

Surgical Hand Preparation



Objectives

- Clinical importance of hand scrub
- Steps before surgical hand preparation
- Surgical scrub techniques:
 - Time method
 - Stroke method
 - Water-based # Waterless hand scrub



Introduction

- Skin: a major potential source of microbial contamination in the surgical field.

**Although scrubbed members
wear sterile gloves,
the skin should be cleaned pre-op.**

Clinical Importance of Surgical Hand P.

- ❑ The objective of surgical hand (and forearm) preparation before surgery is:
 - To remove debris and transient microorganisms
 - Reduce resident skin flora
 - Inhibit bacterial regrowth on gloved hands.

Although sterile gloves are worn, their use does not replace hand hygiene.

Clinical Importance Of Surgical Hand P.

- *Gloves* can break down and develop unnoticed punctures during an operative procedure.
- *Double-gloving* reduces the risk of puncture, but does not eliminate it.

Hand contamination in a member or members of a surgical team can increase the risk of SSIs, despite the use of sterile gloves.

NEJM 2023

Surgical Hand Preparation

- At the beginning **of an operation**, surgical hand preparation must:
 - eliminate the transient flora, and
 - significantly reduce the resident flora, **and**
- Until the end of the procedure, *maintain the microbial release from the hands below baseline*



Who Must Perform Scrub?

The operative team who'll be in contact with:

The sterile operative field

The sterile instruments and supplies



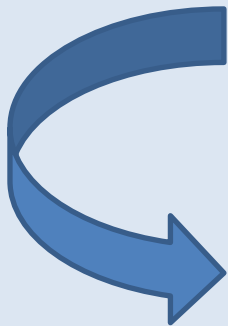
Basic Hand Hygiene

☐ For:

✓ Circulator

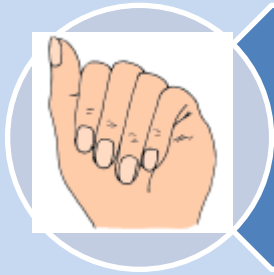
✓ Anesthesiologist

✓ Other team members



**who won't be in
contact with sterile field**

Steps Before Surgical Hand Preparation



Fingernail



Jewelry



Mask and cap

The length of maintaining
fingernails for perioperative
personnel?



Fingernails

- Keep nails short:

↓ Risk of puncturing gloves
↓ Pathogens under the nails
↓ Possibly injuring patients

AORN J February 2017

AORN "Guideline for hand hygiene" 2016

WHO 2009

Fingernails

Keep fingernails short

Not to exceed 1/4 inch
1 inch=2.54 cm

Fingernails

Fingernail tips should be
no longer than 2 mm
(0.08 inch)

Fingernails

Hold the hand vertically and look at the palmar side, nails should not extend beyond the tip of the finger.

Fingernails can be seen extending beyond the tips of the fingers



No fingernails can be seen extending beyond the tips of the fingers



Artificial Fingernails

❑ An important risk factor:

- ⌘ Changes of the normal flora
- ⌘ Impede proper hand hygiene

**Both artificial nails and
nail extenders contribute to
contamination of the hands and
have led to
outbreaks of infection.**

AORN , 2016 , 2017
WHO 2009

Artificial Nail & Nail Polish

**Do not wear
artificial nails or
nail polish**



Fingernails

Some hospital allow personnel to wear nail polish, as long as it is freshly applied and not chipped.

Difficulty in monitoring fingernail polish for chips and length of application may lead some organizations to prohibit perioperative personnel from wearing nail polish.



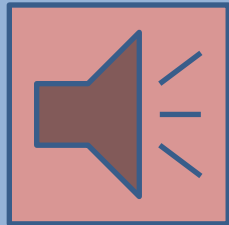
Fingernails

- The determination should also address wearing of **gel nail polishes** that are dried under ultraviolet light, because it is currently **not known** whether wearing these types of polishes carries the same risk of harboring pathogens as wearing artificial nails does.



Jewelry In Operating Room

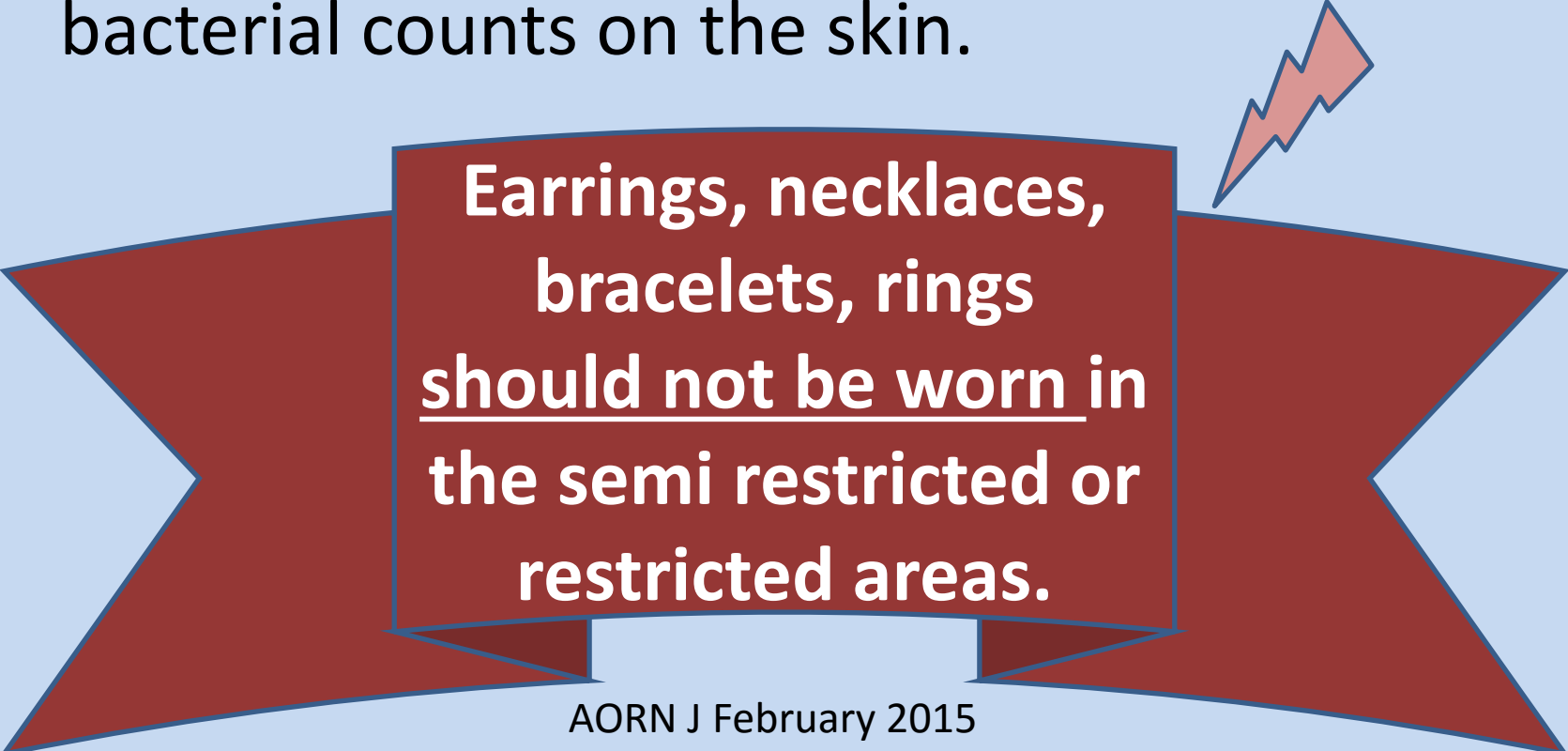
- Recommendation



**Remove all jewelry
(rings, watches, bracelets)
before entering the
operating theatre**

Jewelry

- Wearing jewelry has been found to increase bacterial counts on the skin.



**Earrings, necklaces,
bracelets, rings
should not be worn in
the semi restricted or
restricted areas.**

AORN J February 2015

Mask During Hand Scrub

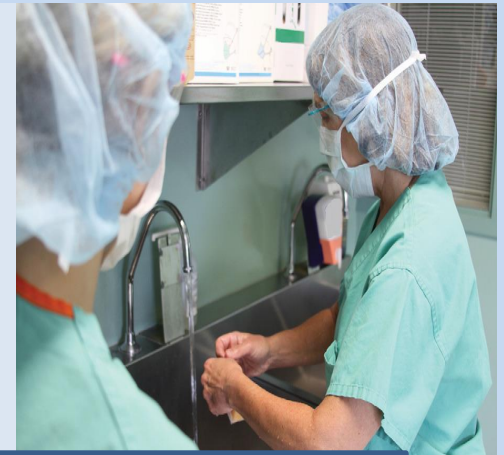
Don a surgical mask.

**Surgical masks should be
worn by all personnel
at the scrub sink
during hand scrub activity.**

Surgical Hand Scrub

1- Timed hand scrub

2- Counted-stroke hand scrub



Two techniques for surgical hand preparation:

1. Water based scrub

(with an antimicrobial soap)

2. Waterless scrub

(with an alcohol based hand rub).

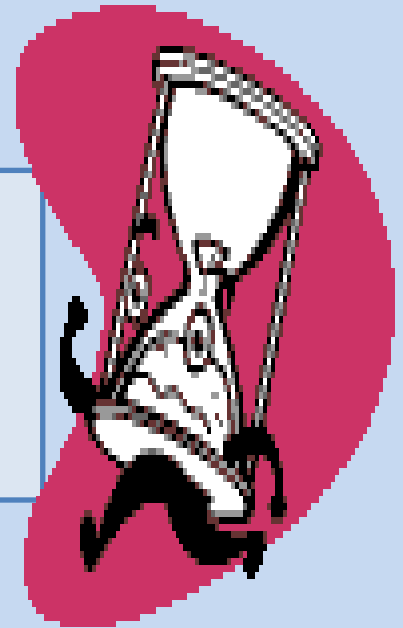
NEJM 2023

Surgical Hand Scrub: Time Method

- Current recommendation vary on the duration of hand antisepsis

- ✓ CDC: 2-5 min
- ✓ AORN: 3-4 min
- ✓ WHO: 3-5 min

2-6 min



Surgical Hand Preparation Products

The spectrum of antimicrobial activity for surgical hand preparation should be as broad as possible against bacteria and fungi



Surgical Hand Preparation Products

- Antiseptic preparations are evaluated for their ability:
 - To reduce the number of bacteria released from hands;
 - **Immediately** after scrubbing
 - After wearing surgical **gloves** for **6 hours** (*persistent activity*)
 - After multiple applications **over 5 days** (*cumulative activity*)

Surgical Hand Hygiene Products

- Significantly reduce microorganisms on intact skin
- Non-irritating
- Broad-spectrum activity
- Fast-acting
- Persistent



Antimicrobial Activity of Antiseptics

Antiseptics	Gr + bacteria	Gr - bacteria	Virus enveloped	Virus Non- enveloped	M.B	Fungi	Spores
Alcohol	+++	+++	+++	++	+++	+++	-
Chlorhexidine	+++	++	++	+	+	+	-
Iodophors	+++	+++	++	++	++	++	-/+

Antiseptics in Hand Hygiene

Antiseptics	Typical conc. in %	Speed of action	Residual activity	Use
Alcohol	60-70 %	Fast	No	HR
Chlorhexidine	0.5-4 %	Intermediate	Yes	HR, HW
Iodophors	7.5-10 %	Intermediate	Contradictory	HW

Surgical Hand Hygiene Products



The diagram consists of two large, stylized arrows pointing towards each other, meeting at a central point. The arrow on the left is purple and contains the text 'Medicated soap'. The arrow on the right is teal and contains the text 'Alcohol-based hand rub'. The background is a light blue gradient.

**Medicated
soap**

**Alcohol-based
hand rub**

Alcohol-based Hand Rub

Surgical Hand Hygiene

Alcohol-based Hand Scrub

- Formulations containing:
 - 60–95% alcohol alone
 - 50–95% when combined + small amounts of QAC, hexachlorophene or CHG

**Reduce bacterial counts on the skin
immediately post-scrub
more effectively than do other agents.**

Medicated Soap

Surgical Hand Scrub

Medicated Soap

- The most commonly used products for surgical hand antisepsis are:

♣ chlorhexidine

OR

♣ povidone-iodine containing soaps

Hand Hygiene Products

**There is no clear difference
among various antiseptic agents
for operative team
to wash their hands**

J of Orthopaedic Research 2014
Who 2018

Alcohol-based Hand Scrub

- For hand hygiene, the use of alcohol-based hand rubs is recommended rather than soap and water, unless hands are visibly soiled, because:
 - ♣ hand rub products are better tolerated *and*
 - ♣ result in less dermatitis.



Scrub Position

- Scrub is performed at:
 - ♥ a scrub sink located in a separate scrub room
 - or**
 - ♥ directly outside the OR in an open corridor



Surgical Hand Scrub and Brush

- Scrubbing with a brush may damage skin and increase bacterial shedding from the hands.

Almost all studies discourage the use of brushes.



WHO 2009
AORN 2016

Surgical Hand Scrub and Brush

**Brushes are not appropriate
for surgical scrub.**

The Best Temperature Of Water For Surgical Scrub

- Warm water makes antiseptics and soap work more effectively.



- ▶ Very hot water removes more of the protective fatty acids from the skin.
- ▶ Washing with hot water should be avoided.

Water Temperature

21.1 ° C - 26.7 ° C

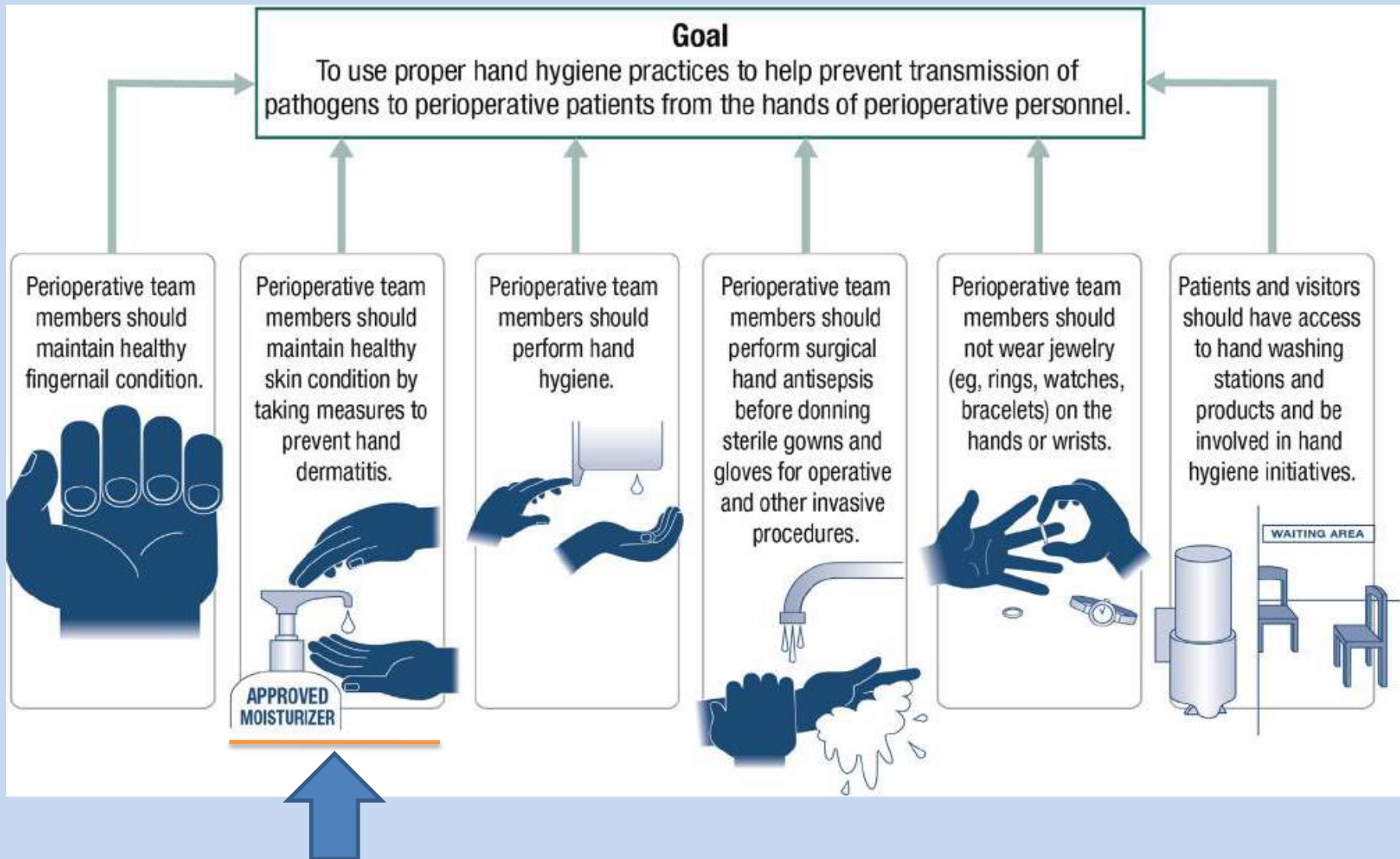
(70 ° F - 80 ° F)

[FGI & AORN]

Because a comfortable temperature improves user acceptance and aids in preventing dermatitis.

AORN: 105° F - 120° F(40.5 ° C - 48.8 ° C) ?

Guideline for hand hygiene




Skin Condition

Maintaining healthy hands and skin can be difficult in the perioperative setting.

A large, hollow, blue downward-pointing arrow connecting the first box to the second box.

Personnel frequently perform hand hygiene as well as surgical hand antisepsis.

A large, hollow, blue downward-pointing arrow connecting the second box to the third box.

Dermatitis can be painful and prevent personnel from properly washing their hands or performing hand hygiene.

Skin Condition

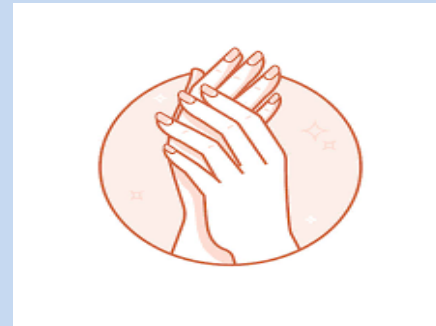
- Damaged skin may harbor more pathogens than healthy skin does.
- **Therefore, it is essential that personnel take measures to prevent dermatitis.**



Skin Condition

- Some lotions can alter the integrity of gloves and change the effects of hand antiseptics.

The use of moisturizers should be limited to those approved by the health care organization.



Skin Condition

- A key component of maintaining healthy **hands** is to ensure they are **fully dried after washing and before donning gloves.**



Skin Condition

- The hands and forearms should be free from lesions or breaks in skin integrity.
- **A waterproof occlusive dressing must cover minor lesions.**



Skin Condition

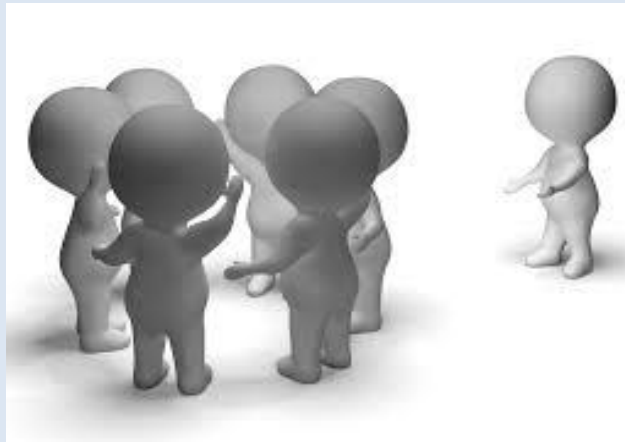
HCWs who have:

- Cuts
 - Abrasions
 - Weeping dermatitis
 - Fresh tattoos on exposed skin,
- should not provide direct patient care until the skin is healed.**

Skin Condition

- If there are any **open lesions** or **breaks** in the skin integrity,

exclude health care providers from the perioperative environment if they pose a threat to patient safety.



Surgical Hand Preparation

WHO 2009

IFPN 2021

AfPP2023



Surgical Hand Preparation

- Clean subungual areas with a nail file.

Nailbrushes should not be used;
If used, nailbrushes must be **sterile**,
once only (single use).









Surgical Scrub With Medicated Soap

❑ Start timing

- Scrub each side of each finger, between the fingers, and the back and front of the hand for 2 minutes
- Proceed to scrub the arms, keeping the hand higher than the arm at all times.












A close-up photograph of a person's hand being washed with soap under a chrome faucet in a stainless steel sink. The hand is covered in white soap suds, and a yellow bar of soap is visible. The person's arm is extended from the right side of the frame. The background shows a white wall and a soap dispenser.

Wash all four sides effectively.







Surgical Scrub With Medicated Soap

- Wash each side of the arm from wrist to the elbow **for 1 minute**
- Repeat the process on the other hand and arm, keeping hands above elbows at all times







Surgical Scrub With Medicated Soap

- If the hand touches anything at any time, the scrub must be lengthened by 1 minute for the area that has been contaminated.



**Throughout the procedure,
hold your hands above your elbows to allow
the water to flow away from the cleanest area,
thereby avoiding contamination.**

Surgical Scrub With Medicated Soap

- 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.**







Procedural Steps for the Water-Based Scrub

Timing or Duration	Step
Before starting	Wet the sponge and start timing.
1 Minute	Scrub the nails of one hand (30 seconds). Scrub every aspect of the fingers of that hand, including the webs, sides, fronts, and backs (30 seconds total; 6 seconds per finger).
1 Minute	Scrub the palm and back of the hand (30 seconds each).
30 Seconds	Scrub each side of the forearm from the wrist to 2 inches (5 cm) above the elbow.
2.5 Minutes	Repeat the process for the other hand and forearm.
After finishing	Rinse both hands and forearms from the fingertips to the elbows.

Surgical Scrub With Medicated Soap

**Proceed to the operating theatre
holding hands above elbows.**

Surgical Scrub With Medicated Soap

- At all times during the scrub procedure, care should be taken not to splash water onto surgical attire.



Surgical Scrub With Medicated Soap

- Hands and arms should be **dried** using a sterile towel and aseptic technique before donning gown and gloves.





Surgical Scrub With Medicated Soap

**Blot dry hand,
progressing
from fingers to
hand**



Surgical Scrub With Medicated Soap



Surgical Scrub With Medicated Soap

Move down the forearm, ending just below the elbow



Surgical Alcohol-based **Handrub**

Surgical Alcohol-based Handrub



1 Put approximately 5ml (3 doses) of alcohol-based handrub in the palm of your left hand, using the elbow of your other arm to operate the dispenser

Surgical Alcohol-based Handrub



2

Dip the fingertips of your right hand in the handrub to decontaminate under the nails (5 seconds)

Surgical Alcohol-based Handrub



3

Images 3–7: Smear the handrub 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 handrub has fully evaporated (10-15 seconds)

Surgical Alcohol-based Handrub



Surgical Alcohol-based Handrub



Surgical Alcohol-based Handrub



8 Put approximately 5ml (3 doses) of alcohol-based handrub in the palm of your right hand, using the elbow of your other arm to operate the dispenser

Surgical Alcohol-based Handrub



9

Dip the fingertips of your left hand in the handrub to decontaminate under the nails (5 seconds)

Surgical Alcohol-based Handrub



10

Smear the handrub 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 handrub has fully evaporated (10-15 seconds)

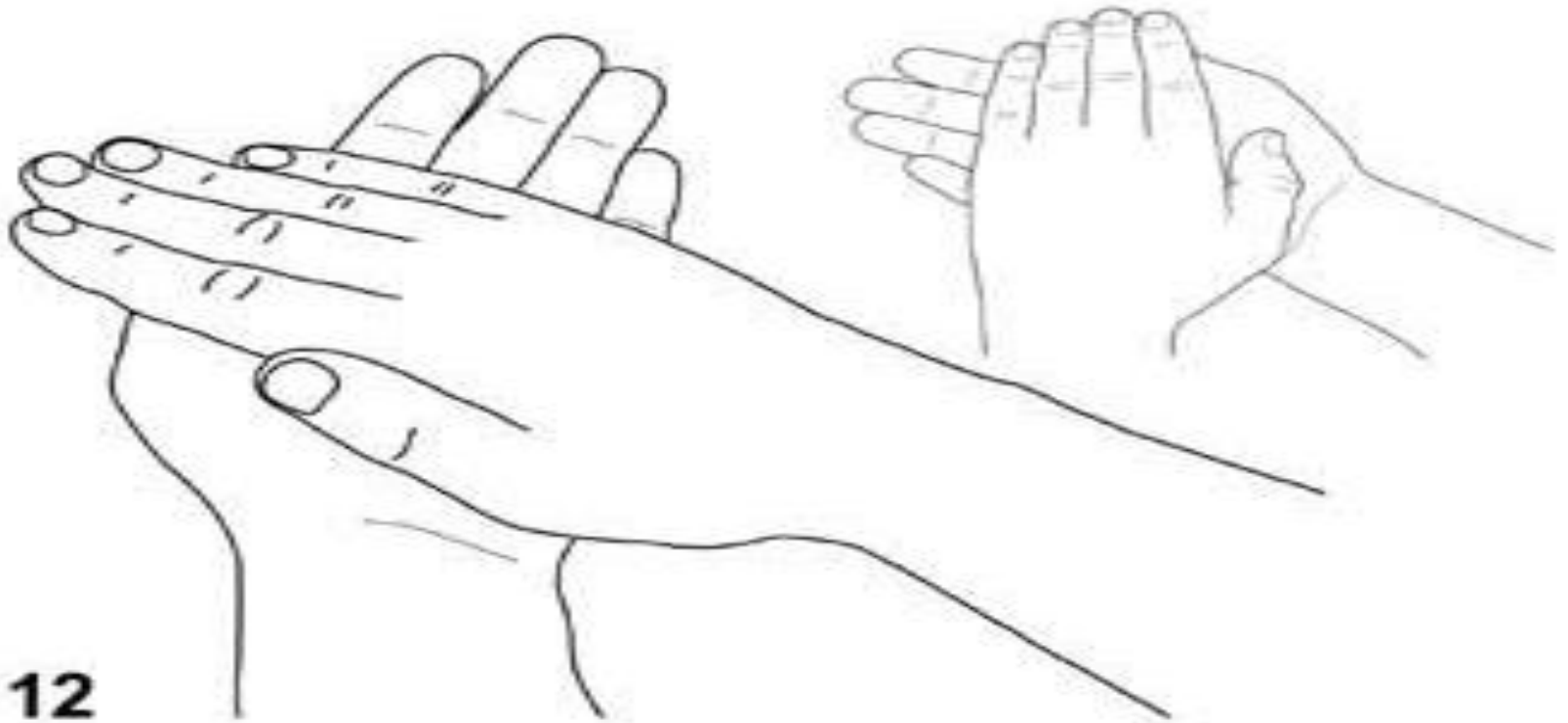
Surgical Alcohol-based Handrub



11

Put approximately 5ml (3 doses) of alcohol-based handrub 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 all the steps represented in Images 12-17 are followed (20-30 seconds)

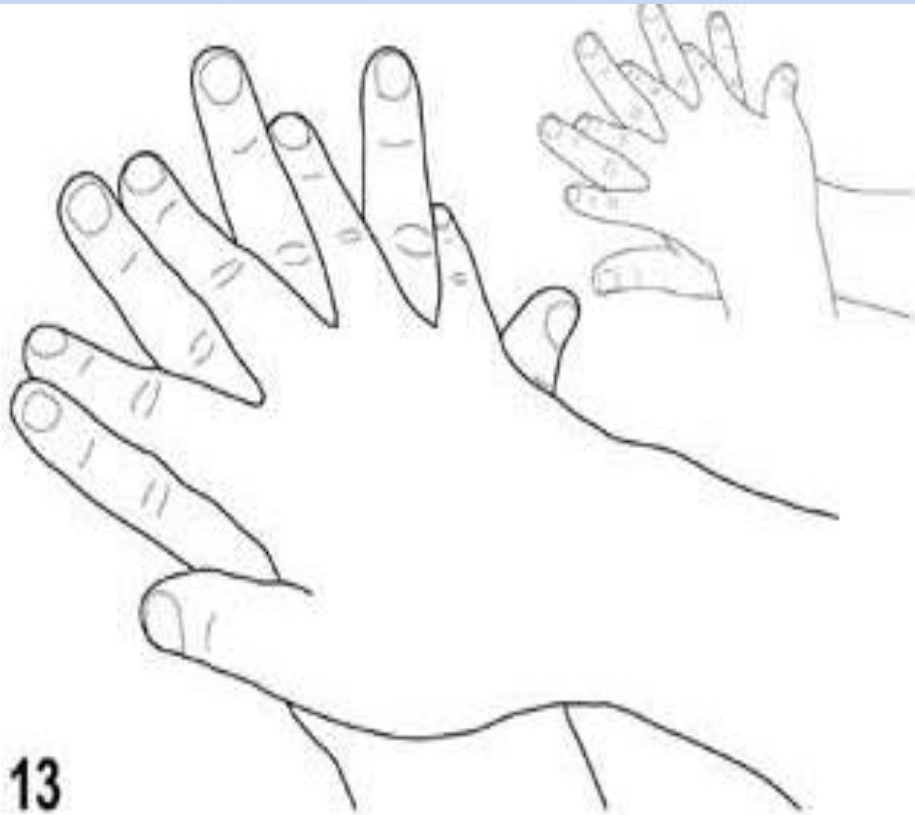
Surgical Alcohol-based Handrub



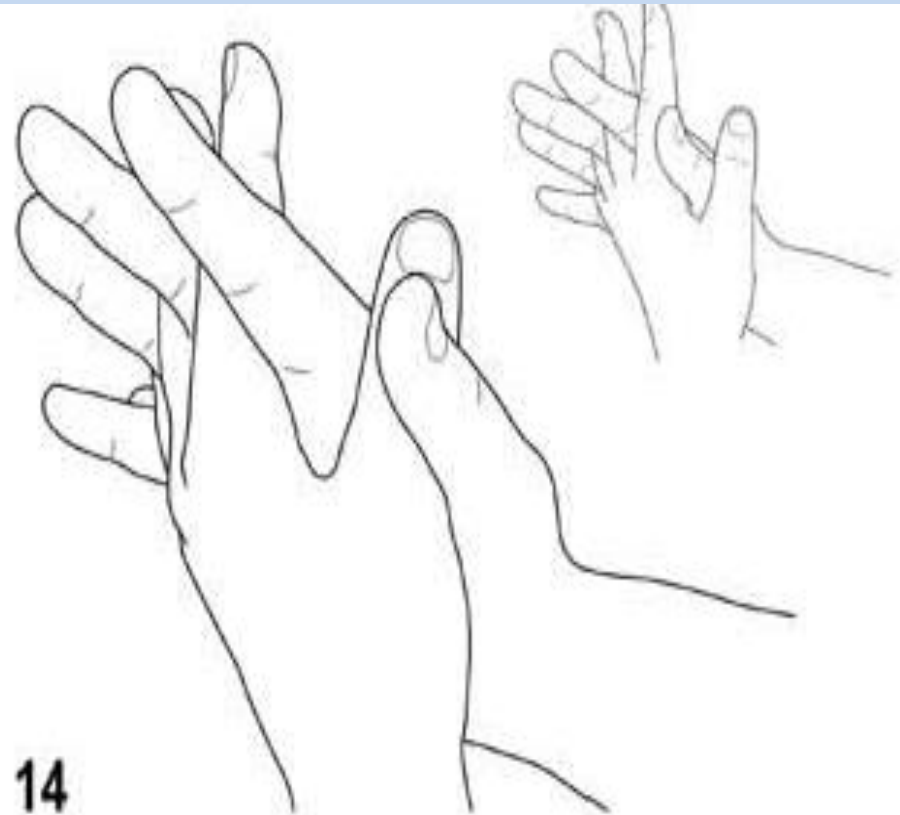
12

Cover the whole surface of the hands up to the wrist with alcohol-based handrub, rubbing palm against palm with a rotating movement

Surgical Alcohol-based Handrub



- 13
- Rub the back of the left hand, including the wrist, moving the right palm back and forth, and vice-versa

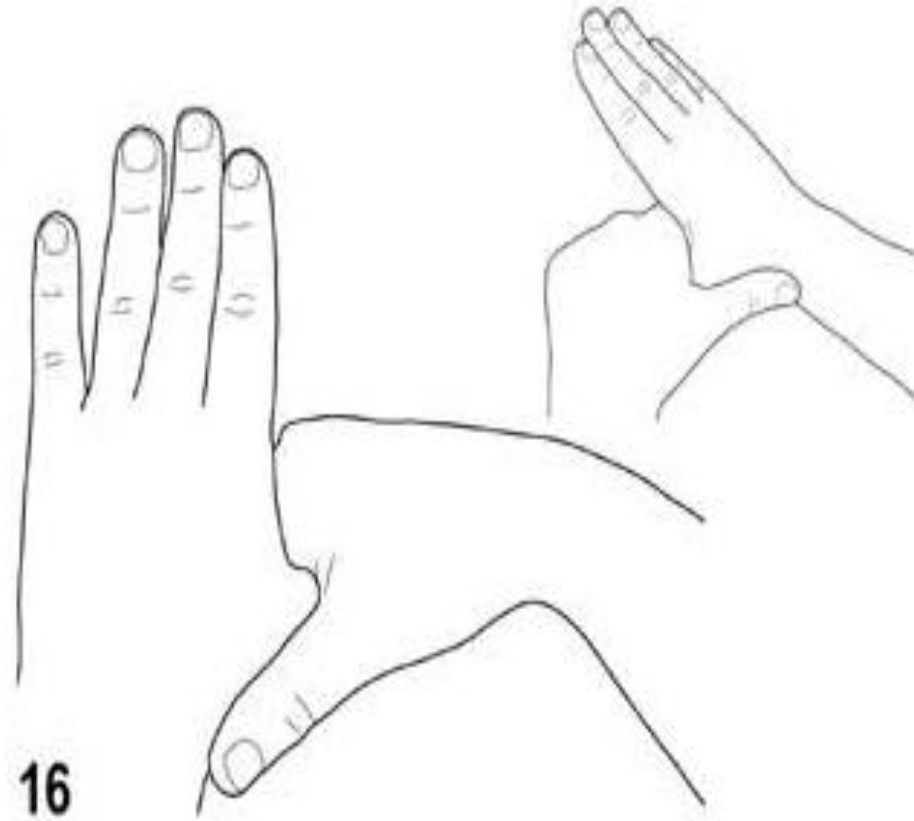


- 14
- Rub palm against palm back and forth with fingers interlinked

Surgical Alcohol-based Handrub



15
Rub the back of the fingers by holding them in the palm of the other hand with a sideways back and forth movement



16
Rub the thumb of the left hand by rotating it in the clasped palm of the right hand and vice versa

Surgical Alcohol-based Handrub



17

When the hands are dry, sterile surgical clothing and gloves can be donned

Pump 1



Dispense hand rub into one hand using foot release or elbow



Dip fingertips of other hand and decontaminate area under nails



Spread remaining solution from wrist to elbow



Apply in circular movement until forearm is covered

Pump 2

Repeat procedure for other hand and forearm

Pump 3



Cover all aspects of hands, up to wrists



Rub backs of hands and palms



Interlace fingers to reach interdigital spaces and apply to thumbs



Allow hands to dry before donning gloves and gown



Surgical Hand Scrub

- Timed hand scrub
- Counted-stroke hand scrub

Counted-stroke Method

- One up-and-back motion = one stroke.
- With scrub brush held in one hand, bristles perpendicular to nail tips, begin scrubbing across nails and fingertips using 30 strokes (20 strokes)

Counted-stroke Method

- Next scrub fingers of the same hand, using **10 strokes** to each side of fingers
- Imagine fingers as having four surfaces (one on each side of each finger)
- Each surface gets **10 strokes**

Counted-stroke Method

- Give special attention to webbed spaces between fingers while scrubbing
- Scrub hand next
- Imagine hand as having four surfaces (*palmar, dorsal, medial, lateral*) and give each surface **10 strokes.**

Counted-stroke Method

- Repeat these steps on other hand
- Add water to sponge as necessary to maintain a good lather.

Counted-stroke Method

- Next scrub arm surfaces from wrists to 2 inches above elbows
- Again, envision the arms as *having four surfaces*, and give each surface 10 strokes (six strokes)

Counted-stroke Method

- To make stroke motion easier on length of arm, *arm length should be divided in half*, scrub from wrist to mid-arm on one arm, then the other.
- Continue from mid-arm to 2 inches above elbow on that arm, then complete the other.

Counted-stroke Method

- **Once a surface has been scrubbed, do not go back over it.**

Aftercare

After the sterile surgical procedure is complete and you have removed your gloves,

➤ clean your hands with soap and water or

➤ an alcohol-based hand rub.

❖ If there is residual talc from the gloves, or

❖ if the gloves have been punctured and biologic fluids are present,

use soap and water.



References

- WHO
- AORN
- CDC
- IFPN
- AfPP
- NEJM

Guidelines

2009-2023



