AMERICAN REUSABLE TEXTILE ASSOCIATION

Scientific Article Review from ARTA

"Glove and Gown Effects of Intraoperative Bacterial Contamination"

Annals of Surgery

By Dr. Michael Overcash, PhD

June 2014

The *Annals of Surgery* publication (Glove and gown effects of intraoperative bacterial contamination, W. Williams et al., 2014) involves three gown type-related studies. The first examines the effect of glove exchange practices on a set of surgeries with a mix of reusable and disposable gowns. So these bacterial contamination results bear the impact of this mix of gowns (glove study 1). The second study was only with disposable gowns and again the same glove exchange practices were studied. Thus these bacterial contamination results have no effect of reusables (increase or decrease) (glove study 2). The third study (strike-through) involves no surgeons and examines the transmission of bacteria, based on the fabrics of the same reusable and disposable gowns used in the first two studies.

I. Strike-through results

The authors provide an incomplete specification of gowns used for reusables and disposables, but it appears they are not comparing the disposable and reusables at the same level of protection, or they have exceeded the rated pressure for strike through for the reusable. The failure of 26 out of 27 new reusable gowns (and zero for new disposables) should have been an immediate red flag to the fact that something was incorrect. For reusables and disposables that are designated level 3, the liquid performance is required to be the same. Similarly for levels 2 and 4. For orthopedic implant surgery, the generally recommended gown is a level 4, and if these were not used, full strike-through protection is not unexpected. At level 4, the results would have been substantially different and no strike-through expected. In addition, the healthcare scientific community has agreed for the last decade that the only full consensus standard microbial challenge test methods are ASTM F1671 or AATCC 42-2000 series. The authors did not follow these. Then to put subsequent major weight on this strike-through comparison and to abandon reusables for disposables has at the least provided no incremental improvement. The conclusions and actions are just not supported by the data.

II. Glove study 1

In the study comparing reusable and disposables, the bacterial contamination before any surgery was performed (referred to as baseline), has the highest (see glove exchange) or the second highest (see gown type) values of all the contamination values before or during surgery. This is a fundamental flaw affecting all subsequent contamination conclusions since the effects of pre-surgery contamination cannot be factored out. So the gown contamination conclusions are not supported by actual data. Something else has had an overriding impact on the whole study as the pre-surgery contamination may thus come from the surgeons, the room, or other conditions.

The effect of gown type shows no difference between reusable and disposables when sampled on the gown sleeve after one hour of surgery, but the disposables were higher in glove contamination measurements after this hour of surgery, and again after 1.25 hour of surgery. However, fifteen minutes after the first sampling (at 1 hr.), the disposable gown contamination on the sleeve actually went down, even though some surgeons had not changed gloves. It is this unexplained drop in contamination during the further 15 minutes that led to the apparent difference in reusable and disposables (significant). So the conclusion of greater reusable gown permeation is made with data that do not appear to follow the physical phenomena (more contamination with longer hours of surgery), nor would it be a significant difference if the data 15 minute earlier were used.

III. Glove study 2

The second glove study was only with disposable gowns, and so conclusions about the impact of reusables can only be obtained by comparing the contamination behavior of glove study 1 (mix of reusable and disposables) and glove study 2 (all disposables). The results of studies with both gown types should (by following the authors discussion that reusables have a powerful effect) then be significantly different from those in which only disposables are used. The authors do not make this comparison. If one examines the percent bacterial contamination of the two studies (Table 1) there is no consistent or large improvement across glove and sleeve results. That is to say, including substantial numbers of reusables (glove study 1) did not significantly increase the contamination results. This is inconsistent with the authors' conclusions that the reusables have a major adverse impact on potential contamination.

Table 1. Comparison of bacterial contamination results in studies with reusables (glove study 1) and without reusables (glove study 2)

Location	Time	Glove retention in study 1, % positive cultures	Glove retention in study 2, % positive cultures	Glove exchange in study 1, % positive cultures	Glove exchange in study 2, % positive cultures
Glove	1 hr.	21.2	21.3	18	23.8
	1.25 hr.	26.9	23.2	26	13.3
Sleeve	1 hr.	21.2	18.5	14	14
	1.25 hr.	19.2	11.1	10	13.3

Literature Cited

The authors support their conclusions with five reference articles, all done in the era before barrier protection for gowns and drapes were standardized and improved. Two citations by Moylan (1980 and 1987), plus Baldwin (1981), and Granzow (1998) were of a disposable barrier fabric (Tyvek or polypropylene) versus a cotton or muslin reusable (similar to the methodology mismatch in the current paper reviewed herein). These are obvious unequal comparisons, even though these were material in usage. The citation of Smith and Nichols (1991) actually states clearly in Figure 2 that the reusables had substantially less bacterial penetration when compared to the disposables. So the literature citations do not include any modern gown AAMI standard for gown protection.

Conclusions

The fundamental conclusion by the authors regarding reusables is based on using a known lower level of protection gown versus a higher protection level of disposable gown. These conclusions should be removed until equal standards of gowns are compared.

Second, the pre-surgery contamination levels found were so high that conclusions of the effects of gowns cannot be made based on the data obtained.

Finally the comparison of overall studies with reusables included did not show significant differences from the results of studies with just disposables and so little macro shift in protection from contamination appears to have occurred. The hospital conclusion to shift to disposables is unlikely to lead to safer surgery conditions and thus must be justified by other factors, or the return to reusables would be logical and likely more comfortable.

###