In 2010, the New England Journal of Medicine published a randomized controlled trial (RCT) which reported the use of preoperative skin antisepsis using 2% chlorhexidine gluconate/70% isopropyl-alcohol (applied with a disposable, purpose-built, sponge applicator and a “scrubbing” technique), or an aqueous 10% povidone-iodine based preparation (applied as a paint), for prevention of surgical site infection (SSI) \(^1\). Thirty nine of 409 patients in the 2% CHG/70% IPA study arm (9.5%) and 71 of 440 patients in the 10% PVP-I study arm (16.1%) developed an SSI after clean and clean-contaminated abdominal procedures (RR = 0.59; 95% CI: 0.41 – 0.85; \(P=0.004\)).

The study led to extensive discussion about the methodology of preoperative skin antisepsis and SSI prophylaxis. The limitation of a comparison of aqueous PVP-I with alcoholic CHG in particular has been highlighted \(^2\). We agree with this latter observation as it is widely accepted that alcoholic chlorhexidine, and not aqueous chlorhexidine solution alone, is superior to aqueous povidone-iodine in preventing SSIs in clean and clean-contaminated surgical procedures. The clinical effectiveness of CHG, compared with PVP-I skin antisepsis, must be determined in equivalent circumstances for formulation (aqueous or alcoholic) and modality of application (use of a scrubbing technique using a purpose-built applicator or by a simple painting technique).

To strengthen this latter point another similar RCT, also published in the NEJM, adds important insight into this conundrum \(^3\). This RCT compared the effect of preoperative skin antisepsis using 2% CHG/70% IPA or 8.3% PVP-I/ 72.5% IPA, but using a similar disposable applicator for delivery of each antiseptic prior to Caesarean delivery. Twenty three of 572 (4.0%) patients in the 2% CHG/70% IPA study arm, and 42 of 575 (7.3%) patients in the 8.3% PVP-I/72.5% IPA study arm developed an SSI (RR = 0.55; 95% CI: 0.34 – 0.90; \(P=0.02\)). The authors concluded that adding chlorhexidine in alcoholic solution, rather than
povidone-iodine in alcoholic solution, resulted in a significantly lower risk of SSI after clean surgery.

However, in addition to attention to the ingredients of the antiseptic solutions used in the two RCTs, aqueous or alcoholic chlorhexidine or povidone-iodine, there is now an opportunity for a comparison of the method of application: using either a packaged antiseptic sponge applicator or simple painting of the surgical site skin. If the patients who had aqueous 10% PVP-I applied as a paint as in the first RCT 1 are compared with those who had 2% CHG/70% IPA solution applied with an applicator and scrubbing technique 3, the inferiority to prevent SSI using aqueous 10% PVP-I paint is confirmed again (RR = 0.22; 95% CI: 0.13 – 0.36; P< 0.001). Conversely, if the cohort in the first RCT, who had skin preparation with 2% CHG/70% IPA solution applied with an applicator, is compared with the similar cohort in the Tuuli study, who had skin preparation with 8.3% PVP-I/72.5% IPA applied with the identical applicator, there is no statistical significant difference in the frequency of SSI (RR = 1.34; 95% CI: 0.83 – 2.16; P=0.26). It is too early to undertake a Forest plot based on only two RCTs but when they are combined there is a clear superiority for the use of 2% chlorhexidine in alcohol when applied with a sponge applicator.

Although our observation has a number of limitations, including different case-mix and surgical procedures, we conclude that not only which antiseptic in alcohol is applied is important, but also the way it is applied. Perhaps the use of a disposable, sponge applicator enhances delivery of an alcoholic skin preparation, whether it contains chlorhexidine or povidone iodine, deeper into the skin appendages, thereby giving a longer exposure to the antiseptic and help to reduce bioburden not just on the skin surface.

References:
