

QUESTION 3: Does the use of occlusive strips at the sleeves of the surgical gowns reduce the risk of surgical site infection/periprosthetic joint infection (SSI/PJI)?

RECOMMENDATION: There is no direct evidence that occlusive strips at the sleeves of surgical gowns reduce the risk of subsequent SSIs/PJIs. However, there is evidence that occlusive strips prevent the egress of particles from the gown-glove interface of certain gowning systems, and thereby can reduce contamination of the surgical field and potentially reduce the risks of SSIs/PJIs.

LEVEL OF EVIDENCE: Limited

DELEGATE VOTE: Agree: 91%, Disagree: 3%, Abstain: 6% (Super Majority, Strong Consensus)

RATIONALE

Despite the sleeves of modern disposable gowns being repellent to liquids, the gown cuff is permeable to fluids and was recognized as a potential source of contamination to the surgical field over 60 years ago [1,2]. The failure of the gown-glove interface allows for blood and body fluids to reach the skin of the gown wearer in some circumstances [3–6].

It is, however, less well-established that the gown-glove interface is also a potential source of contamination to the patient and thus a source of subsequent PJIs/SSIs [7]. A study using 10 years of data from the New Zealand Joint Registry showed increased risk of reoperations due to infection at 6 months when surgery was performed using a surgical helmet exhaust system, although follow-up studies using multivariate analyses have refuted the latter findings [8–10]. It is postulated that one potential mechanism of contamination may be egress of particles at the gown-glove interface and that positive air pressure generated by the helmet fan may force air down the sleeve, resulting in escape of particles at gown-glove interface.

The type of gown sleeve material may also influence the ability and volume of particles that migrate out of the gown-glove junction. A study by Fraser et al. analyzing egress of fluorescent powder applied to the hands prior to gowning, compared various gowning systems (one standard gown and four surgical helmet systems), and found that all gowns had some contamination at the gown-glove interface [11]. However, one surgical helmet-gown system had significantly greater contamination ($p < 0.001$) compared to the other four, which did not differ significantly. The gowning system with the most contamination was made of a stiffer, more plasticized material that allowed for deeper folds and a less air tight seal at the gown-glove interface. Additionally, the authors noted that the stiffer sleeve material allowed for further distal migration of the glove cuff, potentially exposing the woven gown cuff. There was no statistical differences in contamination between other surgical helmet systems and the conventional gown, thereby not supporting the hypothesis that positive pressures within the suit is the main driver of contamination at the gown-glove interface for the gowns tested, but rather the gown sleeve material.

This same gown material noted to have greater contamination in the study by Fraser et al., was also tested in a similar fashion in a study by Young et al. [12]. In this study, the authors noted greater egress of fluorescent powder at the gown-glove interface with the surgical helmet system gown compared to a standard gown. An additional arm of the study included the surgical helmet system with the gown-glove junction taped and sealed with a drape tap. The addition of the drape tape eliminated the egress of particles at the gown-glove interface.

There have been some recommendations for modifications that can be made to surgical gown cuffs, that increase the security of the gown-glove interface such as making a small cut in the cuff and introducing the thumb through this hole to potentially decrease surgical contamination [13]. While this modification has been suggested there is minimal research testing this theoretical approach to decreasing the risk of SSI or PJI.

In a randomized trial, Shirley et al. found no differences in wound surgical contamination in total knee arthroplasty with the use of normal surgical gowns versus surgical helmet systems. They also showed the addition of tape at the gown-glove interface did not alter the contamination rate [14].

Although there are no studies directly linking occlusions at the gown-glove interface to a reduction in SSIs/PJIs, there is evidence that occlusions of this interface eliminates the egress of particles that may act as source of contamination, thus potentially reducing the risk of SSIs/PJIs.

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