

Recommended Practices for Surgical Hand Antisepsis/Hand Scrubs

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 recommended practices for comment to members and others. These recommended practices are effective January 1, 2004.

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 numerous types of settings in which perioperative nurses practice. These recommended practices are intended as guidelines adaptable to various practice settings. These practice settings include traditional ORs, ambulatory surgery units, physicians' offices, cardiac catheterization suites, endoscopy suites, radiology departments, and all other areas where operative and other invasive procedures may be performed.

Purpose

Microorganism transfer from the hands of health care workers to patients is an important factor in health care-associated (ie, nosocomial) infections and has been recognized since the observations of Semmelweis and others more than 100 years ago.¹ Skin is a major potential source of microbial contamination in the surgical environment. Hand hygiene is a critical step in preventing infections and the spread of infections, is of critical importance for the entire health care team, and remains the most effective and least expensive measure to prevent the transmission of microorganisms and health care-associated infections. It is the single most important step in the prevention of infections.² The term *general hand hygiene* refers to decontamination of the hands by one of two methods—hand washing with either an antimicrobial or plain soap and water, or use of an antiseptic hand rub.³

The term *surgical hand antisepsis* refers to the antiseptic surgical scrub or antiseptic hand rub performed before donning sterile attire preoperatively. Although scrubbed members of the surgical team wear sterile gloves, the skin of their hands and forearms should be cleaned preoperatively to significantly reduce the number of microorganisms. The

moist environment underneath surgical gloves can promote microorganism proliferation on the hands of the wearer. Both surgical and examination gloves can fail during a procedure. Choice of surgical hand antiseptic/scrub agents should be limited to those that are US Food and Drug Administration (FDA) compliant, have a documented ability to kill organisms immediately upon application, provide antimicrobial persistence to reduce regrowth of microorganisms, and have a cumulative effect over time.³ The purpose of surgical hand antisepsis/hand scrubs is to

- ◆ remove debris and transient microorganisms from the nails, hands, and forearms;
- ◆ reduce the resident microbial count to a minimum; and
- ◆ inhibit rapid rebound growth of microorganisms.

Perioperative nursing vocabulary

The perioperative nursing vocabulary is a clinically relevant and empirically validated standardized language. This standardized language consists of the Perioperative Nursing Data Set and includes perioperative nursing diagnoses, interventions, and outcomes. The expected outcome of primary importance to this recommended practice is outcome 10 (O10), "The patient will be free of signs and symptoms of infection."⁴

Recommended Practice I

All personnel should practice general hand hygiene.

1. Hand hygiene immediately before and after patient contact remains the most cost-effective and simplest measure for health care workers to prevent cross contamination in the health care setting.⁵ General hand hygiene should be performed before and after patient contact, after removing gloves, any time there is a possibility that there has been contact with blood or other potentially infectious materials, before and after eating, and after using a restroom.³ Wearing gloves is not a substitute for hand hygiene.⁶ Hands are a major source of transient flora and, therefore, a major vector of cross contamination in health care. Health care workers should avoid contact with surfaces that are potentially contaminated, such as equipment and other inanimate objects in the patient care setting (see

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“Recommended practices for standard and transmission-based precautions”).⁷

2. Fingernails should be kept short, clean, and healthy. The subungual region harbors the majority of microorganisms found on hands. Removal of debris underneath fingernails requires the use of a disposable, single-use nail cleaner under running water. Additional effort may be necessary for longer nails. The risk of tearing gloves can increase if fingernails extend past the fingertips. Long fingernails may cause patient injury during the moving or positioning process.⁸⁻¹² Ideal nail length has been described as not extending beyond the fingertips.¹³ Polish, if used, should not be chipped. Studies have found no increase in microbial growth related to wearing freshly applied nail polish, but chipped nail polish may support the growth of larger numbers of organisms on fingernails.^{3,9,12} There is concern, however, that individuals who spend considerable time and money on maintaining their nails may be less inclined to perform a vigorous surgical scrub to protect their nails. If this occurs, there could be a detrimental effect of bacterial growth on the hands, not from the polish itself, but from a change in hygienic practices. Available data indicate that nail polish that has been obviously chipped or worn for more than four days harbors greater numbers of bacteria.^{9,12} This time frame may suggest a guide for changing polish so that nails remain well manicured. Individuals who choose to wear nail polish in the surgical setting should be guided by surgical conscience.^{8,9,12}
3. Artificial nails should not be worn.³ The variety and amount of potentially pathogenic bacteria cultured from the fingertips of personnel wearing artificial nails is greater than from the fingertips of personnel with natural nails, both before and after hand washing.¹³⁻¹⁶ Numerous state boards of cosmetology report that fungal growth occurs frequently under artificial nails as a result of moisture becoming trapped between the natural and artificial nail.^{8,17-19}
4. Cuticles, hands, and forearms should be free of open lesions and breaks in skin integrity. Open lesions and breaks in skin integrity increase the risk of patient and surgical team member infection. Cuts, abrasions, exudative lesions, and hangnails tend to ooze serum, which may contain pathogens. Broken skin permits microorganisms to enter the various layers of skin, providing deeper microbial breeding grounds.^{8,17,20}
5. Rings, watches, and bracelets should be removed before performing hand hygiene. During hand hygiene, rings, watches, and bracelets may harbor microorganisms or inhibit their removal. Allergic skin reactions (eg, irritation) have been observed as a result of hand soaps, antimicrobial agents, residual chemicals, or glove powder accumulating under jewelry.^{8,21,22} Removal of all jewelry from the hands and forearms permits full skin contact with the chosen surgical hand antimicrobial agent. The risk of infection from transient microorganisms increases exponentially in relation to the number of rings worn. A recent study found that there was no increase in reported microbial counts on the hands of personnel who removed rings before work.²³ Ring wearing has been associated with up to a 10-fold increase in median skin microorganism count (ie, bioload).²³
6. Lotions, if used, should be chosen based on infection control practices, approved by infection control professionals, and compatible with the hand antimicrobial agent and gloves used. Lotions should be packaged in nonrefillable containers that are discarded when empty.³ Skin moisturizing products can prevent drying, discomfort, and dermatitis and may help reduce bacterial shedding from the skin.^{24,25} The use of moisturizing products in health care facilities should be examined and incorporated in a formalized and standardized manner into policies, procedures, and practices.²⁶ Petroleum-based products may weaken latex gloves, causing increased permeability.²⁷ Anionic-based lotions (ie, many over-the-counter products) that commonly are available on the market and used in health care facilities can neutralize the cumulative antimicrobial activity of chlorhexidine gluconate and chloroxylenol, ingredients that are found in many antimicrobial hand antiseptic products.^{3,28} Always check with the manufacturer of the skin care product to verify that it is indeed compatible with the chosen hand antiseptic agent.

7. If hands are soiled visibly, wash them as soon as possible with plain or antimicrobial soap and water as follows.

- ◆ Wet hands with warm water.
- ◆ Apply soap to the hands according to the manufacturer's written instructions, if given.
- ◆ Rub hands together vigorously for at least 15 seconds, covering all surfaces of the hands and fingers. Pay particular attention to areas often overlooked (ie, the backs of the hands, fingertips, the thumb and inner web).²⁹
- ◆ Rinse hands with warm water and dry thoroughly with a disposable towel.
- ◆ Use towel to turn off the faucet.³

Alcohol-based hand rubs are not appropriate for use when hands are visibly dirty or contaminated with proteinaceous materials (eg, blood, saliva) because these hand rubs do not remove soil or debris.³

8. If hands are not soiled visibly, an alcohol-based hand rub may be used for routine decontamination of hands.³ Degerming with an alcohol-based hand rub is more effective than washing with soap and water and requires much shorter exposure time. Data indicate that the use of an alcohol-based agent may increase overall compliance with hand hygiene.³⁰⁻³² When relatively small amounts of proteinaceous material are present (ie, nonvisible soiling), alcohol may reduce viable bacterial counts on hands more rapidly than plain or antimicrobial soap.³ Follow manufacturers' written directions for product application.³ Alcohol-impregnated towelettes, if used in the facility, should have the Centers for Disease Control and Prevention's (CDC's) recommended volume and percentage of alcohol (ie, 60% to 95%). Lesser concentrations may be only comparable to soap and water.³

9. To improve adherence to general hand-hygiene recommendations among personnel working in busy patient care environments, an appropriate alcohol-based agent should be available in convenient locations (eg, wall, bedside). Individual, disposable, pocket-sized containers may be carried by health care providers.^{3,31-34} Specific regulations may limit placement of alcohol-based products because of fire hazard considerations. Consult applicable local, state, and federal regulations for specific direction.

Recommended Practice II

An FDA-compliant, surgical hand antiseptic agent (ie, surgical hand scrub/rub) approved by the facility's infection control personnel should be used for all surgical hand antisepsis/hand scrubs.

1. The surgical hand antiseptic agent should
 - ◆ significantly reduce microorganisms on intact skin;
 - ◆ contain a nonirritating, antimicrobial preparation;
 - ◆ be broad spectrum;
 - ◆ be fast acting; and
 - ◆ have a persistent effect.³⁵

An antimicrobial ingredient is intended to kill microorganisms. A characteristic of certain hand antiseptic agents that sets them apart from plain soap is their ability to bind with the stratum corneum of the skin, resulting in persistent chemical activity. Organisms can proliferate in the moist environment underneath gloves. Surgical gloves may become damaged during procedures, placing both the wearer and patient at risk. In appropriate concentrations (ie, 60% to 95%), alcohols provide the most rapid and greatest reduction in microbial counts on skin but have no persistent activity. Persistent antimicrobial activity, measured in hours, helps decrease rebound microbial growth after surgical hand antisepsis.³ Cumulative effect is a progressive decrease in the number of microorganisms over time, usually measured in days, after repeated applications of product. According to the CDC, alcohol-based preparations containing 0.5% to 1% chlorhexidine gluconate have persistent and cumulative activity that, in certain studies, has equaled or exceeded that of chlorhexidine gluconate-containing detergents.^{3,36-39}

2. Product selection for surgical hand antisepsis should follow AORN's recommended practices for product selection.⁴⁰ Infection control professionals, managers, and end users should be involved in the trial and selection of surgical hand antiseptic agents. Options should be included for individuals with product sensitivities. If an alcohol-based product is selected, the product should meet FDA requirements as outlined in the Tentative Final Monograph (TFM) for Health-Care Antiseptic Drug Products or be the

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subject of a new drug approval (NDA) process or an abbreviated new drug approval process (ANDA).³⁵ The FDA requires that products for surgical hand scrubs provide a one-log reduction on day one, a two-log reduction on day two, a three-log reduction on day five, and show persistent activity for at least six hours on each of the three test days.³⁵

3. Infection control professionals and committees should review the data provided by manufacturers to ensure that the surgical hand antiseptics agents chosen comply with current FDA testing and labeling criteria. Testing should be performed by an independent, FDA-approved testing laboratory employing standard methods as published by ASTM International.
4. Whenever possible, containers of surgical hand antiseptics agents should be placed in areas that facilitate ease of access and use by health care staff members while complying with local, state, and federal guidelines and/or regulations. New products continue to enter the market, and practitioners should consult manufacturers' scientific data when selecting products for use.
5. Surgical hand antiseptics agents should be stored in clean, closed containers. Single-use containers are recommended and should be discarded when empty. Reusable containers, if used, should be washed and dried thoroughly before refilling. Do not top off reusable containers. Refilling before cleaning or topping off dispensers with surgical hand antiseptic agents may cause contamination and could contribute to the spread of potentially harmful microorganisms.¹¹ Dispensers should function for long periods without becoming occluded or obstructed.⁴¹
6. Alcohol-based products are flammable and should be stored away from high temperatures, sparking devices, or flames. Reports about alcohol-based hand rubs in Europe, where alcohol-based rubs have been in clinical use for years, indicate few fires.⁴² There has been a recent report of one fire associated with an alcohol-based hand rub in the United States.⁴³ Containers should be designed to minimize spilling, leaking, and evaporation because alcohols are

extremely volatile. The National Fire Protection Agency does not specifically address alcohol-based sanitizers, and the judgment falls to the local authority having jurisdiction. Consideration must be given to location of use, mounting location (eg, near light switches, egress hallways, emergency exits), volume and size of individual dispensing units, bulk storage conditions and location, frequency of use, and the specific medical benefits of the chosen product. Further studies are underway to determine true flammability and improved safety in containers.^{33,44-46} The American Society of Healthcare Engineers states that it is permissible to install 1.2-L containers of alcohol-based hand rub in egress corridors.⁴⁷ Additional information may be found at <http://www.cdc.gov/handhygiene/firesafety/default.htm>. Check for individual state regulations.

Recommended Practice III

Surgical hand antiseptics/hand scrub should be performed before donning sterile gloves for surgical or other invasive procedures. Use of either an FDA-compliant, antimicrobial surgical scrub agent intended for surgical hand antiseptics or an FDA-compliant, alcohol-based antiseptic hand rub with documented persistent and cumulative activity that has been approved for surgical hand antiseptics is acceptable.³

1. Rings, watches, and bracelets should be removed before beginning the surgical hand antiseptics/scrub procedure (see recommended practice I, number 5).
2. Hands should be washed with plain or antimicrobial soap and running water immediately before beginning the surgical hand antiseptics/scrub (see recommended practice I, number 7).
3. Each surgical hand antiseptics/scrub procedure should follow a standardized protocol established and approved by the health care facility and the manufacturer's written directions for use, regardless of method. A standardized protocol should be adopted for each method used in the facility. Table 1 provides a summary of directives for general hand hygiene and surgical hand antiseptics.

Recommended Practice IV

Surgical hand antisepsis/hand scrub using an FDA-compliant, traditional antimicrobial scrub agent should include a standardized hand scrub procedure that follows the manufacturer's written directions for use and is approved by the health care facility.

1. A traditional, standardized, surgical hand antisepsis scrub procedure should include, but may not be limited to, the following.
 - ◆ Wash hands and forearms with soap and running water immediately before beginning the surgical scrub.
 - ◆ Clean the subungual areas of both hands under running water using a disposable nail cleaner.
 - ◆ Rinse hands and forearms under running water.
 - ◆ Dispense the approved antimicrobial scrub agent according to the manufacturer's written directions.
 - ◆ Apply the antimicrobial agent to wet hands and forearms. Some manufacturers may recommend using a soft, nonabrasive sponge.
 - ◆ Visualize each finger, hand, and arm as having four sides. Wash all four sides effectively. Repeat this process for opposite fingers, hand, and arm.
 - ◆ Repeat this process if directed to do so by the manufacturer's written directions for use.
 - ◆ Avoid splashing surgical attire.
 - ◆ For water conservation, turn water off when it is not directly in use, if possible.
 - ◆ Hold hands higher than elbows and away from surgical attire.
 - ◆ Discard sponges, if used, in appropriate containers.
 - ◆ In the OR, dry hands and arms with a sterile towel before donning a sterile surgical gown and gloves.

Although the skin never can be rendered sterile, it can be made surgically clean by reducing the number of microorganisms.¹⁷ A short, prescrub wash can loosen surface debris and transient microorganisms.⁸ Subungual areas that are cleaned improperly can harbor microorganisms.^{3,8,12} The mechanical action associated with hand scrubbing removes

Table 1

GENERAL HAND HYGIENE AND SURGICAL HAND ANTISEPSIS DIRECTIVES	
<i>TOPIC</i>	<i>ACTION</i>
General hand hygiene	
Visible soil	Wash hands with plain or antimicrobial soap and water.
No visible soil	Sanitize hands with an alcohol-based hand rub or wash with plain or antimicrobial soap and water.
Surgical hand antisepsis	
Visible soil/no visible soil	Wash hands with soap and water, then use either a US Food and Drug Administration (FDA) compliant, antimicrobial scrub agent or an FDA-compliant, alcohol-based antiseptic hand rub agent that is cleared for surgical hand antisepsis and provides persistent and cumulative activity.

microorganisms. This can be accomplished by rubbing the skin with or without a sponge to produce friction. With the addition of a facility-approved soap, which acts as a surfactant, transient and some resident microorganisms can be lifted and flushed away under running water.¹⁷ Surgical hand antisepsis/hand scrubs are effective only if all surfaces are exposed to the mechanical cleaning and chemical antisepsis processes.^{8,17} 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.^{8,17} Appropriate disposal of sponges, if used, prevents cross contamination of the surgical scrub sink area. A sterile gown cannot be put on over wet or damp surgical attire without resultant potential contamination of the gown by strike-through moisture.¹⁷

2. A traditional, standardized, anatomical, timed method or a counted stroke method may be used for surgical hand antisepsis/hand scrubs. The degree of microbial reduction necessary

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for effective prophylaxis of surgical wound infections has not been characterized fully. The advantages of a shorter scrub time include less skin trauma, greater water conservation, and actual OR time savings. European and Australian studies have evaluated scrub times between two and six minutes, concluding that with specific products, scrub times of three to four minutes are as effective as five-minute scrubs.^{3,20} Facilities are encouraged to follow scrub agent manufacturers' written directions for use when establishing policies and procedures for scrub times.^{3,20,48-52}

3. The use of a brush for surgical hand antisepsis/hand scrubs is not necessary for adequate reduction of bacterial counts.³ Skin damage from scrubbing with brushes can lead to an increased number of gram-negative bacteria and *Candida*.^{18,53} Scrubbing with a brush is associated with an increase in skin cell shedding.⁵³⁻⁵⁵
4. General hand hygiene should be performed immediately after surgical gloves are removed and before any further activities are undertaken.

Recommended Practice V

Surgical hand antisepsis/hand rub with an FDA-compliant, alcohol-based surgical hand rub product should follow a standardized application according to the manufacturer's written directions for use.³

1. Alcohol-based solutions reduce bacterial counts on hands more rapidly than do antimicrobial soaps or detergents in the majority of experimental in vivo and in vitro models.³ Alcohol hand-hygiene products alone kill more organisms than any product on the market but offer no appreciable persistence or cumulative effect. Use of a combination of active ingredients (eg, alcohol and chlorhexidine gluconate) to achieve both rapid reduction of microbial counts and the persistence and cumulative effect needed to prevent microbial regrowth is desirable. Randomized trials demonstrate better compliance with a surgical hand antisepsis protocol using an alcohol-based hand rub agent than with the traditional surgical scrub protocol.⁵⁶⁻⁵⁹

2. A standardized protocol for alcohol-based surgical hand rubs should follow manufacturers' written instructions and include, but may not be limited to, the following.
 - ◆ Wash hands and forearms with soap and running water immediately before beginning the surgical hand antisepsis procedure.
 - ◆ Clean the subungual areas of both hands under running water using a nail cleaner.
 - ◆ Rinse hands and forearms under running water.
 - ◆ Dry hands and forearms thoroughly with a paper towel.
 - ◆ Dispense the manufacturer-recommended amount of the surgical hand rub product.
 - ◆ Apply the product to the hands and forearms, following the manufacturer's written directions. Some manufacturers may require the use of water as part of the process.
 - ◆ Rub thoroughly until dry.
 - ◆ Repeat the product application process if indicated in the manufacturer's written directions.
 - ◆ In the OR, don a sterile surgical gown and gloves.
3. General hand hygiene should be performed immediately after surgical gloves are removed and before any further activities are undertaken.

Recommended Practice VI

Policies and procedures for surgical hand antisepsis should be developed, reviewed periodically, and readily available in the practice setting.

1. Policies and procedures for surgical hand antisepsis should include, but may not be limited to,
 - ◆ identifying facility-approved, FDA-compliant, surgical hand antisepsis agents;
 - ◆ defining the duration of surgical hand antisepsis procedures; and
 - ◆ establishing standardized protocols for each hand antisepsis method used.

To provide optimal effect, antimicrobial-containing products should be chosen from the FDA's product category defined as surgical hand antisepsis agents.³⁵ Contact times should follow manufacturers' written directions for optimum efficacy. Policies for general hand

hygiene and surgical hand antisepsis should be established in conjunction with infection control practitioners and meet the particular needs of the practice setting. AORN's "Recommended practices for surgical attire" should be consulted when developing guidelines.⁶⁰

2. Education regarding surgical hand antisepsis products and protocols should be ongoing and systematic for all personnel in the perioperative setting.
3. Recommended practices should be used as guidelines for developing policies and procedures in the practice setting. Policies and procedures establish authority, responsibility, and accountability and serve as operational guidelines. Introduction and review of policies and procedures should be included in orientation and ongoing education of personnel to assist in the development of knowledge, skills, and attitudes that affect patient outcomes. Policies and procedures also assist in developing quality assessment and improvement activities.

Glossary

Alcohol-based hand rub: "An alcohol-containing preparation designed for application to the hands for reducing the number of viable microorganisms on the hands. In the United States, such preparations usually contain 60% to 95% alcohol."^{3(p3)}

Alcohol-based preparations: Products used for general hand hygiene and/or surgical hand antisepsis. Appropriate products (ie, alcohol-based products) may be used as an alternative to the traditional surgical hand scrub using detergent-based antiseptic agents. These alcohol-based products do not remove soil; therefore, application of these products for surgical hand antisepsis must be preceded by a soap and water wash.

Anatomical timed scrub or counted stroke scrub method: An anatomical scrub method that uses a prescribed number of strokes or specified amount of time for scrubbing each surface of the fingers, hands, and arms.

Antimicrobial soap: Soap containing an FDA-compliant antiseptic agent.

Antiseptic agent: Antimicrobial substance applied to the skin to reduce the log number of microbial flora. Examples include alcohols,

chlorhexidine, chlorine, hexachlorophene, iodine, parachloroxylenol, quaternary ammonium compounds, and triclosan.

Artificial nails: Substances or devices applied or added to the natural nails to augment or enhance the wearer's own nails. They include, but are not limited to, bondings, tips, wrappings, and tapes.

Cumulative effect: A progressive decrease over time, usually measured in days, in the number of microorganisms present after repeated applications of a product.

Hand antisepsis: Refers to either hand wash or hand rub using an antiseptic agent.

Hand hygiene: A generic term that applies to hand washing with either a plain or antimicrobial soap or use of an alcohol-based, antiseptic hand rub product.

In vitro: Outside the living body and in an artificial environment.

In vivo: In the living body of a plant or animal.

Persistence: Prolonged or extended antimicrobial activity, usually measured in hours, that prevents or inhibits the regrowth of microorganisms after application of the product.

Resident microorganisms: Microorganisms considered to be permanent residents of the skin and not readily removed by hand washing.

Stratum corneum: The outermost layer of the epidermis. The cells of the stratum corneum are rough and jagged and contain myriad niches in which bacteria dwell.

Subungual: Under the nail (eg, fingernail).

Surgical hand antisepsis: "Antiseptic hand wash or antiseptic hand rub performed preoperatively by surgical personnel to eliminate transient bacteria and reduce resident hand flora. Antiseptic detergent preparations often have persistent antimicrobial activity."^{3(p4)} Previously known as surgical hand scrub.

Surgical hand antiseptic agent: An FDA-compliant product that is a broad-spectrum, fast-acting, and nonirritating preparation containing an antimicrobial ingredient designed to significantly reduce the number of microorganisms on intact skin. Surgical hand antiseptic agents demonstrate both persistent and cumulative activity.

Transient microorganisms: Microorganisms isolated from the skin. Such microorganisms are of concern because they can be transmitted readily on hands unless removed by mechanical friction and soap and water hand washing or use of a hand rub agent.

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US Food and Drug Administration compliant: Refers to an agent that meets the testing and labeling criteria outlined by the FDA in the TFM for Health-Care Antiseptic Drug Products, a NDA, or an ANDA. The process required depends on the components, concentration, and mixture of ingredients used in the individual product. Both persistence and cumulative effect are critical to providing optimum product effectiveness and patient safety. When following the FDA over-the-counter TFM process, there is no specific clearance or letter of approval from the FDA; however, the FDA requires all studies and product labeling to meet the TFM criteria and remain on file for their review.³⁵

Vector: An organism that transmits a pathogen.

Waterless antiseptic agent: "An antiseptic agent that does not require use of exogenous water. After applying such an agent, the hands are rubbed together until the agent has dried."^{3(p4)}

NOTES

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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; scheduled for publication in the *AORN Journal* in 2004.