

Comparing of using sterile brush during surgical scrubbing versus brushless for surgical team in operating room

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Abstract: Background: The aim of this study is comparing between surgical scrubbing with brush versus brushless. **Methods:** Randomized control trials: the subjects will divided into two groups; study group (students who will done the scrubbing without brush) and second group (students who will done the scrubbing with sterile brush). **Sitting:** Operating rooms in EL-Qurryate general hospital. **Subjects:** All internship students in EL-Qurryate general hospital (their numbers 50). Tools of data collection: Data will be collected by (The Modified Scrubbing observation checklist) and Sterile swabs will be used for determining the types of bacteria on students' hands. **Results:** There was no statistically significant difference between the groups; although increase percentage of staphylococci organisms with group of brush (16%). **Conclusion:** this study find that brushes during scrubbing are unnecessary and because of their associated costs would not recommended their use.

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1. Introduction

Surgical site infections (SSIs) are the second to third most common site of health care associated infections (HAIs). These complications of surgical procedures cause considerable morbidity and, when these occur deep at the site of the procedure, can cause mortality as high as 77%. For more than 100 years, research has shown that proper hand washing is the most important way to reduce the spread of infections in health care setting. Without the proper precautions, your health care facility can cause the spread of infections and diseases. When providing health services, it is essential to prevent the transmission of infections at all times [1]. Normal human skin contains bacteria, usually about 10² to 10⁶ colony forming units (CFU) per cm² [2]. prior to operating, scrub team members try to remove extraneous organisms, or transient flora, and minimize the amount of their own skin organisms, or resident flora, with a scrubbing regimen [3,4]. However for SSIs, the initial introduction of microbial pathogens occurs most often during the surgical procedure performed in the Operating Theatre (OT) Although all infection prevention practices contribute to this effort, aseptic technique refers to those practices performed just before or during clinical procedure including:

- Properly preparing a client for clinical procedures: Hand washing, Operating Theatre, Surgical hand scrub, Using barriers such as gloves and

surgical attire, Maintaining a sterile field, Using good surgical technique, Maintaining a safe environment in the surgical/procedure area [1]. The current study focused on surgical hand scrub. The surgical hand scrub is an integral part of the operative environment. Surgeon and technicians must perform this procedure each time they prepare to perform surgery. The Surgical hand scrub plays a significant role in preventing nosocomial and surgical site infections [5]. Surgical hand wash or surgical hand scrub must be performed preoperatively by surgical personnel to eliminate transient and to reduce resident hand flora. The warm, moist conditions inside surgical gloves provide an ideal environment for the growth of microorganisms. Surgical hand wash with antiseptics before beginning surgical procedures will help prevent this growth of microorganisms for a period of time and will help to reduce the risk of infections. Indications of surgical hand wash:

Surgical hand wash is needed for any invasive surgical procedure. All personnel (e.g., doctors, anesthesiologists, and nurses) should perform surgical hand antisepsis before any procedure [1]. The standard of surgical scrub is To reduce the number of bacteria present on the skin of those who are scrubbed for a surgical procedure, thus reducing the possibility of transmission of bacteria if a defect occurs in the sterile gown or gloves. An effective antimicrobial surgical hand scrub agent approved by the facility's Infection

Control Committee will be used for all surgical hand scrubs. The surgical hand scrub procedure shall be standardized for all personnel according to Institutional Policy and Procedures. All operating room personnel will scrub prior to gowning and gloving. Sterile members of the surgical team scrub preoperatively adhering to the principles of Surgical Asepsis. The scrub is timed by a clock for five minutes or fifteen stroke anatomic count method. Another standard of surgical scrub practice is performing the surgical scrub without a brush or sponge is acceptable. The practice of using a brush can damage the skin resulting in increasing shedding of microorganisms from the hands and arms. Scrubbing with a brush also contributes to an increase in the shedding of skin cells [6].

Several studies confirm that the use of a brush or sponge is not necessary as well as demonstrating lower bacterial counts when a brushless surgical scrub is performed, as compared to the use of a brush [7-9].

2. Procedure (according to AORN [6].):

I. Surgical Hand Scrub Preparation:

Remove jewelry as it may harbor organisms, including watches, bracelets and rings. Wear appropriate surgical attire:

- Head gear that covers hair, including sideburns and neckline.
- A mask that covers the nose and mouth.
- Protective eyewash or face shield.
- Shoes that provide protection.

Inspect hands and arms for cuts and abrasions. Open lesions increase the risk of infection to both patient and the surgical team member. Avoid scrubbing if you have open lesions or a cold. Report problems to the head nurse.

Fingernails should be short, clean, and healthy. Sculptured/artificial nails are not permitted for any health care personnel having direct contact with patients harbor microorganisms and hinder effective hand washing.

II. Scrubbing Procedure:

Before the surgical hand scrub, the scrub person opens the gown package containing the sterile gown, towel and gloves and places them on a table in the OR. The main instrument table should not be used to perform the surgical hand scrub, the scrub person:

- Rolls sleeves of scrub top to at least 3" above the elbow, tucks the scrub shirt into the scrub pants.
- Opens the sterile scrub brush package and positions it for easy access;
- Adjusts the water to a comfortable temperature and flow to prevent spraying on the scrub attire. Water is controlled with the knee panel on the sink. Water on

the non-sterile scrub attire may soak through and contaminate the sterile gown;

- Wets hands and forearms;
- Lathers the hands and forearms two inches above the elbows, using an antimicrobial soap. This loosens the surface debris and removes cross-contamination;
- Rinses hands and arms while keeping the fingers pointed upward so that the water drips at the elbows away from the scrub attire;
- Dries hands and arms thoroughly with paper towels;
- Removes nail cleaner from the package, cleans under nails of both hands using the nail cleaner while holding hands under running water, and then discards the nail cleaner;
- Rinses hands;
- Removes the scrub brush and squeezes it under water to dispense the soap (if the brush contains soap), or applies soap from the soap dispenser;
- Avoids contact with faucets or side of sink. If contact is made, scrub must be started again using a new brush.
- Using either the anatomic timed scrub or counted stroke method (see item 3,) holds the brush perpendicular to the fingertips and scrubs the nails; the scrubs the fingers using a back and forth motion on all four sides of each finger, including the webbed spaces of each hand, bends fingers to flatten creases or knuckles while scrubbing;
- Scrubs the palm and the back of the same hand to the wrist using a circular motion;
- Maintains lather and ensures that all skin surfaces are sufficiently exposed to the friction of scrubbing and the antimicrobial agent;
- Moves to arm scrub by mentally dividing the arms into thirds, each third having four planes. The first third is the wrist, the second third is the middle area, and the last third is the proximal third, which is two inches above the elbow. Scrubs 15 strokes for each plane or 2-5 minutes.
- Transfers the scrub brush to the other hand and repeats all the steps for scrubbing from the fingertips to two inches above the elbow;
- Discards the brush into the waste container, dropping it in, keeping hands up and away from your body.
- Rinses hands and arms under running water, starting at the fingertips and working towards the elbow, keeping hand upright and elbows in a downwards position.

Methods of the Surgical Hand Scrub

A. Anatomic Timed Scrub- Scrub maybe for 5 min. or 10 min.

- Five minute scrub provides a 2 % minute scrub per arm.
- Ten minute scrub provides a 5 minute scrub per arm

B. Counted Stroke Scrub- The scrub person counts the number of strokes for each area, 15 strokes per

area. The person should consider each anatomic part-arms, fingers and hands- to have four sides. This method assigns a number of strokes (15) through the scrub brush for each of these surfaces.

C. Brushless (Hand Rub) Scrub-a. Wash hands and forearms with soap and running water immediately before beginning the surgical hand antisepsis procedure.

b. Clean the subungual areas of fingers under running water using a nail cleaner.

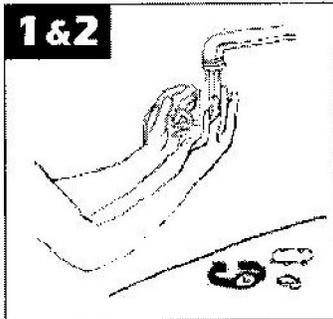
c. Rinse hands and forearms under running water.

d. Dry hands thoroughly with a paper towel.

e. Dispense the manufacturer-recommended amount of the surgical hand rub product.

f. Apply the product to the hands and forearms, following manufacturer's written instructions. Some manufacturers may require the use of water as part of the process.

Steps of Surgical Scrub

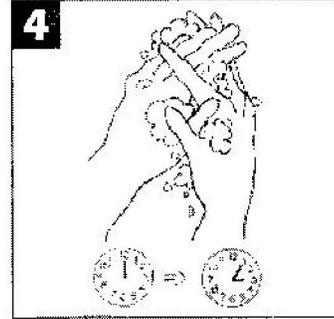


1&2
Remove all jewelry on your hands and wrists.

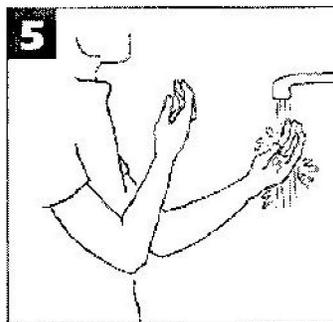
Adjust the water to a warm temperature and wet your hands and forearms thoroughly.



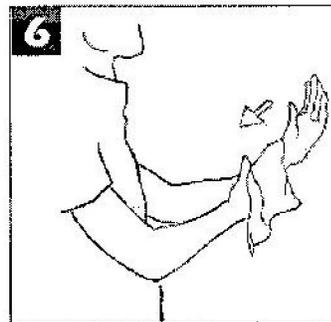
3
Clean under each fingernail with a stick or brush. It is important for all surgical staff to keep their fingernails short.



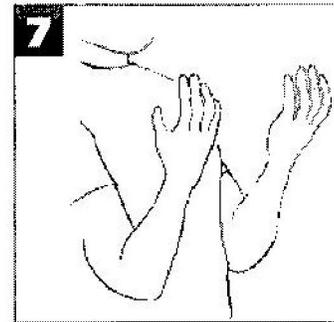
4
Holding your hands up above the level of your elbow, apply the antiseptic. Using a circular motion, begin at the fingertips of one hand and lather and wash between the fingers, continuing from fingertip to elbow. Repeat this for the second hand and arm. Continue washing in this way for 3-5 minutes.



5
Rinse each arm separately, fingertips first, holding your hands above the level of your elbow.



6
Using a sterile towel, dry your hands and arms—from fingertips to elbow—using a different side of the towel on each arm.



7
Keep your hands above the level of your waist and do not touch anything before putting on surgical gloves.

Aseptic Technique

Thus, to reduce the risk of SSI, a systematic but realistic approach must be applied with the awareness that this risk is influenced by characteristics of the patient, operation, personnel, and health care facility. For most SSIs, the source of pathogens is the endogenous flora of the patient's skin, mucous membranes, or hollow viscera. When mucous membranes or skin is incised, the exposed tissues are at risk for contamination with endogenous flora. These organisms are usually aerobic Gram-positive cocci (e.g., staphylococci), anaerobic bacteria and Gram-negative aerobes, Gram-negative bacilli (e.g., *E. coli*), Gram-positive organisms e.g., enterococci, and sometimes anaerobes (e.g., *Bacillus fragilis*) may become typical SSI isolates. Exogenous sources of SSI pathogens include surgical personnel (especially members of the surgical team), the operating room environment (including air and all tools, instruments, and materials brought to the sterile field during an operation). Exogenous flora is primarily aerobes, especially gram-positive organisms (e.g., staphylococci and streptococci). Interventions to prevent SSIs therefore are aimed at reducing or preventing microbial contamination of the patient's tissues or of sterile surgical instruments. Other interventions include preoperative antibiotic prophylaxis, careful surgical technique (as surgical brush), adequate ventilation of the OT [10].

Methodology:

Data is collected from (50) internship students girls (College of Health sciences for Girls at El-Qurryate), their age ranged from 19 years to 35 years. They are divided into (2) groups; G1 (25) students

had scrub without brush and G2 (25) had scrub with sterile brush (Table 1). G1 and G2 are selected randomly and all characteristics are nearly in two groups except the intervention.

Process:

The current study is performed at El-Qurryate General Hospital. The researcher starts with explaining the scrubbing procedure for two groups of study. The researcher ensures that there is no injury or wound in hand before performing the scrubbing procedure and through applying the scrubbing procedure by internship student the researcher observes each student through 2-minutes by hand scrubbing checklist (table 1). All students in group (G1) do not use brush during procedure but (G2) using sterile brush in scrubbing. After the student dries the hand, the researcher takes a bacterial swab from the right back hand surface and this swab tube is colored with red and given a serial number. Then after one hour of sterile gloved hand (during an operation) the student removes the sterile gloves by the correct way (table 2) and takes another sterile bacterial swab from the same hand and swab tube is colored with black and given the same serial number. The same steps that occurred for (G1) are repeated also for (G2) *except using of sterile brush during scrubbing*, and the first bacterial swab is colored with green and the second bacterial swab after one hour of gloved hand is colored with blue and given the same serial number. Collect all swab results from laboratory for statistical analysis. The collection data is taken ten months; start from May 2011 to March 2012.

Table (1): Scrubbing procedure:

- *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 (or brush).
- *Visualize each finger, hand, and arm as having four sides. Wash all four sides effectively
- *Repeat this process for opposite fingers, hand, and arm.
- 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 sponge, if used, in appropriate container.
- *In OR, dry hands before donning a sterile surgical gown and gloves.

Reference [11].

Table (2): Removing the gloves:

- *Grasp one glove near the cuff and pull it partway off.
- *The glove will turn inside out.
- *Keep the first glove partially on before removing the second one to protect you from touching the outside of a glove with your bare hand.
- *Leaving the first glove over your fingers, grasp the second glove near the cuff and pull it partway off.
- *Keep the second glove partially on.
- *Pull off the two gloves at the same time, being careful to touch only the inside surface of the gloves with your bare hand.

Reference [12].

Laboratory Test:

Each swab is taken serial number and putted in a blood agar dishes then enter inside special incubator at 36°C and the result is taken through 48 hours. The number & type of microorganism present per hand were calculated and determined. The microorganisms that may present are coagulase negative staphylococci, streptococci and *E.coli* but the result is (four) cases from 25 samples, had microorganisms of

coagulase negative staphylococci for group 2 (that using a brush) after one hour gloved hand.

3.Result:

Analysis of variance (ANOVA) is used between two groups across immediate after scrub and after one hour gloved hand. There was no statistically significant difference between the groups. Though increase number and percentages (16%) of Staphylococci microorganisms after one hour gloved hand in G2.

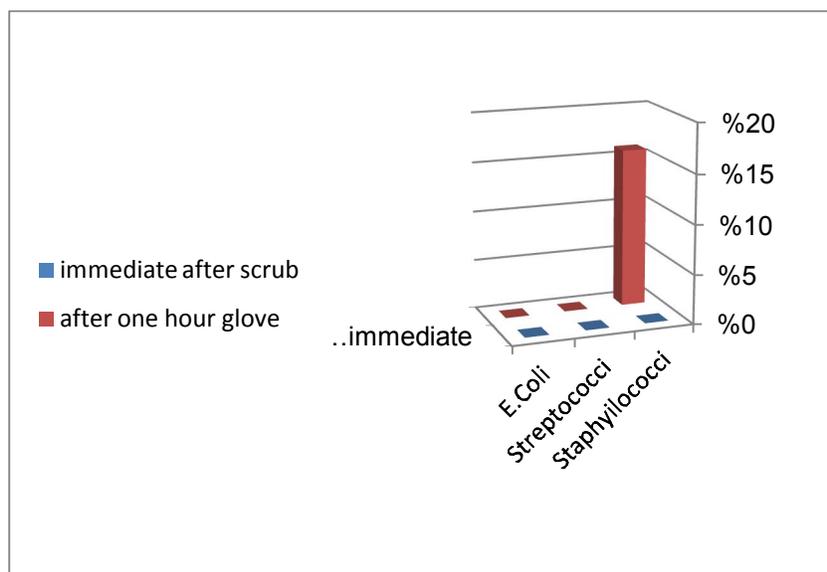
***Table (3): Numbers of microorganisms' multiplication during surgical scrubbing through laboratory investigations (Swabs) for groups under study**

Microorganisms type	G1(25no)*				G2(25no)**			
	Immediate after scrub		After one hour gloved hand		Immediate after scrub		After one hour gloved hand	
	no	%	no	%	no	%	No	%
Staphylococci	0	0	0	0	0	0	4	16
Streptococci	0	0	0	0	0	0	0	0
<i>E.coli</i>	0	0	0	0	0	0	0	0

*G1(group not use brush during surgical scrubbing)

**G2(group use brush during surgical scrubbing)

Percentages of microorganisms' multiplication during surgical scrubbing through laboratory investigations (Swabs) for two groups under study

**4.Discussion:**

The results of the current study show no statistically significant differences between two groups(G1 & G2) in bacterial counts, though appears bacteria laboratory results (staphylococci) in four cases of (G2) scrubbing with brush after gloved hand. This could mean that brush causes skin damage. The other studies that support study result and the same time support the hypothesis of current study; [13] said that no statistically significant differences

between nail brushes or nail picks during scrubbing. This means that using of brushes or picks does not provide any further reduction in bacterial counts on hands. In fact, the group which used brushes had a slightly higher bacterial counts, this could mean that brushes traumatize the skin around the nails creating an environment for bacteria thrived. Also [14] support the current hypothesis study and said that, no scrub brush resulting in no skin damage. All hand washing involves some skin damage and the skin

harbors increased numbers of bacteria. [15] showed that the use of a for surgical hand antisepsis/scrubs is not necessary for adequate reduction of bacterial counts. Skin damage from scrubbing with brushes can lead to an increased number of gram-negative bacteria and candida. Scrubbing with a brush is associated with an increase in skin cell shedding. Mechanical scrubbing with friction and brushes has been standard procedure for many decades [16] despite the need for surgical hand scrubbing, more scrubbing with a brush is not necessarily better or clinically effective in reducing microbial counts [17-20].

Mechanical scrubbing with friction and brushes has been standard procedure for many decades [20]. Despite the need for surgical hand scrubbing, more scrubbing with a brush is not necessarily better or clinically effective in reducing microbial counts [21-24].

However, in this study, the increase was not statistically significant and a larger sample size would be needed to confirm this hypothesis.

However, changing practice can be difficult especially with male staff because hair in forearm.

Some researchers have shown that 2- and 3-minute surgical hand scrubs are both clinically effective [25], this support current study methodology. Brushes should be soft enough to not damage skin and also remember that excessive use of the surgical scrub (with brush) process may result in skin damage and dermatitis more than use of anatomic scrub (brushless).

Almost all studies discourage the use of brushes. Early in the 1980s, Mitchell and colleagues suggested a brushless surgical hand scrub [26].

Conclusion:

Surgical scrubbing with or without brushes do not provide additional decontamination. So, this study find that brushes during scrubbing are unnecessary and because of their associated costs would not recommended their use.

The need for further research to be conducted with male sample and study viruses, fungal or atypical organisms.

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