



Opinion

Skin antiseptics: it's not only what you use, it's the way that you use it

A.L. Casey^{a,*}, J.M. Badia^b, A. Higgins^c, J. Korndorffer^d, C. Mantyh^e, O. Mimoz^f, M. Moro^g

^a Department of Clinical Microbiology, University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK

^b Hospital General de Granollers, Universitat Internacional de Catalunya, Barcelona, Spain

^c Medical Audits Ltd, Dublin, Ireland

^d Tulane University School of Medicine, New Orleans, LA, USA

^e Department of Surgery, Duke University Medical, Durham, NC, USA

^f University Hospital of Poitiers, Poitiers, France

^g San Raffaele Hospital, Milan, Italy

ARTICLE INFO

Article history:

Received 21 April 2017

Accepted 21 April 2017

Available online 16 May 2017



CrossMark

Numerous guidelines have been published by consensus groups worldwide regarding optimal skin antiseptics prior to surgical incision or insertion of intravascular catheters [1–3]. However, in the opinion of the authors, current guidelines fail to address a key element: the method of application of the antiseptic agent.^h

Several agents are available for skin antiseptics, including alcohols, iodine and iodophors, octenidine hydrochloride,

polyhexamethylene biguanide, and chlorhexidine. The authors highlighted the need for adequately powered comparative studies and considered the current guidelines for skin antiseptics from the UK, USA, France, Germany, Ireland, Italy, and Spain [1–3]. Most guidelines focus on antiseptic agents with little consideration of the importance of application methods. The exceptions are those from Spain, which specifically suggest that an applicator is preferred, and a 'back and forth' application method for 30 s is recommended [4].

The panel reached a consensus that the method of application may improve safety, standardization, and practicality compared to traditional skin antiseptics using multiple-use bottles and gauzes. For example, a single-use applicator has the potential to control the antiseptic volume, reduce drug errors, save time, and reduce waste. A single-use applicator may also potentially encourage a standardized and more thorough approach to skin preparation, offering reduction of the risk of cross-contamination during antiseptic application.

Relatively few recent studies assess the effectiveness of applicators for skin antiseptics. In a comparison of 2% chlorhexidine in 70% isopropyl alcohol applied using an applicator, and povidone-iodine applied on gauze by 30 experienced healthcare workers, no healthcare worker completed all steps recommended by the manufacturer for povidone-iodine [5]. By contrast, 16.7% completed all recommended steps with chlorhexidine in isopropyl alcohol ($P = 0.027$). Compliance with critical steps was 33.3% with povidone-iodine and 90% with chlorhexidine in isopropyl alcohol ($P = 0.0001$), with no difference in the average reduction of colony-forming units. Findings of another study suggest that single-use applicators for chlorhexidine in isopropyl alcohol could replace current

* Corresponding author.

E-mail address: Anna.Casey@uhb.nhs.uk (A.L. Casey).

^h Expert panel convened in Geneva, Switzerland in April 2016, to discuss agents and methods used for skin antiseptics prior to surgery or IV catheter insertion. The panel did not consider the role of skin antiseptics in hand hygiene, chronic wound care, decolonization, or pre-operative bathing.

skin antiseptics with 10% povidone-iodine and 70% isopropyl alcohol in blood donation [6]. Although these are relatively small studies in a single centre, they start to provide evidence and rationale for further studies to be replicated in larger, multicentre trials.

The method of applying skin antiseptic may be equally as important as the selection of skin antiseptic, although this has not been studied directly. Traditionally, skin antiseptics have been applied in concentric circles working out from the intended needle insertion site, although there is no evidence to support this procedure. The concentric circle method is required when using aqueous-based products, which need additional drying time to prevent reintroduction of contaminants to previously cleansed areas [7]. Around 20% of bacteria live in the deeper layers of the skin, among dead skin cells, sweat glands and hair follicles, making it difficult to adequately decontaminate the skin [8]. Back-and-forth friction has been suggested to cleanse more skin layers and this reduces the bacterial load of the epidermal layer more effectively [9].

It is suggested that a large multicentre study could compare different antiseptic fluids in the same applicator against a control consisting of multiple-use fluid and gauze. Further studies need to ascertain the clinical, economic and logistical consequences of using a single-use applicator compared to standard skin antiseptics with multiple-use bottles and gauze, for example, in terms of infection rates, healthcare worker time, and the associated costs.

The panel concluded that as well as further studies into the use of application method for skin antiseptics prior to surgery and intravenous catheter insertion, a full review of this topic is a priority. In the meantime, guideline committees should consider the empirical benefits and published studies, which consistently suggest that single-use applicators offer advantages over multiple-use bottles and gauze [6,7]. Without due attention to the value of application method, this important aspect of infection control remains far from evidence-based.

Conflict of interest statement

None declared.

Funding sources

The authors were funded by Becton, Dickinson & Company (BD). Medical writing and logistical support for the advisory board provided by LBC SW6 Limited, funded by BD. Advisors received an honorarium for attending the expert panel meeting.

References

- [1] Loveday HP, Wilson JA, Pratt RJ, Golsorkhi M, Tingle A, Bak A, et al. *epic3: National evidence-based guidelines for preventing healthcare-associated infections in NHS hospitals in England*. *J Hosp Infect* 2014;86:S1–70.
- [2] National Institute for Health and Care Excellence. *Surgical site infections: prevention and treatment*. 2008 (updated 2017). Available at: <https://www.nice.org.uk/guidance/cg74> [last accessed May 2017].
- [3] O'Grady N, Alexander M, Burns L, Dellinger P, Jeffery Garland J, Heard SO, et al. *Guidelines for the prevention of intravascular catheter-related infections*. 2011. Available at: <https://www.cdc.gov/hicpac/pdf/guidelines/bsi-guidelines-2011.pdf> [last accessed December 2016].
- [4] Proyecto Infección Quirúrgica Zero. Sociedad Española de Medicina Preventiva, Salud Pública e Higiene. Available at: <http://infeccionquirurgicazero.es/images/stories/recursos/protocolo/2017/3-1-17-documento-Protocolo-IQZ.pdf> [last accessed February 2017].
- [5] Lundberg PW, Smith AA, Heaney JB, Wimley WC, Hauch AT, Nichols RL, et al. *Pre-operative antiseptics protocol compliance and the effect on bacterial load reduction*. *Surg Infect* 2015;17:32–7.
- [6] So BKL, Chu CCY, Ho PL, Chow KH, Leung JN, Lee IY, et al. *Evaluation of two chlorhexidine–alcohol-based skin disinfectants in blood donation setting*. *Vox Sang* 2014;106:316–21.
- [7] Baron EJ, Weinstein MP, Dunne WM, Yagupsky P, Welch DF, Wilson DM. *Cumitech 1C, Blood cultures IV*. Washington DC: ASM Press; 2005.
- [8] Stohl S, Benenson S, Sviri S, Avidan A, Block C, Sprung CL, et al. *Blood cultures at central line insertion in the intensive care unit: comparison with peripheral venipuncture*. *J Clin Microbiol* 2011;49:2398–403.
- [9] Stonecipher K. *Going around in circles: is this the best practice for preparing the skin?* *Crit Care Nurs* 2009;32:94–8.