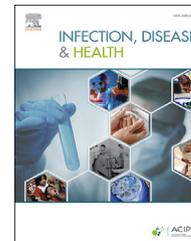


Available online at www.sciencedirect.com

ScienceDirect

journal homepage: <http://www.journals.elsevier.com/infection-disease-and-health/>

Editorial

Bundles of bundles

Possibly the first time many of us became familiar with the concept of a healthcare associated infection (HAI) prevention bundle was when Pronovost published his Michigan study that demonstrated an evidence based intervention (a bundle) significantly reduced catheter related bloodstream infections in an ICU setting [1]. HAI prevention interventions are often multimodal, which intuitively makes sense, given as it is often difficult to identify the one causative factor. So instead of focussing on just one intervention, we identify several and combine them together into a bundle (as we picture the arrow passing through the holes in the cheese).

The success of a bundle depends on several key factors. They must be composed of only 2–5 simple evidence based components, they must be accompanied by an implementation strategy, and crucially, their success depends on high compliance with all the bundle components [2].

Since Pronovost's study, a variety of infection prevention bundles have been described. For example intervention bundles to prevent catheter associated urinary tract infections [3], a bundle to prevent surgical site infections in colorectal surgery [4], and most recently an environmental cleaning bundle to reduce HAI [5]. Whilst some HAI prevention bundles would appear to be widely implemented and clearly effective, others require further exploration.

In this edition of *Infection Disease and Health*, Ray-Burrueal and colleagues [6] from the Alliance for Vascular Access Teaching and Research (AVATAR) group, present the results of an excellent systematic review exploring the effectiveness of insertion and maintenance bundles to prevent peripheral intravenous catheter (PIVC) related complications and bloodstream infection in hospital patients. Ultimately their findings have set an important research agenda necessary to address several gaps in our knowledge.

The results are basically reported using two categories, bundle components identified for PIVC insertion, and bundle components identified for PIVC maintenance.

Amongst the 13 studies included in the final review, the researchers identified 21 different insertion bundle components in 10 of the studies. The most common components, perhaps not surprisingly, were site selection, hand

hygiene, asepsis, chlorohexidine skin preparation, closed catheter, and the use of transparent dressings. What is surprising is that these most common components were only found in a maximum of three studies each, meaning for each there were seven other studies that did not include these most basic HAI prevention components.

Similarly the researchers identified 22 different maintenance components found in 11 studies. Pleasingly, review of the need for a PIVC was a component described in seven studies, (albeit as was the use of a poster, the effectiveness of this mode is worthy of another discussion). However there were 10 other components that were found in only one study each.

This broad array of components and combinations for both insertion and maintenance hints rather strongly that there is uncertainty as to what works.

Importantly Ray-Burrueal et al. also report on compliance findings. Only nine studies reported either total or partial bundle compliance, one reporting total bundle compliance of 77%, however even these estimates were uncertain. With less than 95% compliance, and or lack of compliance measurements, those study outcomes must be interpreted with care.

Bundles are a reasonably modern concept in infection prevention. They are attractive for their apparent simplicity, and lend themselves well to effective communication and translation into practice. Bundle components can easily be disseminated via an InfoGraph, a 15 s video grab, and through an assortment of social media avenues.

But before this occurs, as Ray-Burrueal et al. highlight, in the era of scarce health resources, not only do we need to more evidence to identify those interventions that improve patient safety for preventing adverse events relating to PIVC, we must also have data on their cost effectiveness.

Clearly, evidence is lacking when it comes to HAI prevention bundles for PIVC insertion and maintenance. This has resulted in the broad variety of bundles components this review has identified. A key factor to the success of the other bundles has been in their standardisation and consistency, and this serves as a model for PIVC related bundles.

In our journey towards standardisation and consistency, we need to explore those components that will

have the most affect. Thanks to Ray-Burrue et al., the gaps have been identified, and we now need the quality research.

Authorship statement

The author was the sole contributor to this editorial.

Conflict of interest

The author is an editorial board member for *Infection, Disease and Health*.

Funding

There is no funding associated with this publication.

Provenance and peer review

Invited editorial, subject to Editorial review.

References

- [1] Pronovost P, Needham D, Berenholtz S, Sinopoli D, Chu H, Cosgrove S, et al. An intervention to decrease catheter-related bloodstream infections in the ICU. *N Engl J Med* 2006;355(26):2725e32. <https://doi.org/10.1056/NEJMoa061115>.
- [2] Resar R, Griffin FA, Haraden C, Nolan TW. Using care bundles to improve health care quality. IHI innovation series white paper. Cambridge, Massachusetts: Institute for Healthcare Improvement; 2012. Available on, www.IHI.org.
- [3] Meddings J, Rogers MAM, Krein SL, Fakhri MG, Olmsted RN, Saint S. Reducing unnecessary urinary catheter use and other strategies to prevent catheter-associated urinary tract infection: an integrative review. *BMJ Qual Saf* 2014;23:277–89.
- [4] Bull A, Wilson J, Worth LJ, Stuart RL, Gillespie E, Waxman B, et al. A bundle of care to reduce colorectal surgical infections: an Australian experience. *J Hosp Infect* 2011;78(4):297–301.
- [5] Mitchell BG, Hall L, White N, Barnett AG, Halton K, Paterson DL, et al. An environmental cleaning bundle and health-care-associated infections in hospitals (REACH): a multicentre, randomised trial. *Lancet Infect Dis* 2019;19(4):410–8.
- [6] Ray-Barruel G, Xu H, Marsh N, Cooke M, Rickard CM. Effectiveness of insertion and maintenance bundles in preventing peripheral intravenous catheter-related complications and bloodstream infection in hospital patients: a systematic review. *Infect Dis Health* 2019;24:152–68. <https://doi.org/10.1016/j.idh.2019.03.001>.

Philip L. Russo, Associate Professor
*Cabrini Monash University, Department of Nursing
 Research, Victoria, Australia*
*Faculty of Medicine, Nursing, and Health Sciences, Monash
 University, Clayton, Victoria, Australia*
*Lifestyle Research Centre, Avondale College of Higher
 Education, Cooranbong, New South Wales, Australia*
E-mail address: philip.russo@monash.edu