



TITLE: Techniques and Products for Surgical Hand Antisepsis: A Review of Guidelines

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CONTEXT AND POLICY ISSUES

Surgical site infections are a leading cause of health care-associated infections and are associated with increased morbidity, mortality, and additional costs.^{1,2} Adherence to proper hand hygiene practice is the most effective and least expensive way to prevent health care-associated infections.¹⁻³ In the perioperative setting, surgical hand preparation include washing visibly soiled hands, using alcohol-based products, surgical hand scrubs using antimicrobial soap and water, and surgical hand scrubs using an alcohol-based surgical hand rub product.³

Common medicated soap formulations for surgical hand antisepsis include chlorhexidine- or povidine-iodine-containing soaps.¹ Hand washing with medicated soap may result in increased skin irritation and dermatitis compared to alcohol-based hand rubs.¹ In addition, surgical hand antisepsis with medicated soap requires clean water to rinse hands after application to avoid the risk of recontamination.¹ Surgical hand preparation with alcohol-based hand rubs also requires a shorter recommended duration of scrubbing than with medicated soap.¹ The application technique for alcohol-based hand rubs may be more prone to error, however.¹

The purpose of this review is to review evidence-based guidelines and recommendations regarding techniques and products for surgical hand antisepsis.

RESEARCH QUESTION

What are the evidence-based guidelines regarding techniques and products for surgical hand antisepsis?

KEY FINDINGS

Two guidelines recommend that artificial nails and jewelry be removed prior to cleaning and soiled hands be washed with soap and water prior to surgical hand antisepsis. Surgical hand antisepsis techniques and agents include surgical hand scrubs with antiseptic soap or alcohol-based hand rubs. No recommendations on specific antiseptic agents were identified.

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METHODS

Literature Search Strategy

A limited literature search was conducted on key resources including PubMed, The Cochrane Library (2014 June, Issue 6), University of York Centre for Reviews and Dissemination (CRD) databases, CINAHL, Canadian and major international health technology agencies, as well as a focused Internet search. No filters were applied to limit the retrieval by study type. The search was limited to English language documents published between January 1, 2009 and June 12, 2014.

Selection Criteria and Methods

One reviewer screened the titles and abstracts of the retrieved publications and evaluated the full-text publications for the final article selection, according to selection criteria presented in Table 1.

Table 1: Selection Criteria

Population	Patients undergoing surgery
Intervention	Any type of scrub solution or technique used by the scrub team or personnel working in the operating room for surgical hand antisepsis (e.g., aqueous scrub solutions, alcohol rubs)
Comparator	Any comparator
Outcomes	Post-operative surgical site infections
Study Designs	Health technology assessments, systematic reviews, meta-analyses, evidence-based guidelines

Exclusion Criteria

Studies were excluded if they did not meet the selection criteria, were duplicate publications, or were published prior to 2009.

Critical Appraisal of Individual Studies

Guidelines were assessed for quality using the Appraisal of Guidelines for Research and Evaluation II (AGREE II) instrument.⁴ A numeric score was not calculated for each guideline. Instead, strengths and limitations of each guideline were summarized and described.

SUMMARY OF EVIDENCE

Quantity of Research Available

The literature search yielded 328 citations. Upon screening titles and abstracts, 323 citations were excluded and five potentially relevant articles were retrieved for full-text review. An additional three potentially relevant reports were identified through grey literature searching. Of the eight potentially relevant reports, six did not meet the inclusion criteria. The study selection

process is outlined in a PRISMA flowchart (Appendix 1). Two evidence-based guidelines met the inclusion criteria and were included in this review. Two clinical practice guidelines that were not clearly supported by a systematic search of the literature (not clearly evidence-based) are included in Appendix 5.

Summary of Study Characteristics

Details on the grading of evidence, critical appraisal, and guideline recommendations can be found in Appendices 2, 3 and 4, respectively.

Country of origin

One guideline was developed in the USA by the Institute for Clinical Systems Improvement (ICSI).⁵ The other guideline was developed by a group of international experts at the World Health Organization (WHO) headquarters in Switzerland.⁶

Population

The ICSI guideline targeted adult and pediatric patients undergoing a surgical procedure in a hospital inpatient, outpatient, or freestanding surgical center.⁵ The WHO guideline provided recommendations on hand hygiene for healthcare workers, hospital administrators, and health authorities to reduce the transmission of pathogenic microorganisms to patients and healthcare workers.⁶

Interventions

Both guidelines provided recommendations on surgical hand antisepsis in the perioperative setting.^{5,6} Both guidelines provided guidance on measures the surgical staff should take prior to hand disinfection and recommended options for what agents to use.

Grading of recommendations and levels of evidence

Although a grading scheme was defined for the ICSI guidelines, the specific recommendations related to surgical hand antisepsis were not graded.⁵ Grades for the level of evidence and strength of recommendation were provided in the WHO guideline.⁶ The WHO used criteria developed by the Healthcare Infection Control Practices Advisory Committee (HICPAC) or the United States Centers for Disease Control and Prevention (CDC) to rank evidence and recommendations.⁶ A recommendation that was graded as category IA was strongly recommended for implementation and strongly supported by well-designed experimental, clinical, or epidemiological studies; IB, strongly recommended for implementation and supported by some experimental, clinical, or epidemiological studies and a strong theoretical rationale; IC, Required for implementation, as mandated by federal and/or state regulation or standard; II, suggested for implementation and supported by suggestive clinical or epidemiological studies or a theoretical rationale or a consensus by a panel of experts (see Appendix 2).

Summary of Critical Appraisal

Both guidelines had clearly defined objectives, scope and target populations.^{5,6} The guideline development groups generally included individuals from relevant professional groups such as infection control experts, physicians, nurses and other health professionals. The guideline

development methodology was described and consisted of a systematic review of the literature. The ICSI guideline considered reported potential barriers of implementing guidelines, while the WHO guideline did not. The WHO guideline provided grading for recommendations and evidence supporting recommendations, while the ICSI guidelines did not grade the recommendations specific to surgical hand antisepsis and wasn't explicit about how the evidence to support the recommendations was identified. The cost implications of applying the recommendations were not considered or reported in both guidelines and it was unclear whether patients' views and preferences were sought. WHO stated that they would plan to update their guideline every two to three years, but there has not been an update since 2009.

Summary of Findings

Two guidelines provided recommendations on techniques and products for surgical hand antisepsis.^{5,6}

Pre-surgical antisepsis hand preparation

Both guidelines recommend that artificial nails should not be worn by surgical staff [WHO, IB] and that all jewelry should be removed prior to beginning surgical hand preparation [WHO, II].^{5,6} The ICSI guideline recommends that cuticles, hands, and forearms should be free of open lesions and breaks.⁵ If hands are visibly soiled, the WHO guideline recommends washing hands with plain soap before surgical hand preparation and removing debris from underneath fingernails using a nail cleaner [II].⁶

Frequency of surgical hand antisepsis

With regards to frequency, the ICSI guideline recommends that general hand hygiene be performed before and after each patient contact, after glove removal, following any contact with blood or other infectious materials, before and after eating, and after using the restroom.⁵ This was general guidance and not specific to the surgical setting.

Antiseptic agents

The ICSI guideline recommends washing with soap and water with mechanical friction for 15 seconds if hands are soiled.⁵ If hands are not soiled, a waterless alcohol preparation may be used. The ICSI guideline did not recommend a specific antiseptic agent to use, but recommended that it should be FDA compliant, have a documented ability to kill organisms upon application, and provide persistence to reduce regrowth and have a cumulative effect over time.

The WHO guideline recommends that surgical hand antisepsis be performed using a suitable antimicrobial soap or alcohol-based hand-rub, preferably with a product ensuring sustained activity, before donning sterile gloves [IB].⁶ If the quality of water is not assured, an alcohol-based hand-rub is recommended [II].

Applying antiseptic agents

The WHO guideline recommends the following protocols for surgical hand antisepsis:

Antimicrobial soap

- “Scrub hands and forearms for the length of time recommended by the manufacturer, typically 2 to 5 minutes. Long scrub times (e.g., 10 minutes) are not necessary. [IB]” (p. 152)⁶

Alcohol-based hand rub

- “Follow the manufacturer’s instructions for application times. Apply the product to dry hands only [IB]. Do not combine surgical hand scrub and surgical handrub with alcohol-based products sequentially [II].
- Use sufficient product to keep hands and forearms wet with the handrub throughout the surgical hand preparation procedure [IB].
- After application, allow hands and forearms to dry thoroughly before donning sterile gloves [IB]” (p. 153)⁶

Limitations

No guidelines were identified that were specific to the Canadian context. The ICSI guideline was from the USA and WHO guidelines were meant to be applied to any healthcare setting on a global scale. The ICSI guidelines did not grade the recommendations and evidence supporting the recommendations regarding hand hygiene. There were no recommendations as to specific product formulations that should be used for surgical hand antisepsis.

CONCLUSIONS AND IMPLICATIONS FOR DECISION OR POLICY MAKING

Two evidence-based guidelines provided recommendations on techniques and products for surgical hand antisepsis. The guidelines stated that artificial nails should not be worn and all jewelry should be removed by surgical staff. If hands are visibly soiled, plain soap and water was recommended prior to surgical hand antisepsis. The type of technique to use for hand antisepsis may be dependent on whether the quality of water is assured. No specific hand antisepsis agent was recommended, but the agent should be effective at killing organisms and have sustained activity. Following manufacturer’s instructions was recommended for determining application time.

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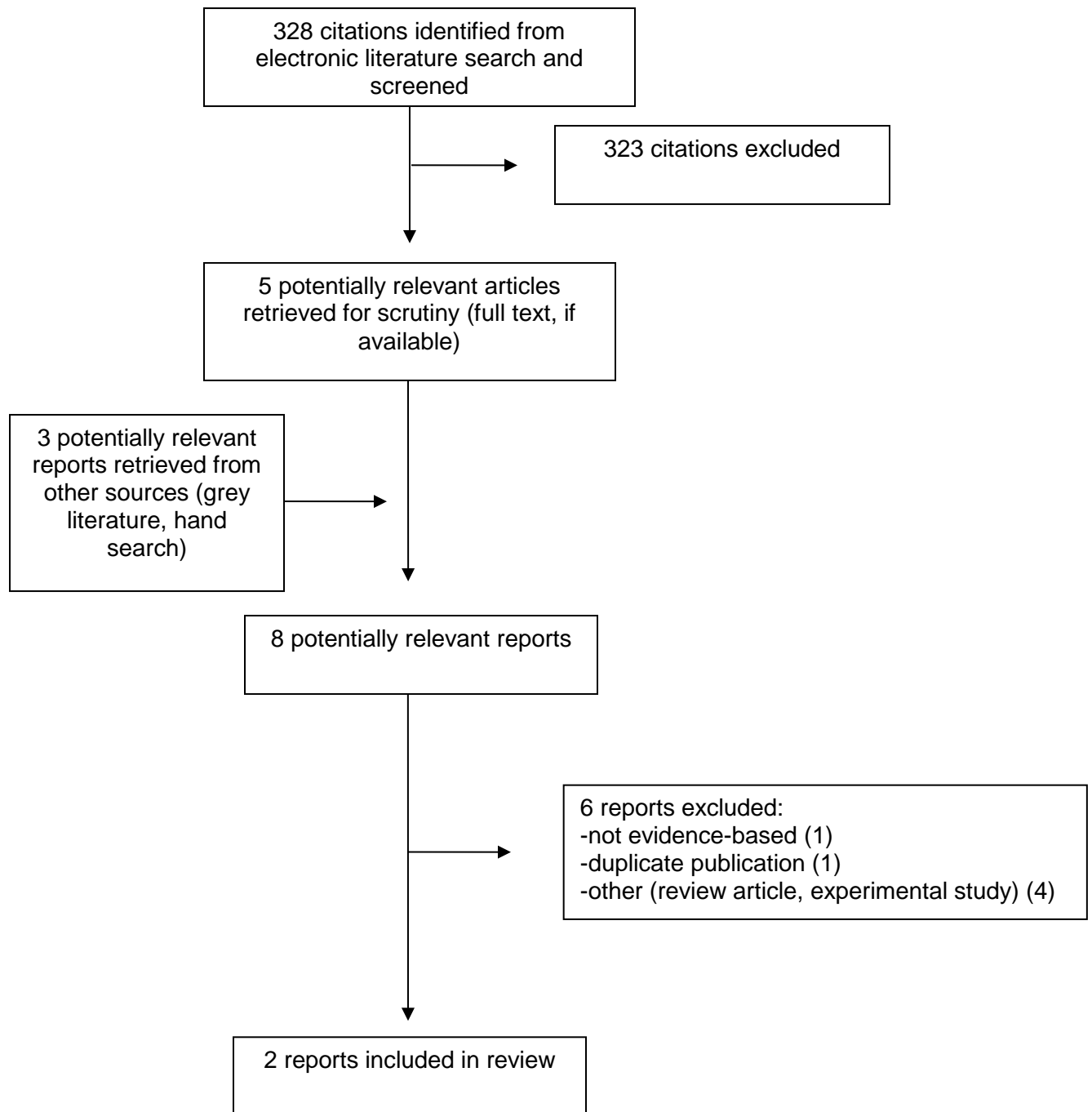
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APPENDIX 1: Selection of Included Studies



APPENDIX 2: Grading of Recommendations and Levels of Evidence

Guideline Society, Author, Publication Year	Level of Evidence
Institute for Clinical Systems Improvement, USA, Sawyer et al. (2012) ⁵	No grading of hand hygiene recommendations and evidence were reported.
World Health Organization, Pittet et al. (2009) ⁶	<p>IA: Strongly recommended for implementation and strongly supported by well-designed experimental, clinical, or epidemiological studies.</p> <p>IB: Strongly recommended for implementation and supported by some experimental, clinical, or epidemiological studies and a strong theoretical rationale.</p> <p>IC: Required for implementation, as mandated by federal and/or state regulation or standard.</p> <p>II: Suggested for implementation and supported by suggestive clinical or epidemiological studies or a theoretical rationale or a consensus by a panel of experts.</p>

APPENDIX 3: Summary of Critical Appraisal

Guideline Society, Author, Country, Publication Year	Strengths	Limitations
Institute for Clinical Systems Improvement, USA, Sawyer et al. (2012) ⁵	<ul style="list-style-type: none"> • Clearly defined objectives, scope and target populations • Guideline development group included individuals from relevant professional groups • Guideline development methodology described • Potential barriers of implementing guideline considered and reported 	<ul style="list-style-type: none"> • Recommendations and evidence supporting recommendations were not graded for hand hygiene section • Cost implications of applying the recommendations not considered or reported • Unclear whether patients' views and preferences were sought
World Health Organization, Pittet et al. (2009) ⁶	<ul style="list-style-type: none"> • Clearly defined objectives, scope and target populations • Guideline development group included individuals from relevant professional groups • Guideline development methodology described • Recommendations and evidence supporting recommendations were graded 	<ul style="list-style-type: none"> • Cost implications of applying the recommendations not considered or reported • Unclear whether patients' views and preferences were sought • Lack of update since 2009

APPENDIX 4: Summary of Evidence-Based Guidelines

Guideline Society, Author, Country, Publication Year	Main Study Findings
<p>Institute for Clinical Systems Improvement, USA, Sawyer et al. (2012)⁵</p>	<p>Recommendations for surgical staff <i>Hand Hygiene</i></p> <ul style="list-style-type: none"> • Hand hygiene is a critical step in prevention and spread of infection. It is the single most important step in the prevention of infection. General hand hygiene should be performed before and after each patient contact, after glove removal, following any contact with blood or other infectious materials, before and after eating, and after using the restroom. Wash with soap and water with mechanical friction for 15 seconds. If hands are not soiled, a waterless alcohol preparation may be used. Waterless alcohol preparations reduce more organisms on the hands than soap and water alone. • Fingernails should be short, clean and healthy. Nail polish should not be chipped. The Association of PeriOperative Registered Nurses recommends that artificial nails not be worn. Artificial nails can make it more difficult to eliminate bacteria from under the nails. Strict adherence to appropriate hand washing and the use of alcohol-based cleansers is critical to reducing the risk of surgical site infection from organisms transferred by health care worker hands, either with or without artificial nails. • Cuticles, hands and forearms should be free of open lesions and breaks. This presents a risk for exposure to blood-borne pathogens for both patients and personnel. • All jewelry must be removed. • Surgical hand antisepsis (surgical scrub) is performed to significantly reduce the number of microorganisms on the hands and forearms of scrubbed members of the surgical team. • Antiseptic agents should be limited to those that are Food and Drug Administration compliant, have a documented ability to kill organisms upon application, provide persistence to reduce regrowth and have a cumulative effect over time. There is no evidence to support a recommendation of a specific antiseptic product.
<p>World Health Organization, Pittet et al. (2009)⁶</p>	<p>Recommendations for surgical hand preparation (p. 152-153)</p> <ul style="list-style-type: none"> • Remove rings, wrist-watch, and bracelets before beginning surgical hand preparation (II). Artificial nails are prohibited (IB). • Sinks should be designed to reduce the risk of splashes (II). • If hands are visibly soiled, wash hands with plain soap before surgical hand preparation (II). Remove debris from underneath fingernails using a nail cleaner, preferably under running water (II). • Brushes are not recommended for surgical hand preparation (IB). • Surgical hand antisepsis should be performed using either a suitable antimicrobial soap or suitable alcohol-based hand-rub, preferably with a product ensuring sustained activity, before donning sterile gloves (IB). • If quality of water is not assured in the operating theatre, surgical hand antisepsis using an alcohol-based hand-rub is recommended before donning sterile gloves when performing surgical procedures (II). • When performing surgical hand antisepsis using an antimicrobial soap, scrub hands and forearms for the length of time recommended by the manufacturer, typically 2–5 minutes. Long scrub times (e.g. 10 minutes) are not necessary (IB). • When using an alcohol-based surgical hand-rub product with sustained activity, follow the manufacturer's instructions for application times. Apply the product to dry hands only (IB). Do not combine surgical hand scrub and surgical hand-rub with alcohol-based products sequentially (II). • When using an alcohol-based hand-rub, use sufficient product to keep hands and forearms wet with the hand-rub throughout the surgical hand preparation procedure (IB). • After application of the alcohol-based hand-rub as recommended, allow hands and forearms to dry thoroughly before donning sterile gloves (IB).

APPENDIX 5: Clinical Practice Guidelines (methodology not clear)

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