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Major Article

Impact of home versus hospital dressing on bacterial contamination of surgical scrubs in the obstetric setting: A randomized controlled trial

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Background: The impact of the site where an obstetrician dresses in their surgical scrubs, home versus hospital, on total bacterial burden remains unknown. Therefore, our objective was to quantify the effect of dressing in surgical scrubs at home versus at the hospital on the bacterial contamination at the beginning of a scheduled shift.

Methods: This was a single blind randomized controlled trial. Eligible participants were resident physicians assigned to labor and delivery at a single institution during the study period, and participants were randomized daily to 1 of 4 arms based on the site where their scrubs were laundered (A) and where the resident dressed (B) (A/B): home/home, home/hospital, hospital/home, and hospital/hospital. At the beginning of the assigned shift, microbiologic samples from the chest pocket and pants' tie were collected with a sterile culture swab. Samples were plated on trypticase soy agar with 5% sheep blood before being incubated at 35°C-37°C for 48 hours, with observation every 24 hours. The primary outcome was total bacterial burden, defined as the sum of the colony forming units (CFUs) from the 2 sampling sites.

Results: There were 21 residents randomized daily for 4 days to 1 of 4 study arms, resulting in 84 observations. There were no baseline differences between the home- and hospital-dressed cohorts. Overall, 68% of sampled scrubs demonstrated some bacterial growth. There was no difference between the home- and hospital-dressed cohorts in percentage of samples demonstrating any bacterial growth after 72 hours (60% vs 76%, $P = .14$), nor in median bacterial burden at the beginning of a shift (2 [interquartile range, 0-7] vs 1 [interquartile range, 1-5] CFUs, $P = .62$). Finally, there was no difference in total bacterial burden at the beginning of a shift between the home- and hospital-dressed cohorts when stratified by site where the scrubs were laundered.

Conclusions: There was no significant difference in total bacterial burden of surgical scrubs at the start of a shift between cohorts who dressed at home versus at the hospital.

Reducing the incidence of health care–associated infections is a significant policy priority of both the World Health Organization[1] and the Joint Commission on Accreditation of Healthcare Organizations. The Centers for Disease Control and Prevention and the Occupational Safety and Health Administration have issued specific guidelines to reduce surgical site infections, covering all facets of exposure that patients encounter during operative procedures.[2] Although these guidelines prescribe specific laundering parameters for surgical scrubs worn by hospital personnel, there are no clear parameters for restriction of location in which staff dress in their uniforms. In the absence of formal national recommendations, many individual hospitals have crafted their own internal policies, often prohibiting surgical scrubs to be worn in from home to, in theory, limit the risk of bacterial contamination.[3] However, the effect of the location where a provider dresses (home vs hospital) on bacterial contamination of surgical scrubs has not been tested.

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Three primary methods for quantifying bacterial contamination of surgical scrubs have been described: the rolling swab technique, in which a designated area is swabbed for 20 seconds in a rolling fashion with a CultureSwab EZ (BD Diagnostics, Franklin Lakes, NJ) and then plated and incubated for a given period[4]; the imprinting technique, in which a dedicated area of the surgical scrubs is directly imprinted on the agar for 3 seconds and incubated for a given period[5]; and the destructive technique, where a dedicated area of the surgical scrubs is excised from the uniform and pummeled for 4 minutes on high speed in a Seward Stomacher (Seward Limited, Worthing, West Sussex, UK), with the resulting liquid plated and incubated for a given period.[6] Although the imprinting and destructive techniques have yielded higher rates of bacterial contamination per item sampled and cultured, they either soil or destroy the scrub uniform in question. The rolling swab technique offers the advantage of a subject being able to continue to wear the cultured scrubs.

Therefore, our objective was to quantify the effect of dressing in surgical scrubs at home versus dressing in the hospital on total bacterial contamination of surgical scrubs at the beginning of a scheduled shift, using the rolling swab technique.

MATERIALS AND METHODS

We conducted an institutional review board–approved single blind randomized controlled trial between February 1, and June 30, 2015 (clinicaltrials.gov registration no. NCT02348866). Eligible participants were obstetrics and gynecology resident physicians assigned to the labor and delivery rotation at our tertiary teaching hospital (annual delivery volume, 5,600) during the study period; there were no exclusion criteria.

Consenting participants were randomized daily for 4 d/wk per rotation block, and were assigned to 1 of 4 study arms by the restricted shuffle approach. The study was conducted Monday-Thursday for practical reasons because these are the days with the largest number of staff and when the largest volume of procedures are scheduled on the labor and delivery ward. The study arms were based on the site where their scrubs were laundered (A) and where the resident got dressed (B) (A/B): home/home, home/hospital, hospital/home, and hospital/hospital. Assignments were sealed in sequentially numbered opaque envelopes, and were given to each participant the evening before their assigned labor and delivery shift by a research assistant (L.B.J.). Researchers were blinded to participant assignments. Other than the site where the scrubs were laundered and put on, subjects were instructed to follow their usual daily practices, including whether or not a white coat or other outer layer was worn. Given our pragmatic design, scrubs that were taken home for either laundering or dressing were transported in standard fashion. The institution's scrub dispensing machine does not dispense scrubs in any wrapping; therefore, most were transported unwrapped in personal backpacks or purses.

Microbiologic samples were collected using the rolling swab technique with CultureSwab EZII swabs (BD Diagnostics, Sparks, MD) the morning after randomization at the start of the day's shift by 1 of 2 study investigators (D.H.S. or L.B.J.). Based on the work of Krueger et al,[4] we chose 2 standardized sites for sampling: the medial portion of the chest pocket and the end of the pants' tie. Although the Kruger study sampled a 10- × 10-cm area directly below where the pants were tied, our cohort included 21 residents, men and women, and the sampling took place twice, both at the beginning and the end of a scheduled shift, while the scrubs were being worn, and in a public space. We opted to sample proximal to the 2 areas with the highest bacterial content from the Kruger study, and we chose the actual pants' tie, as opposed to the material below the tie, because it was deemed less invasive to the wearer of the scrubs than the 10-cm area beneath the pants' tie. Designated areas (2 cm) were identified and swabbed for 20 seconds in a rolling fashion. All swabs were taken to the microbiology laboratory within 30 minutes of collection, and the samples were plated on trypticase soy agar with 5% sheep blood (BD Diagnostics) before being incubated at 35°C-37°C for 48 hours, with observation every 24 hours. A subset of samples (n = 24) were also screened for methicillin-resistant *Staphylococcus aureus* colonization.

We had 2 primary outcomes of interest: (1) the percentage of scrub samples demonstrating some bacterial growth after the rolling swab technique, and (2) total bacterial burden, which we defined as the sum of the number of colony forming units (CFUs) derived from the swabs of the chest pocket and pants' tie areas for each subject. Based on the work of Nordstrom et al,[6] we estimated that we would need 42 subjects per arm to detect a 50% difference in total bacterial burden between scrubs put on at home and those put on at the hospital, with an α of 0.05 and a β of 0.2.

Bivariate comparisons of home- versus hospital-dressed samples were conducted using 2-tailed independent sample *t* test or Wilcoxon rank-sum test for continuous variables, and χ^2 test for categorical variables. We used the nonparametric k-sample test on the equality of medians to compare total bacterial burden by dress site, and the Kruskal-Wallis test to compare distributions of total bacterial burden across launder and dress groups. All analyses were by intention to treat, and using Stata Release 13 (StataCorp, College Station, TX).

RESULTS

Between February 1, and June 30, 2015, 21 of 21 eligible subjects were randomized (Fig 1). There were no baseline differences between the home- and hospital-dressed cohorts (Table 1). Sixty-eight percent of our entire cohort demonstrated some bacterial growth.

There was no difference between the home- and hospital-dressed cohorts in percentage of samples demonstrating any bacterial growth after 72 hours (60% vs 76%, $P = .14$), nor in median total bacterial burden at the beginning of a shift (2 [interquartile range, 0-7] vs 1 [interquartile range, 1-5] CFUs, $P = .62$) (Table 2). There was no difference in total bacterial burden at the beginning of a shift between the home- and hospital-dressed cohorts when stratified by site where the scrubs were laundered (Fig 2). Finally, no methicillin-resistant *S aureus* isolates were identified within the subset of samples (n = 24) that were formally screened.

DISCUSSION

In this randomized controlled trial, which was specific to obstetrics and gynecology residents on labor and delivery, we found

Table 1
Participant characteristics

Characteristic		Hospital dressed (n = 43)	Home dressed (n = 41)	*P* value
Age, y		28.0 ± 1.4	27.9 ± 1.5	.647
Resident year	1	37	29	.716
	2	30	37	
	3	33	34	
Launder site	Home	51	46	.659
	Hospital	49	54	
Start of shift		11.5 ± 46.0	10.9 ± 48.4	.701
Start of shift, % of samples demonstrating no growth		40	24	.137

NOTE. Values are mean ± SD, percentages, or as otherwise indicated. Proportions compared with χ^2 test. Age compared with 2-sample *t* tests. CFU burden compared with Wilcoxon rank-sum test.
CFU, colony forming unit.