Surgical site infection: are we using the right skin preparation?

The NHS has prioritized the prevention of health-care-associated infections and these strategies are meeting with success. In 2008 meticillin-resistant *Staphylococcus aureus* (MRSA) bloodstream infections had fallen by 57% compared to the baseline from 2003–4 when targets were set (UK Government, 2008; Health Protection Agency, 2009). This has been achieved through a range of initiatives from a greater focus on hand hygiene to implementation of the Saving Lives high-impact interventions. While this multifaceted approach is resulting in decreased numbers of infections, are there any further initiatives we should consider?

Surgical site infections

In addition to bloodstream infections, there is also the challenge of surgical site infections. As surgical techniques improve, more procedures are being carried out on at-risk groups. The National Institute for Health and Clinical Excellence reports that surgical site infections account for 20% of all health-care-associated infections. At least 5% of patients undergoing a surgical procedure develop a surgical site infection (National Collaborating Centre for Women's and Children's Health, 2008), which may cause considerable morbidity and extend patient hospital stay.

Clearly, undergoing surgery can bring a significant risk of infection and health-care professionals need to address how they can further change their practice to improve the prevention of surgical site infection. Indeed, the National Institute for Health and Clinical Excellence has issued new guidelines on surgical site infection offering guidance on this key area (National Collaborating Centre for Women's and Children's Health, 2008).

Microorganisms can enter any breach of the skin and these microorganisms may come from equipment, the operating environment, a health-care worker or from the patient's skin itself. In fact, most surgical site infection develops from microorganisms derived from the skin, mucous membranes or hollow viscera (Mangram et al, 1999). Optimizing skin preparation, therefore, is a crucial way of preventing surgical site infections.

Skin preparation

So what do the new guidelines reveal about skin preparation before surgery? They recommend that skin at the surgical site is prepared 'immediately before incision using an antiseptic (aqueous or alcohol-based) preparation: povidone-iodine or chlorhexidine are most suitable' (National Collaborating Centre for Women's and Children's Health, 2008). It is noteworthy that no preference for one solution over another is expressed nor recommendation offered on the concentration of the solution to be used. This is reasonable as there is a dearth of robust data on the use of skin antiseptic treatments to support any specific guidance.

The health-care professionals who brought together the guidelines considered a range of trials which compared iodine/iodophors (including povidone-iodine), alcohol at various concentrations, and chlorhexidine in a range of different surgical procedures and in different formulations ranging from spray to scrub. The review panel found that none of the studies showed statistical significance and that they were underpowered, or also used antiseptic drapes which may have confounded the results, or showed results that could not be pooled because of their heterogeneity.

This leaves health-care professionals working in theatres with a choice to make in terms of skin preparation: should povidone iodine or chlorhexidine be used, and should it be aqueous or alcohol based? In the case of equal efficacy, cost can be a useful guide. The National Institute for Health and Clinical Excellence guidelines looked at the comparative costs of the preparations but concluded that both chlorhexidine and povidone iodine 'have similar costs' (National Collaborating Centre for Women's and Children's Health, 2008).

Another source of evidence which can be considered when establishing a more defined protocol of choosing a skin antiseptic is research into the prevention of bloodstream infections associated with intravascular catheters. There are more studies here, which have resulted in specific guidelines. The epic2 national guidelines, which were published in 2007, addressed the issue of skin antisepsis before intravascular catheter insertion and specifically stipulated a 2% chlorhexidine gluconate/70% isopropyl alcohol solution for use before catheter insertion (Pratt et al, 2007). This is based on evidence from two trials comparing povidone-iodine, alcohol and chlorhexidine in central venous or arterial catheters (Maki et al, 1991; Mimoz et al, 1996). Maki and colleagues found that aqueous chlorhexidine was more effective than iodine or alcohol. Similarly Mimoz et al compared a 0.25% chlorhexidine combination with alcohol to a povidone iodine and alcohol mix, and also found the chlorhexidine to be more effective.

In a meta-analysis, Chaiyakunapruk and coworkers (2002) considered a further six studies in addition to the two above and concluded that insertion site disinfection with chlorhexidine gluconate significantly reduced the incidence of bloodstream infections in patients with central vascular catheters compared with povidone-iodine. Similarly, in the authors' own investigation, 2% chlorhexidine combined with alcohol was shown to be more effective when compared with the other three standard preparations of chlorhexidine gluconate available in the UK, namely 0.5% aqueous chlorhexidine gluconate, 2% aqueous chlorhexidine gluconate, and 0.5% chlorhexidine gluconate/70% isopropyl alcohol when tested against *Staphylococcus epidermidis* RP62A (Adams et al, 2005).

In spite of this evidence and the recommendations of the epic2 guidelines, many hospitals still use iodine for skin antisepsis in intravascular catheter insertion.

Conclusions

Appropriate antiseptic should be used for all patients undergoing intravascular catheterizations in major vessels. There is also a need for more evidence for surgical site antiseptic skin preparation. In the meantime, should findings from studies on intravascular catheters be applied to the operating theatre? BJHM

TSJ Elliott
Consultant Microbiologist
University Hospital Birmingham NHS Foundation Trust
Queen Elizabeth Hospital
Birmingham B15 2TH
PA Lambert
Professor of Microbiology
School of Life and Health Sciences
Aston University
Birmingham

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KEY POINTS

- Surgical site infections occur in 5% of all patients undergoing surgery. Improved skin antisepsis may reduce this.
- The National Institute for Health and Clinical Excellence guidelines on surgical site infections do not specify a particular skin antiseptic because there is a dearth of studies but chlorhexidine and povidone iodine are both recommended and are both cited as being acceptable in terms of cost.
- Using evidence from relevant studies, the epic 2 guidelines for intravascular catheters stipulate the use of 2% chlorhexidine gluconate/70% isopropyl alcohol for skin preparation.
- Until we have more specific studies for surgical site skin antisepsis, can we assume that 2% chlorhexidine gluconate/70% isopropyl alcohol should be used for skin preparation pre-insertion of intravascular catheters and also preoperatively?