, CO: AORN; 2009:415.
  50. Boyce JM, Kelliher S, Vallande N. Skin irritation and dryness associated with two hand-hygiene regimens: soap-and-water hand washing versus hand antisepsis with an alcoholic hand gel. *Infect Control Hosp Epidemiol* 2000;21(7):442.
  51. Kownatzki E. Hand hygiene and skin health. *J Hosp Infect* 2003;55(4):239.
  52. Schwanitz HJ, Riehl U, Schlesinger T, Bock M, Skudlik C, Wulfhorst B. Skin care management: educational aspects. *Int Arch Occup Environ Health* 2003;76(5):374.
  53. Pittet D. Improving compliance with hand hygiene in hospitals. *Infect Control Hosp Epidemiol* 2000; 21(6):381.
  54. Voss A, Widmer AF. No time for handwashing!? Handwashing versus alcoholic rub: can we afford 100% compliance? *Infect Control Hosp Epidemiol* 1997;18(3): 205.
  55. Pittet D. Compliance with hand disinfection and its impact on hospital-acquired infections. *J Hosp Infect* 2001;48 (Suppl A):S40.
  56. Kampf G. The first hand scrub: why it does not make much sense. *J Hosp Infect* 2007;65(1):83.
  57. Venkatesh AK, Lankford MG, Rooney DM, Blachford T, Watts CM, Noskin GA. Use of electronic alerts to enhance hand hygiene compliance and decrease transmission of vancomycin-resistant *Enterococcus* in a hematology unit. *Am J Infect Control* 2008;36(3):199.
  58. Van de Mortel T, Murgo M. An examination of covert observation and solution audit as tools to measure the success of hand hygiene interventions. *Am J Infect Control* 2006;34(3):95.
  59. Paulson DS. *Independent Laboratory Studies Summary: Automated Handwashing Stations*. Bozeman, MT: BioScience Laboratories, Inc; 2008.
  60. Bandura A. Health promotion by social cognitive means. *Health Education & Behavior* 2004;31(2):143.
- Originally published May 1976, *AORN Journal*, as “Recommended practices for surgical hand scrubs.”  
 Revised March 1978, July 1982, May 1984, October 1990. Published as proposed recommended practices August 1994.  
 Revised November 1998; published April 1999, *AORN Journal*. Reformatted July 2000.  
 Revised November 2003; published in *Standards, Recommended Practices, and Guidelines*, 2004

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