Wearing long sleeves while prepping a patient in the operating room decreases airborne contaminants

Troy A. Markel MD, Thomas Gormley PhD, Damon Greeley PE, John Ostojic IH, Jennifer Wagner PhD, CIC

Department of Surgery, Riley Hospital for Children, Indiana University Health, Indianapolis, IN
School of Concrete and Construction Management, Middle Tennessee University, Murfreesboro, TN
Global Health Systems Inc., Fort Mill, SC
ARTEC Environmental Monitoring, Indianapolis, IN
Prism Environmental Health and Safety, Discovery Bay, CA

Key Words: Operating room attire long sleeves environmental quality indicators patient prep

Background: The use of long sleeves by nonscrubbed personnel in the operating room has been called into question. We hypothesized that wearing long sleeves and gloves, compared with having bare arms without gloves, while applying the skin preparation solution would decrease particulate and microbial contamination.

Methods: A mock patient skin prep was performed in 3 different operating rooms. A long-sleeved gown and gloves, or bare arms, were used to perform the procedure. Particle counters were used to assess airborne particulate contamination, and active and passive microbial assessment was achieved through air samplers and settle plate analysis. Data were compared with Student’s t-test or Mann-Whitney U, and P < .05 was considered to be significant.

Results: Operating room B demonstrated decreased 5.0-μm particle sizes with the use of sleeves, while operating rooms A and C showed decreased total microbes only with the use of sleeves. Despite there being no difference in the average number of total microbes for all operating rooms assessed, the use of sleeves specifically appeared to decrease the shed of Micrococcus.

Conclusion: The use of long sleeves and gloves while applying the skin preparation solution decreased particulate and microbial shedding in several of the operating rooms tested. Although long sleeves may not be necessary for all operating room personnel, they may decrease airborne contamination while the skin prep is applied, which may lead to decreased surgical site infections.

© 2017 Association for Professionals in Infection Control and Epidemiology, Inc. Published by Elsevier Inc. All rights reserved.

Wearing surgical scrubs in the operating room has been standard since the middle of the 20th century. Multiple studies have evaluated the type of fabric used for scrubs, as well as whether the cuffs and ankles should be tucked in, whether boots should be worn, and where the scrubs should be laundered. However, the use of only certain articles of surgical clothing, such as sterile gloves and impervious surgical gowns, has been shown to reduce surgical site infections. In the modern operating room, there has been a development of appropriate and effective ventilation strategies, which help cleanse the air and reduce bacterial load.

Although much attention has been devoted traditionally to the immediate bedside surgical team, concerns regarding overall operating room cleanliness have shifted the focus to other care members within the clean space. Previous studies have revealed that simple movements by operating room personnel generate a fairly large number of airborne particles. In 2004, the Association of periOperative Registered Nurses (AORN) began to recommend that long sleeves be worn by these personnel under the premise that the long sleeves would capture epithelial skin cells, which tend to carry bacteria. They thought that this practice might reduce surgical site infections. Furthermore, the current policy recommendation from AORN is that the individuals who apply antibacterial skin prep immediately prior to surgery do so wearing long sleeves and gloves. These “sleeves” are typically warm-up jackets or nonsterile gowns.

Studies with clothed and unclothed individuals in the operating room suggested that clothed individuals may actually disperse more bacteria. The theory surrounds the notion that the friction
of the clothes increases skin cell and bacterial dispersal. Given the conflicting data in the literature regarding the effectiveness of wearing long sleeves while performing skin preparation before surgery, we elected to review several environmental quality indicators. We hypothesized that wearing a long-sleeved gown and gloves during skin prep would decrease airborne contaminants, compared with standard scrubs with bare arms exposed.

METHODS

Study design

An experimental study was performed to assess the utility of long-sleeved gowns and gloves in reducing the particle and bacterial load over the operating room table during standard preoperative skin prep. Two experimental groups were studied: “Sleeves,” in which the prepping individual wore a long-sleeved sterile gown with sterile gloves; and “Bare Arms,” in which the prepping individual did not wear a long-sleeved gown or gloves. Particle contamination as well as bacterial load were assessed (see below).

Location

In order to better translate the results of this study across multiple institutions, one operating room at each of 3 hospitals was used for experimentation. Two operating rooms were within academic medical centers (A and B), and one was an outpatient surgery center (C). All had high-efficiency particulate air (HEPA) filtration systems and measured 638, 554, and 415 square feet, respectively. All rooms were maintained at approximately 25 air changes per hour for the study. Studies took place from February to July of 2017.

Personnel

The study team consisted of a surgeon, a microbiologist, 2 engineers specializing in heating, ventilation, and air conditioning, and an industrial air hygienist. The surgeon, microbiologist, one engineer, and the air hygienist were present in the room during the studies. The surgeon was responsible for performing the mock prep procedure; the microbiologist and engineer deployed and monitored the surface air samplers and settle plates to collect bacterial data; and the air hygienist monitored the particle counter for particle assessment. The microbiologist, engineer, and air hygienist approached the operating room table only to tend to their equipment, and then backed slowly away to the periphery of the room. The additional engineer was outside of the operating room and insured that the room temperatures and air velocities were consistent throughout the procedures and between sites. Study personnel wore standard, hospital-issued, clean scrubs, masks, head covers, and shoe covers.

Mock prep of patient

A mock skin prep procedure was designed to cover the area of the operating room table, in the location where a normal adult patient’s abdomen would be during surgery (Fig 1). An actual patient was not utilized, so that instrumentation could be in the sterile field, and to avoid contamination of the sterile field with the patient’s native flora. Additionally, we wanted to ensure that we measured only the flora of the prepping person. The mock skin prep lasted 11 minutes, to allow adequate capture of environmental contaminants. During that time, the prepping surgeon (TAM) held a chlorhexidine skin prep stick and moved his hands back and forth over the patient in a fashion similar to what would be done for a routine skin prep for surgery. The mock skin prep encompassed the whole prep zone (Fig 1). In each of 3 operating rooms, a total of 4 experiments were performed. In 2 of these experiments, the prepping surgeon (TAM) held a chlorhexidine skin prep stick and moved his hands back and forth over the patient in a fashion similar to what would be done for a routine skin prep for surgery. The mock skin prep encompassed the whole prep zone (Fig 1). In each of 3 operating rooms, a total of 4 experiments were performed. In 2 of these experiments, the prepping surgeon wore a sterile gown and gloves that were provided by the institution (“Sleeves”). Experiments were alternated—Sleeves, Bare Arms, Sleeves, Bare Arms—at each institution. A total of 6 experiments with Sleeves, and 6 with Bare Arms were performed for the entire study.

Particles

Particle contamination was measured using a Climet Model CJ-750T 75 LPM particle counter. The particle counter was placed...
دریافت فوری متن کامل مقاله

امکان دانلود نسخه تمام متن مقالات انگلیسی
امکان دانلود نسخه ترجمه شده مقالات
پذیرش سفارش ترجمه تخصصی
امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
امکان دانلود رایگان ۲ صفحه اول هر مقاله
امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
دانلود فوری مقاله پس از پرداخت آنلاین
پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات