

Standard Infection Control Precautions Literature Review:

**Hand Hygiene: Surgical hand antisepsis
in the clinical setting**

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Key Information

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Document information

- Description:** This literature review examines the available professional literature on surgical hand antisepsis in the clinical setting.
- Purpose:** To inform the Standard Infection Control Precaution (SICP) section on hand hygiene in the National Infection Prevention and Control Manual in order to facilitate the prevention and control of healthcare associated infections in NHS Scotland healthcare settings.
- Target Audience:** All NHS staff involved in the prevention and control of infection in NHSScotland.
- Update/review schedule:** Updated as new evidence emerges with changes made to recommendations as required.
- Review will be formally updated every 3 years.
- Cross reference:** [National Infection Prevention and Control Manual](#)
- [SICPs Literature Review: Handwashing](#)
- Update level:** Practice – No significant change
- Research – No significant change

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Version history

This literature review will be updated in real time if any significant changes are found in the professional literature or from national guidance/policy.

Version	Date	Summary of changes
5.1	May 2022	Following stakeholder feedback, an additional line was added to the recommendation ' What is the correct technique to ensure that all surfaces of the hands are covered during surgical hand antisepsis? ' - 'Repeat the procedure to the mid forearms only'. This is to align with the Association for Perioperative Practice (AfPP)-recommended practice.
5.0	June 2020	<p>Additional research question added:</p> <ul style="list-style-type: none"> • Which products are suitable for surgical scrubbing/surgical rubbing? • Where should hand hygiene facilities be located for surgical hand antisepsis? <p>New recommendations:</p> <p>Which products are suitable for surgical scrubbing/surgical rubbing?</p> <ul style="list-style-type: none"> • Surgical rubbing with ABHR is a suitable alternative to surgical scrubbing with an antimicrobial scrub agent if the ABHR is licensed for this use. • Surgical scrubbing should be performed with an agent that has immediate and sustained antimicrobial effect (e.g. chlorhexidine gluconate, povidone-iodine). • Surgical rubbing should be performed with an agent that has immediate and sustained antimicrobial effect. <p>Where should hand hygiene facilities be located for surgical hand antisepsis?</p> <ul style="list-style-type: none"> • Scrub areas should be separate from the operating theatre (OR) or within a recessed area within the OR and located away from areas containing

Version	Date	Summary of changes
		<p>equipment and laid-up instrument trolleys in order to prevent water splashing and potential contamination.</p> <p>Recommendations updated:</p> <p>What is the recommendation relating to finger nails to enable effective surgical hand antisepsis?</p> <p>Removal of the following</p> <ul style="list-style-type: none"> • Nail products should not be worn as chips may harbour bacteria and thus represent an infection risk. <p>What are the hand hygiene facilities required for surgical hand antisepsis (including sink and tap design)?</p> <p>The following recommendations should be adhered to when considering surgical hand antisepsis facility requirements including sink and tap design:</p> <ul style="list-style-type: none"> • The sink and furniture should be at a height to facilitate hand and arm washing and prevent splashing of surgical attire/scrubs/uniform. • The design and drainage should ensure that the floor does not become wet during washing procedures. • The rim of the scrub sink should not have an internal lip, as contaminated water from the scrub procedure could collect beneath the rim and attract debris with a potential risk of infection. • For clinical wash hand basins used for invasive procedures, all basins should have curved sides with no plugs, have no overflows, and be fitted with infrared non touch taps which should not be placed over the waste outlet. • Foot pedals and/or elbow adjustments should be provided to operate taps and dispense hand hygiene solutions. • Provision of hot and cold water is essential and water should flow at a steady rate. When specifying

Version	Date	Summary of changes
		<p>taps for scrub sinks, consideration should be given to the use of automatic mixer units providing water at a predetermined temperature.</p> <ul style="list-style-type: none"> • The use of sonic accessories i.e. non-touch, fixtures and fittings should be considered. • Where sensor taps are in operation they must allow a sufficient run-on-time for the hand hygiene/scrub protocol to be completed. The run on time should be a minimum of 20 seconds. • Foot operated disposal bins for waste paper should be provided. • Wall-mounted paper towel holders should also be provided. • The splash-back for scrub sinks and clinical wash hand sinks should be a single waterproof sheet or seal mounting with polyurethane or wall glaze.
4.0	December 2016	<p>Recommendations updated:</p> <p>What is the correct technique to ensure that all surfaces of the hands are covered during surgical hand antisepsis?</p> <p>Removal of bullet point</p> <ul style="list-style-type: none"> • At this point local policy may advise repeating the steps above but to the mid-arms only, rinsing as described above when complete. <p>Inclusion of new bullet points 3 and 4</p> <ul style="list-style-type: none"> • Rinse hands by passing them through the water in one direction only, from fingertips to elbow. Do not move the arm back and forth through the water • Put antimicrobial soap into the palm of your left hand using the elbow of the right arm to operate the dispenser. <p>Discussion updated:</p> <p>What is the correct technique to ensure that all surfaces of the hands are covered during surgical hand antisepsis?</p> <p>Removal of text 'and this is current practice in NHSScotland' from bullet point 8.</p>

Version	Date	Summary of changes
3.0	November 2015	Updated after review of current literature
2.0	April 2014	Updated after review of current literature
1.0	January 2012	Defined as final

Approvals

Version	Date Approved	Name
5.0	December 2019	National Infection Prevention and Control Group
4.0	December 2016	National Policies, Guidance and Outbreaks Steering Group
3.0	November 2015	Steering (Expert Advisory) Group for SICPs and TBPs
2.0	April 2014	Steering (Expert Advisory) Group for SICPs and TBPs
1.0	January 2012	Steering (Expert Advisory) Group for SICPs and TBPs

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1. Objectives

The aim of this review is to examine the extant professional literature regarding the correct technique for surgical hand antisepsis in the clinical setting. The specific objectives of the review are to determine:

- When should surgical hand antisepsis be performed?
- Which products are suitable for surgical scrubbing/surgical rubbing?
- What is the recommended water temperature for surgical hand antisepsis?
- What is the recommendation relating to finger nails to enable effective surgical hand antisepsis?
- What is the evidence regarding the wearing of hand and wrist jewellery in the theatre setting?
- Should nail brushes, sponges and picks be used when performing surgical hand antisepsis?
- What is the correct technique to ensure that all surfaces of the hands are covered during surgical hand antisepsis?
- How long should surgical hand antisepsis be carried out to ensure good technique?
- How should hands be dried after surgical hand antisepsis?
- What is the correct technique for surgical hand rubbing?
- How long should surgical hand rubbing be carried out to ensure good technique?
- What are the hand hygiene facilities requirements for surgical hand antisepsis including sink and tap design?
- Where should hand hygiene facilities be located for surgical hand antisepsis?

2. Methodology

This systematic literature review was produced using a defined methodology as described in the [National Infection Prevention and Control Manual: Methodology](#).

3. Discussion

3.1 Implications for practice

When should surgical hand antisepsis be performed?

Surgical hand antisepsis is used to reduce the levels of skin (resident) bacteria present on the hands in addition to removing all transient bacteria and soiling prior to operating/performing an invasive procedure.¹⁻³ Some invasive procedures may take place in care settings out with traditional operating theatres. The consensus/practice guidelines found the most appropriate time for surgical hand antisepsis to take place is before donning sterile PPE (e.g. gloves and gown).¹⁻³

ABHRs may be used between surgical procedures if hands are not visibly soiled and if the product is licensed for this use.²

Which products are suitable for surgical scrubbing/surgical rubbing?

Surgical scrubbing with antimicrobial scrubbing agents is a long established practice for surgical hand antisepsis, while surgical rubbing with alcohol-based surgical rubbing agents is a more recent and therefore less established practice.

Evidence from two systematic reviews indicates that there is no difference in the rate of surgical site infections/wound infections when either surgical rubbing with an ABHR (licensed for this use) or surgical scrubbing.^{4, 5}

In the literature identified, surgical hand antisepsis agents were evaluated for their ability to reduce the number of bacteria on hands at different times including immediately after scrubbing/rubbing, and, after the conclusion of surgery (or a comparable time in experimental studies i.e. following three or six hours of glove wear), which provides assessment of the sustained effect.

Studies assessing immediate and sustained antimicrobial efficacy indicate that ABHR is as effective⁶ or superior^{4, 7, 8} to traditional antimicrobial scrub agents: a Cochrane systematic review identified, albeit very low quality evidence, that an ABHR may have greater immediate and sustained antimicrobial efficacy than aqueous scrub solutions.⁴

Therefore, surgical rubbing with ABHR is an appropriate alternative to surgical scrubbing with an antimicrobial soap. This finding is consistent with recommendations of both the Centres for Disease Control and Prevention (CDC)³ and the World Health Organization (WHO).²

There is limited evidence to suggest that surgical scrubbing products that contain chlorhexidine gluconate have greater immediate antimicrobial efficacy than povidone-iodine containing scrubbing agents.⁹ Studies comparing the antimicrobial efficacy of various scrub products did not reveal a superior agent.^{10,11}

Surgical rubbing products typically contain additional ingredients to enhance their antimicrobial efficacy (e.g. chlorhexidine gluconate, mecetronium ethylsulfate, triclosan) or to improve product tolerance (e.g. emollients) for the user. There is little evidence to recommend one surgical rubbing agent over another, partly due to the identified studies having incomparable rubbing agents and methodologies, and being carried out under experimental conditions that may not be representative of real-life conditions in healthcare settings.¹²⁻¹⁶ Many studies utilised the 'EN 12791' methodology, whereby a product is considered suitable for surgical hand antisepsis if immediate (post disinfection) and sustained (following 3 hours in sterile glove) antimicrobial efficacy is not significantly lower than that of a reference product (n-propanol 60%). The CDC, WHO, and The Association for Perioperative Practice (AfPP) do not recommend a specific surgical rubbing product or active ingredient, instead stating that the rubbing agent should have a sustained/persistent/residual activity.¹⁻³

There is limited evidence to recommend a specific alcohol concentration in ABHR products for surgical antisepsis. The WHO Guidelines on Hand Hygiene in Healthcare state that alcohol solutions containing 60-80% alcohol are most effective, with higher concentrations being less effective due to the fact that proteins are not easily denatured in the absence of water.²

Suchomel and colleagues assessed the effect on antimicrobial efficacy of the concentration of alcohol in ABHR products for surgical rubbing (in this case ethanol, at 75%, 85%, and 95% concentration).¹⁷ A rub of $\geq 85\%$ was most effective when tested against a reference product, however, a power calculation was not carried out to determine sample size, therefore the validity of the results is questionable.¹⁷ Results from a study by Macinga *et al* suggest that product formulation may have a greater effect on efficacy than alcohol concentration alone.¹⁸ Indeed, the impact of adding glycerol to an ABHR can negatively affect antimicrobial efficacy when compared to an EN 12791 reference product.¹⁹

The AfPP state that while ABHR solutions may provide the most rapid reduction in microbial count, they are not as effective at removing soiling and debris as hand washing, and therefore a

hand wash solution is preferred for hand antisepsis, particularly for the first operation of the day and also if hands are visibly soiled.¹ A hand wash with plain soap and water may be appropriate in some settings i.e. low income settings, as evidenced by Nthumba *et al*,²⁰ however the AfPP suggest that an antimicrobial hand wash is more effective at removing resident flora.¹ If plain soap is used, it should be followed with an application of ABHR.¹

Side effects such as allergic reaction and skin sensitivity can occur with use of any hand hygiene product. Erdogan and colleagues reported significantly higher urinary iodine concentrations in operating room staff compared to age-matched staff from non-surgical units of the same hospitals however the implications of this require further study.²¹ The CDC recommends that products are chosen based on low irritancy potential, employee preferences (in terms of feel, fragrance, skin tolerance) and should not be chosen primarily based on cost.³ Products used for surgical hand antisepsis must be licensed for that purpose.

What is the recommended water temperature for surgical hand antisepsis in the clinical setting?

The temperature of water used for surgical hand antisepsis is described in a limited volume of evidence identified. These studies were generally non-systematic reviews or consensus/practice guidelines and as such had a low level of evidence; and recommended that warm water with a steady flow be used as this is both comfortable for the person undertaking the procedure, and is less likely than hot water to increase the risk of dermatitis.^{1-3, 22}

What is the recommendation relating to finger nails to enable effective surgical hand antisepsis?

There is no clear evidence that artificial nails are associated with an increased rate of SSI. A Cochrane systematic review failed to find high quality evidence on the impact of nail polish and the bacterial density on hands of scrubbed personnel.²³ Consensus guidelines recommend that artificial nails should be prohibited, based on the observation that artificial nails may harbour high concentrations of bacteria, and that they impede proper hand hygiene.^{1, 3} Long/artificial nails may also increase the risk of glove perforation.¹

Recommendations for hand hygiene from consensus guidelines which also apply to surgical hand antisepsis include nails being short (tips less than 0.5cm long or approximately ¼ inch), clean, and free from nail products e.g. polish and false/artificial nails.^{1, 2 3}

What is the evidence regarding the wearing of hand and wrist jewellery in the theatre setting?

The literature identified by this review recommend that all hand and wrist jewellery is removed prior to surgical hand antisepsis as it may harbour microorganisms, cause allergic reactions as a result of antimicrobial product accumulating underneath items and inhibit the correct procedures for surgical hand antisepsis.¹⁻³ There have however been no randomised control trials (RCTs) conducted assessing SSI rates and finger rings.²³ In light of the limited evidence base, Woodhead *et al* suggest that wedding bands (with no stones) may be worn but that surgeons may be advised to remove these, particularly if working with metal prostheses.²⁴

A rapid literature review assessing the bacterial contamination of finger rings, their association with glove perforations and their connection with SSI found the evidence to be inconclusive.²⁵ There was however evidence that finger rings (including plain bands) may harbour bacteria and cause surgical glove perforations. The absence of conclusive evidence does not necessarily equate to an absence of risk. Although the likely reduction in risk from removing rings when part of the surgical team is likely to be low, it will enhance patient safety without a disproportionate adverse effect on the wearer. A surgical hand antisepsis policy that includes the removal of finger rings also provides the surgical team with a highly visible way to:

- Demonstrate their commitment to good infection prevention and control practice.
- Highlight their determination to reduce Surgical Site Infection (SSI)/Healthcare Associated Infection (HAI), thus contributing to improved patient safety.
- Effectively comply with good surgical hand antisepsis technique/preparation.

Should nail brushes/sponges be used when performing surgical hand antisepsis?

The use of nail brushes when performing surgical hand antisepsis has been widely discussed in the literature. A Cochrane systematic review found no studies on the use of nail brushes and other equipment used in hand antisepsis impacting on a reduction in surgical site infections.⁴ Studies by Tanner *et al* and Alcan *et al* both found that there was no significant difference in the number of colony forming units (CFU) present on the hands of participants if they did or did not use a nail brush or nail pick and concluded that their use should be optional.^{26, 27} A trial conducted by Larson *et al* found that a traditional scrub with brush was associated with significantly greater skin damage than rubbing with an ABHR.²⁸ In addition, there is consensus

in the literature from a systematic review and expert opinion that the use of nail brushes can be detrimental on the condition of healthcare workers skin.^{5, 22} National/professional guidelines identified as part of this review do not support the use of nail brushes for surgical hand antisepsis but do support the use of nail cleaners (e.g. nail picks) for the removal of soiling from underneath fingernails.¹⁻³

The use of sponge applicators to assist with the surgical hand antisepsis procedure is not widely discussed in the literature. These applicators are typically either plain sponges (used to apply antimicrobial soap) or sponges impregnated with antimicrobial products which may also have soft, flexible bristles (often called a 'brush sponge'). No evidence was identified in this review regarding the use of impregnated sponges or 'brush sponges', however, there is guidance supporting the use of soft, non-abrasive sponges to apply antimicrobial soap.²²

What is the correct technique to ensure that all surfaces of the hands are covered during surgical hand antisepsis?

There is consensus in the literature regarding the recommended method for surgical hand antisepsis in the clinical setting. The WHO provides the following technique to ensure that all surfaces of the hands and arms are covered during surgical hand antisepsis, however, manufacturers guidance for products used should also be taken in to consideration:²

- If hands are visibly soiled, wash hands with non-antimicrobial liquid soap and running water using the normal steps for hand washing immediately prior to beginning the surgical hand antisepsis.
- Start timing. Wet hands and forearms, and using an antimicrobial soap 'scrub' each side of each finger, between the fingers, and the back and front of the right hand for 2 minutes.
- Scrub the right arm, keeping the hand higher than the arm at all times to prevent recontamination of the hands by water from the elbows and bacteria-laden soap and water from contaminating the hands.
- Wash each side of the arm from the wrist to the elbow for a further minute.

- Repeat the process on the other hand and arm, keeping hands above elbows at all times. (If the hand touches anything at any time, the scrub must be lengthened by one minute for the area that has been contaminated).
- Rinse hands and arms by passing them through the water in one direction only, from fingertips to elbow. Do not move the arm back and forth through the water.
- Hold hands above elbows.
- The AfPP recommends that the procedure is repeated to the mid forearms only.¹
- Hands and arms should be dried using a sterile towel and aseptic technique before donning gown and gloves.^{1, 3, 22}

It is important for healthcare workers not to splash water on to surgical attire/scrubs or shake their hands to disperse water from them.¹

Once all surgical procedures are finished, general hand hygiene (i.e. non-antimicrobial liquid soap and water, or ABHR (if hands are not visibly soiled)) should be performed after surgical gloves are removed and before any other activities are undertaken.¹

How long should surgical hand antisepsis be carried out to ensure good technique?

Whilst the length of time required to perform surgical hand antisepsis is well studied in the literature, results are often difficult to interpret due to the wide variation in scrubbing protocols. The majority state that a 10 minute 'scrub' is not required and that a 2 to 6 minute scrub is sufficient. A recent Cochrane systematic review of the literature confirmed this by stating that a 3 minute rather than a 2 minute scrub may lead to fewer CFUs however the evidence identified was low quality.⁴ There is consensus that in practice the scrub technique should take a minimum of 4 minutes to complete; nevertheless, manufacturer's guidance on the specific time deemed effective for their product should be adhered to.^{2, 3, 22, 29}

How should hands be dried after surgical hand antisepsis?

It is important that hands are dried well before donning sterile surgical gloves in order to reduce the transfer of bacteria (the risk of which is increased with wet surfaces).¹ Several methods of

hand drying have been evaluated (paper towels, cloth towels, warm forced air evaporation) but little difference found in their effectiveness.³⁰ The AfPP recommends the following:¹

- The skin should be blotted dry with sterile single-use towels^{1-3, 22} (rubbing will disturb skin cells).
- Using one towel per hand work from fingertips to elbows.
- Hands are dried firstly by placing the opposite hand behind the towel and blotting the skin – then using a corkscrew movement to dry from the hand to the elbow.
- The towel must not be returned to the hand once the arm has been dried and must be discarded immediately.
- The process is then repeated for the opposite hand.

What is the correct technique for surgical hand rubbing?

Evidence shows that ABHR can be superior to, or as effective as, a traditional surgical scrub (see [section on products](#)). A standard method of application has yet to be agreed (WHO), however the identified literature describes a similar basic technique.^{1-3, 22} The WHO recommends the following technique:²

- Hands should be washed with non-antimicrobial liquid soap and dried thoroughly.
- Put approximately 5ml (3 doses)* of ABHR in the palm of your left hand, using the elbow of your other arm to operate the dispenser.
- Dip the fingertips of your right hand in the hand rub to decontaminate under the nails (5 seconds*).
- Smear the hand rub on the right forearm up to the elbow. Ensure that the whole skin area is covered by using circular movements around the forearm until the hand rub has fully evaporated (10-15 seconds*).
- Put approximately 5ml (3 doses)* of ABHR in the palm of your right hand, using the elbow of your other arm to operate the dispenser.

- Dip the fingertips of your left hand in the hand rub to decontaminate under the nails (5 seconds*).
- Smear the hand rub on the left forearm up to the elbow. Ensure that the whole skin area is covered by using circular movements around the forearm until the hand rub has fully evaporated (10-15 seconds*).
- Put approximately 5ml (3 doses)* of ABHR in the palm of your left hand, using the elbow of your other arm to operate the distributor. Rub both hands at the same time up to the wrists, and ensure that the all surfaces of the hands are covered using the standard ABHR procedure for hand hygiene.
- When hands are dry, sterile surgical clothing and gloves can be donned.^{1-3, 22}

It is important that hands and forearms remain wet (i.e. the ABHR should not be allowed to fully evaporate until the surgical hand rubbing process is complete) throughout the surgical hand rub.²

* Always follow the manufacturer's application volumes/times to ensure the effectiveness of the product used.^{2, 3, 22}

Once all surgical procedures are finished, general hand hygiene (i.e. non-antimicrobial liquid soap and water or ABHR (if hands are not visibly soiled)) should be performed after surgical gloves are removed and before any other activities are undertaken.²

How long should surgical hand rubbing be carried out to ensure good technique?

A number of studies have evaluated the efficacy of various rubbing durations using a number of different rubbing agents, with conflicting results.³¹⁻³⁴ A recent Cochrane systematic review found no clear evidence to determine the most effective rubbing duration.⁴ There is consensus in the literature however that manufacturer's instructions should be adhered to with regards to application time.^{1-3, 22 31}

What hand hygiene facilities are required for surgical hand antisepsis (including sink and tap design)?

There is consensus in the literature regarding the facility requirements for surgical hand antisepsis.^{1-3, 22, 35} The following key points are recommended:

- The sink should be at a height to facilitate hand and arm washing and prevent splashing of uniforms.^{1, 35}
- The sink design and drainage should ensure that the floor does not become wet during hand washing.^{1, 35}
- The rim of the sink should not have an internal lip, as contaminated water from the scrub procedure could collect beneath the rim and attract debris with a potential risk of infection.³⁵
- Clinical wash hand basins used for invasive procedures should have curved sides with no plugs, have no overflows, and be fitted with infrared non touch taps which should not be placed over the waste outlet.³⁵
- Foot pedals and/or elbow adjustments should be provided to operate taps and dispense hand hygiene products.^{1, 2, 35}
- Hot and cold water should flow at a steady rate. When specifying taps for scrub sinks, consideration should be given to the use of automatic mixer units providing water at a predetermined temperature.³⁵
- The use of sonic accessories i.e. non-touch, fixtures and fittings should be considered.^{1, 35}
- Where sensor taps are in operation they must allow a sufficient run-on-time for the hand hygiene/scrub protocol to be completed. The run on time should be a minimum of 20 seconds.³⁵
- Foot operated disposal bins for waste paper.¹
- Wall-mounted paper towel holders.³⁵
- Splash-back should be a single waterproof sheet or seal mounting with polyurethane or wall glaze.³⁵

Where should hand hygiene facilities be located for surgical hand antisepsis?

Health Facilities Scotland (HFS) and the AfPP state that the scrub area should be separate from the operating theatre (OR); if an OR has a recessed scrub area, this must be located away from the area containing laid-up instrument trolleys, in order to prevent water and potential microbial contamination.^{1, 35} HFS further states that a scrub room can be shared between two ORs but the room must be large enough to enable three people scrubbing back to back with space between (minimum size 16m²).³⁵

Munoz-Price et al assessed the placement of ABHR dispensers in the OR anaesthesia area.³⁶ The authors of this American study recommend that dispensers should be placed at the entrance to the OR and near anaesthesia providers inside the OR in order to promote frequent hand hygiene. They also recommend that facilities should consider suitable wearable ABHR dispensers with automatic reminders; devices that are not widely used in the UK. It should be noted however that the frequency of hand hygiene does not equate to appropriate hand hygiene i.e. it must be carried out at the appropriate moments to be effective. Ellington et al recommend that hand hygiene product dispenser location may be determined by assessing staff workflow patterns.²²

ABHRs should be located in accordance with applicable national and local fire safety standards and codes.^{22, 35, 36}

3.2 Implications for research

There is an extensive body of literature which examines the efficacy of surgical hand antisepsis however there is a lack of well conducted randomised controlled trials. Further study in relation to the wearing of plain finger rings by the surgical team may be interesting to determine a more robust evidence based recommendation to be made.

4. Recommendations

This review makes the following recommendations based on an assessment of the extant professional literature on surgical hand antisepsis in the clinical setting.

When should surgical hand antisepsis be performed?

Surgical hand antisepsis should take place **before** donning sterile PPE (i.e. gloves and gown).

(Category C recommendation)

Alcohol based hand rub (ABHR) suitable for surgical rubbing may be used between surgical procedures or for hand decontamination between glove changes if hands are not visibly soiled.

(Category C recommendation)

Which products are suitable for surgical scrubbing/surgical rubbing?

Surgical rubbing with ABHR is a suitable alternative to surgical scrubbing with an antimicrobial scrub agent if the ABHR is licensed for this use.

(Category A recommendation)

Surgical scrubbing should be performed with an agent that has immediate and sustained antimicrobial effect (e.g. chlorhexidine gluconate, povidone-iodine).

(Category C recommendation)

Surgical rubbing should be performed with an agent that has immediate and sustained antimicrobial effect.

(Category C recommendation)

What is the recommended water temperature for surgical hand antisepsis

Warm/tepid water with a steady flow should be used for carrying out surgical hand antisepsis.

(Category C recommendation)

What is the recommendation relating to finger nails to enable effective surgical hand antisepsis?

The recommendations for normal hand hygiene practices should be followed (i.e. short, clean and free from nail products and false/artificial nails).

Finger nails should not exceed ¼ inch (approx. 0.5cm) beyond the end of the fingertip to prevent the accumulation of debris under nails and to facilitate effective hand hygiene.

(Grade C recommendation)

Artificial nails should not be worn as they inhibit effective hand hygiene and may pose an infection risk.

(Grade C recommendation)

What is the evidence regarding the wearing of hand and wrist jewellery in the theatre setting?

All hand and wrist jewellery including all finger rings should be removed prior to commencing surgical hand antisepsis.

(Category C recommendation)

A surgical hand antisepsis policy that includes the removal of all finger rings provides the surgical team with a highly visible way to:

- Demonstrate their commitment to good infection prevention and control practice.
- Highlight their determination to reduce Surgical Site Infection (SSI)/Healthcare Associated Infection (HAI), thus contributing to improved patient safety.
- Effectively comply with good surgical hand antisepsis technique/preparation.

(Category C recommendation)

Should nail brushes/sponges be used when performing surgical hand antisepsis?

Nail brushes **should not** be used for surgical hand antisepsis.

Nail cleaners (e.g. nail picks (single-use)) can be used if nails are visibly dirty.

(Category A recommendation)

Soft, non-abrasive, sterile (single-use) sponges may be used to apply antimicrobial liquid soap to the skin if licensed for this purpose.

(Category C recommendation)

What is the correct technique to ensure that all surfaces of the hands are covered during surgical hand antisepsis?

If hands are visibly soiled, or if this is the first surgical hand antisepsis of the day, wash hands with non-antimicrobial liquid soap and running water using the normal steps for hand washing immediately prior to beginning surgical hand antisepsis.

The following technique should be used to ensure that all surfaces of the hands and forearms, to elbows, are covered during surgical hand antisepsis (manufacturers guidance on products used should also be taken into consideration):

- Start timing.
- Wet hands and arms. Apply the appropriate amount of antimicrobial liquid soap to the hands and arms. For 2 min, wash each side of each finger, between the fingers, and the back and front of **both** hands.
- Rinse hands by passing them through the water in one direction only, from fingertips to elbow. Do not move the arm back and forth through the water.
- Put antimicrobial soap into the palm of your left hand using the elbow of the right arm to operate the dispenser.
- For 1 min, wash the right arm from wrist to elbow, keeping the hand higher than the arm at all times.
- Repeat the process on the left arm, keeping hands above elbows at all times. (If the hand touches anything at any time, the scrub must be lengthened by 1 min for the area that has been contaminated).
- Rinse hands and arms by passing them through the water in one direction only, from fingertips to elbow. Do not move the arm back and forth through the water.
- Hold hands above elbows at all times.
- Repeat the procedure to the mid forearms only.

- Hands and arms should be dried using a sterile towel and aseptic technique (See “**How should hands be dried after surgical antisepsis in the clinical setting?**”) before donning sterile gown and gloves.
- Do not splash water onto surgical attire/scrubs.
- Do not shake hands to disperse water from them.

Once all surgical procedures are finished, general hand hygiene (i.e. non-antimicrobial liquid soap and water or ABHR (if hands are not visibly soiled)) should be performed after surgical gloves are removed and before any other activities are undertaken.

(Category C recommendation)

How long should surgical hand antisepsis be carried out to ensure good technique?

The process should take a minimum of 4 minutes to complete, however, manufacturer’s guidance for the minimum specific time that is deemed effective for their product should be adhered to and the process lengthened if required.

(Category C recommendation)

How should hands be dried after surgical hand antisepsis in the clinical setting?

- The skin should be blotted dry with sterile towels (rubbing will disturb skin cells).
- Using one towel per hand and arm work from fingertips to elbows by placing the opposite hand behind the towel and blotting the skin using a corkscrew movement to dry from the hand to the elbow.
- Using a second towel repeat the process on the other hand and arm to the elbow.
- The towel must not be returned to the hand once the arm has been dried and must be discarded immediately.

(Category C recommendation)

What is the correct technique for surgical hand rubbing?

The following technique should be used to ensure that all surfaces of hands and forearms, to elbows, are covered during surgical rubbing:

- Hands should be washed with non-antimicrobial liquid soap and dried thoroughly using the normal steps for hand washing, if visibly dirty.
- Put the recommended amount of ABHR in the palm of your left hand, using the elbow of your right arm to operate the dispenser.
- Dip the fingertips of your right hand in the ABHR to decontaminate under the nails, (as per manufacturer's instructions).
- Smear the ABHR on the right forearm up to the elbow. Ensure that the whole skin area is covered by using circular movements around the forearm until the hand rub has fully evaporated (as per manufacturer's instructions).
- Hands and forearms should remain wet (i.e. the ABHR should not be allowed to fully evaporate until the surgical hand rubbing process is complete) throughout the surgical hand rub.
- Repeat the process for the left fingertips, hand and forearm.
- When hands are dry, sterile surgical gown and gloves can be donned.

* Always follow the manufacturer's application volumes and rub times to ensure the effectiveness of the product used.

Once all surgical procedures are finished, general hand hygiene (i.e. non-antimicrobial liquid soap and water or ABHR (if hands are not visibly soiled)) should be performed after surgical gloves are removed and before any other activities are undertaken.

(Category C recommendation)

How long should surgical hand rubbing be carried out to ensure good technique?

Manufacturer's guidance should be followed to ensure effectiveness of the product used.

(Category C recommendation)

What are the hand hygiene facilities required for surgical hand antisepsis (including sink and tap design)?

The following recommendations should be adhered to when considering surgical hand antisepsis facility requirements including sink and tap design:

- The sink and furniture should be at a height to facilitate hand and arm washing and prevent splashing of surgical attire/scrubs/uniform.
- The design and drainage should ensure that the floor does not become wet during washing procedures.
- The rim of the scrub sink should not have an internal lip, as contaminated water from the scrub procedure could collect beneath the rim and attract debris with a potential risk of infection.
- For clinical wash hand basins used for invasive procedures, all basins should have curved sides with no plugs, have no overflows, and be fitted with infrared non touch taps which should not be placed over the waste outlet.
- Foot pedals and/or elbow adjustments should be provided to operate taps and dispense hand hygiene solutions.
- Provision of hot and cold water is essential and water should flow at a steady rate. When specifying taps for scrub sinks, consideration should be given to the use of automatic mixer units providing water at a predetermined temperature.
- The use of sonic accessories i.e. non-touch, fixtures and fittings should be considered.
- Where sensor taps are in operation they must allow a sufficient run-on-time for the hand hygiene/scrub protocol to be completed. The run on time should be a minimum of 20 seconds.
- Foot operated disposal bins for waste paper should be provided.
- Wall-mounted paper towel holders should also be provided.
- The splash-back for scrub sinks and clinical wash hand sinks should be a single waterproof sheet or seal mounting with polyurethane or wall glaze.

(Category C recommendation)

Where should hand hygiene facilities be located for surgical hand antisepsis?

Scrub areas should be separate from the operating theatre (OR) or within a recessed area within the OR and located away from areas containing equipment and laid-up instrument trolleys in order to prevent water splashing and potential contamination.

(Category C recommendation)

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Appendix 1 – Grades of recommendations

Final recommendations are given a grade to highlight the strength of evidence underpinning them, the NIPCM grades of recommendations are as follows:

Grade	Descriptor	Levels of evidence
Mandatory	'Recommendations' that are directives from government policy, regulations or legislation	N/A
Category A	Based on high to moderate quality evidence	SIGN level 1++, 1+, 2++, 2+, AGREE strongly recommend
Category B	Based on low to moderate quality of evidence which suggest net clinical benefits over harm	SIGN level 2+, 3, 4, AGREE recommend
Category C	Expert opinion, these may be formed by the NIPC groups when there is no robust professional or scientific literature available to inform guidance.	SIGN level 4, or opinion of NIPC group
No recommendation	Insufficient evidence to recommend one way or another	N/A