

## QUESTION 7: Does strict adherence to not wearing operating room (OR) attire outside the hospital or outside the restricted OR area reduce the risk of surgical site infections/ periprosthetic joint infections (SSIs/PJIs)?

RECOMMENDATION: We recommend that OR personnel wearing attire that has come into contact with areas outside the restricted OR environment not wear the same attire during elective arthroplasty or complex orthopaedic procedures.

LEVEL OF EVIDENCE: Consensus

DELEGATE VOTE: Agree: 90%, Disagree: 8%, Abstain: 2% (Super Majority, Strong Consensus)

### RATIONALE

The use of standardized OR attire has been implemented to help reduce the shedding and desquamation of human cells and bacteria from the skin of personnel in restrictive hospital environments [1–3]. Specific institutions have further aimed to reduce contamination by requiring the use of covers and gowns over scrubs when leaving restrictive hospital environments, such as the OR [1–3].

Various institutions utilize these protocols to date, even in light of the deficient data on whether OR attire worn outside restricted hospital environments plays a role in the development of SSIs and/or PJIs. A report from the Hospital Infection Society Working Group in 2002 examined the ritualistic behaviors and numerous studies regarding the methods of sterility in the OR [4]. They determined there to be little to no concrete evidence showing that wearing OR attire in external unrestricted hospital environments and returning without changing led to an increase in SSIs and the rates of wound infections [4].

There have been some studies examining how surgical attire and hospital scrubs collect contaminants upon travel outside the hospital and restricted OR areas. A prospective cross-over study performed by Hee et al. examined fabric samples from the scrubs of 16 anesthesiologists divided into 3 cohorts that had worn their scrubs in different environments (Group 1: OR only, Group 2: OR and hospital wards, Group 3: OR, hospital wards and outpatient offices) in an effort to determine the level of contamination to attire as result of different environmental factors [5].

Fabric samples were collected for microbiological analysis from the chest, waist and hip of each anesthetist every 150 minutes over the course of an 8-hour work day. The group determined there to be no significant differences in the bacterial colony counts among the 3 cohorts in comparing the bacterial colony-forming units (CFUs) ( $p = 0.669$  for Group 1: 16.8 CFU vs. Group 2: 15.3 CFU;  $p = 0.942$  for Group 1: 16.8 (95% confidence interval (CI) (9.8, 23.8)) CFU vs. Group 3: 17.1 CFU (95% CI (10.1, 24.1)); and  $p = 0.616$  for Group 2: 15.3 CFU (95% CI (8.3, 22.3)) vs. Group 3: 17.1 CFU (95% CI (10.1, 24.1)) [5]. Additionally, a study by Sivanandan et al. examined the level of garment contamination by comparing blood agar plates pressed against the OR attire of 20 physicians (at 2-hour intervals during an 8-hour period) who had worn scrubs inside and outside OR attire designated areas [6]. Their results also suggested that the levels of contamination were comparable between the groups that wore OR attire within restrictive OR attire settings and those that wore OR attire outside these settings [6].

Similar results were seen in a study by Kaplan et al., comparing pieces of fabric that were analyzed by traditional cultures in physicians wearing scrubs inside/outside designated zones (including outside the hospital) and also with/without cover garments outside allocated areas [7]. The results were based on a total of 75 participants that each provided fabric samples from 2 sites that were believed to represent areas of likely contamination. In total, 150 samples were collected during the project, 50 from each study arm. The three groups were composed as follows: Group 1: scrubs worn in designated areas and a protective covering was worn when outside these zones and they never left the hospital, Group 2: scrubs worn in designated areas and outside without protective covering and they never left the hospital and Group 3: scrubs worn inside/outside designated areas without protective covering and they were allowed to go outside the hospital. The percentage of agar samples with growth (at 24 and 48 hours) for the various fabric samples taken from each group were as follows: Group 1: 47 and 66%, Group 2: 38 and 56% and Group 3: 56 and 70% of agar samples with growth [7]. The authors determined that wearing cover garments over OR attire did not reduce that rates of contamination and that there were no significant differences ( $p = .55$ ) in groups with attire worn outside the hospital and outside restricted zones [7].

In contrast to the aforementioned studies, a study by Mailhot et al., with a similar design to Kaplan et al., found that there were significant differences in contamination rates of OR attire in comparing nurses with cover garments and those without cover garments when worn in undesignated areas outside OR attire zones [8]. This suggested that the use of cover garments may help decrease the rates of garment contamination when wearing OR attire outside of restrictive areas. However, it remains undecided whether this could reduce the likelihood of patients developing SSIs or PJIs in this setting.

Overall, the above-mentioned studies examined rates of contamination for scrub suits, and not how this impacted the outcomes for patients regarding SSIs or PJIs. Studies directly evaluating if OR attire worn outside the hospital and/or outside the restricted OR area and in relation to the incidence of SSIs/PJIs have yet to be published. Until conclusive evidence is brought forth, OR attire worn outside the operating room remains a potential source for surgical contamination.

### REFERENCES

- [1] Lafrenière R, Bohnen JM, Pasiaka J, Spry CC. Infection control in the operating room: current practices or sacred cows? *J Am Coll Surg.* 2001;193:407–416.
- [2] Mitchell NJ, Evans DS, Kerr A. Reduction of skin bacteria in theatre air with comfortable, non-woven disposable clothing for operating-theatre staff. *Br Med J.* 1978;1:696–698.
- [3] Woodhead K, Taylor EW, Bannister G, Chesworth T, Hoffman P, Humphreys H. Behaviours and rituals in the operating theatre. A report from the hospital infection society working party on infection control in operating theatres. *J Hosp Infect.* 2002;51:241–255.
- [4] Roxburgh M, Gall P, Lee K. A cover up? Potential risks of wearing theatre clothing outside theatre. *J Perioper Pract.* 2006;16:30–33, 35–41. doi:10.1177/175045890601600104.

- [5] Hee HI, Lee S, Chia SN, Lu QS, Liew AP, Ng A. Bacterial contamination of surgical scrub suits worn outside the operating theatre: a randomised crossover study. *Anaesthesia*. 2014;69:816–825. doi:10.1111/anae.12633.
- [6] Sivanandan I, Bowker KE, Bannister GC, Soar J. Reducing the risk of surgical site infection: a case controlled study of contamination of theatre clothing. *J Perioper Pract*. 2011;21:69–72. doi:10.1177/175045891102100204.
- [7] Kaplan C, Mendiola R, Ndjatou V, Chapnick E, Minkoff H. The role of covering gowns in reducing rates of bacterial contamination of scrub suits. *Am J Obstet Gynecol*. 2003;188:1154–1155.
- [8] Mailhot CB, Slezak LG, Copp G, Binger JL. Cover gowns. Researching their effectiveness. *AORN J*. 1987;46:482–490.

