

The surgical scrub: Where do we stand today?

Although data may vary on techniques and antiseptic use, scrubbing is a much needed defense against the spread of surgical infection.

ORTHOPEDICS TODAY 2009; 29:18

by David N Vegari, MD; Lauren May; and Javad Parvizi, MD, FRCS
Special to *Orthopedics Today*

Many people think the greatest threat to orthopedic surgery today is infection. The risk of infection following primary hip or knee arthroplasty hovers around 1%. The repercussions of such an infection are punishing: multiple operations; primary- and secondary-stage exchanges; fusion; and the most dire, amputation. The costs of these complications are equally astonishing: estimated to exceed 50% of inpatient resources for hip and knee revision surgeries by 2025 and 2016, respectively.

Given the current state of health care, the government will desire to curb the infection rate for economic purposes and the benefit of the patient. Perhaps the most cost-effective means to curb the rate of infection is to evaluate and focus on the preoperative scrubbing techniques that we employ prior to entering the operative theater.

History

Perhaps the greatest initial contribution to the idea of sterile technique, and specifically hand washing, comes from Joseph Lister, a professor of surgery at the University of Glasgow. Having followed the workings of French chemist Louis Pasteur, he adopted similar practices in his surgeries. Specifically, he adopted the novel idea of surgeons wearing clean gloves and washing hands with phenol before and after surgery.

In 1961, the U.S. Public Health Service produced a film demonstrating appropriate hand washing techniques. Later, the Centers for Disease Control (CDC), the Association for Professionals in Infection Control and Epidemiology (APIC) and other organizations produced numerous guidelines on hand washing.

Resident flora

It has been found that the hands of medical personnel can have bacterial counts in the range of 3.9×10^4 to 4.6×10^6 . These flora are divided into two subsets: resident and transient flora. Resident flora, including such species as coagulase-negative *Staphylococcus* and anaerobic diphtheroids, are typically located in deeper layers of the skin and are much more difficult to eradicate, but given their location are less likely to cause infection. Conversely, transient flora typically colonize the superficial layers of the skin, making them both readily removable with hand washing and more prone to being the pathogens responsible for an infection. Thus, the goal of a surgical hand scrub is to eliminate transient flora and reduce resident flora while inhibiting growth of bacteria under gloved hands.

Hand scrub technique is mostly regulated by individual hospitals but varies little with regard to important aspects of the national guidelines. All jewelry of the hand and forearm must be removed, and no nail polish or artificial nails should be worn to reduce residual bacterial contamination before beginning to scrub.

The technique

The scrub begins with an antimicrobial soap wash to remove any gross contamination. Next, all subungual areas should be cleaned with a nail file followed by a vigorous scrub of the fingertips that progresses from the fingers to the palms, up the forearms and to the elbows. This should be repeated on the other hand and arm in an identical fashion. While a timed scrub, which includes specific time minimums for each scrub area, is most common, the Association of Operating Room Nurses (AORN) also endorses a counted stroke method. The use of a sponge or brush is often recommended in hospital guidelines, but reviews of recent studies by the World Health Organization (WHO) and the CDC have shown that scrubbing without a sponge or brush also reduces bacterial levels to an appropriate level.

The timing of the surgical scrub is an important part of the protocol. Historically, a longer scrub has been thought to be more effective, but a number of studies question the minimum scrub time for an effective outcome. They found 5-minute scrub is equally sufficient as a 10-minute scrub and 2- to 3-minute scrubs proves as effective in lowering bacterial counts.

An antiseptic must meet several qualifications including: decreasing microbial counts; be fast-acting; and prevent regrowth of organisms, particularly in a gloved hand where a warm, moist environment can easily foster growth. Other traits are the bacteriocidal nature of antiseptic, a broad spectrum of activity and timing of scrub. Antiseptics include alcohols, chlorhexidine, chloroxylenol, hexachlorophene, iodine and iodophors, quaternary ammonium compounds and triclosan. The most effective antiseptics contain 60% to 95% alcohol alone or contain 50% to 95% alcohol and quaternary ammonium compounds, hexachlorophene, or chlorhexidine gluconate.

A recent change in surgical hand hygiene has been the addition of waterless alcohol-based hand rubs that often include long-acting compounds like chlorhexidine gluconate. According to the WHO Guidelines on Hand Hygiene in Health Care, alcohol-based rubs are more effective than other antiseptics. Even though studies comparing alcohol rubs with scrubs are inconclusive, alcohol-based rubs are considered an acceptable alternative to a scrub. While it is not necessary to wash hands before using an alcohol-based hand rub, hands should be washed if they are visibly soiled to eliminate risk of bacterial spores which are not affected by alcohol.

Sterile gloves limit contamination of the surgical field and decrease the risk of pathogen transmission to the patient and the surgical team. However, in orthopedic surgery, gloves are at great risk for puncture. One particular study found 37.5% of gloves were punctured by the end of surgery. The same study showed double gloving decreased the risk of puncture during surgery to 17%, an improved yet unacceptable level of glove breaching.

Thus, hand washing continues to be a necessary line of defense against the ultimate orthopedic failure: infection. With a proper regimented surgical scrub protocol and the proper use of various antiseptics, we as surgeons can help minimize surgical-site infections.

For more information:

- David M. Vegari, MD, Lauren May, and Javad Parvizi, MD, FRCSC, can be reached at Rothman Institute of Orthopaedics at Jefferson, 925 Chestnut St., 2nd Floor, Philadelphia PA 19107; 267-399-3617; e-mail: parvj@aol.com.

References:

- Association of Operating Room Nurses. Recommended practices for surgical hand scrubs. *AORN J.* 1999;69(4): 842,845-850.

Boyce JM, Pittet D, et al. Guideline for hand hygiene in health-care settings. Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. *Infect Control Hosp Epidemiol.* 2002;23(12 supp):S3-40.

Lister J. On the Antiseptic Principle of the Practice of Surgery. *Lancet.* 1867;90:2299.