

implant fixation methods to address the knowledge gaps highlighted here.

See Online for appendix

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\*Erik Lenguerrand,  
Michael R Whitehouse, Ashley W Blom  
erik.lenguerrand@bristol.ac.uk

Musculoskeletal Research Unit, Translational Health Sciences, Bristol Medical School (EL, MRW, AWB), and National Institute for Health Research Bristol Biomedical Research Centre, University Hospitals Bristol National Health Service Foundation Trust (MRW, AWB), University of Bristol, Bristol BS10 5NB, UK.

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## Chlorhexidine for prevention of catheter-associated urinary tract infections: the totality of evidence

We read the Article by Oyebola Fasugba and colleagues,<sup>1</sup> and the supporting Comment by Bart J Laan and Suzanne E Geerlings,<sup>2</sup> with great interest. In a cross-sectional, stepped-wedge, open-label, randomised controlled trial (RCT), Fasugba and colleagues assessed the efficacy of 0.1% chlorhexidine solution compared with saline solution for meatal cleaning before urinary catheter

insertion in reducing the incidence of catheter-associated asymptomatic bacteriuria and urinary tract infection (UTI). Meatal cleaning with 0.1% chlorhexidine before urinary catheterisation reduced the incidence of catheter-associated UTI by 94% compared with use of normal saline (incident rate ratio 0.06; 95% CI 0.01–0.32;  $p=0.00080$ ).

Figure 3 of the study<sup>1</sup> showed that at one of the three participating centres (hospital A), a marked decrease in the incidence of catheter-associated UTI was observed in the intervention period compared with the control period, but the age and sex of the patients during the saline phase and the 0.1% chlorhexidine phase differed significantly. Although much lower than that of hospital A, the incidences of catheter-associated UTI in patients during the saline phase were similar at the other two hospitals. Therefore, the large decrease in the incidence of catheter-associated UTI in hospital A might have been due to bias.

The reduction in the incidence of catheter-associated UTI reported in this study might tempt health-care professionals to use a 0.1% chlorhexidine solution for urethral meatus cleaning instead of standard-of-care saline solution before urinary catheterisation. However, when all the evidence is considered, the efficacy of chlorhexidine is less robust. Based on the 2017 systematic review by Fasugba and colleagues,<sup>3</sup> two RCTs evaluating the efficacy of chlorhexidine have been published.<sup>4,5</sup> Both studies showed no significant benefit of chlorhexidine in meatal cleaning before urinary catheter insertion in reducing the incidence of UTI compared with a non-antiseptic agent (tap water). We did a meta-analysis summarising the data of these two studies and Fasugba and colleagues' RCT using a random-effects model with a generic inverse variance method. The pooled result did not show a significantly different incidence of catheter-associated UTI

between the two treatment groups (pooled risk ratio 0.49; 95% CI 0.13–1.89;  $I^2=78%$ ; appendix).

This meta-analysis might serve as a reminder that the evidence on the efficacy of chlorhexidine solution for meatal cleaning in reducing the incidence of catheter-associated UTI is still evolving and more data from high-quality RCTs are needed before the use of chlorhexidine solution can be recommended and implemented.

We declare no competing interests.

\*Patompong Ungprasert,  
Visanu Thamlikitkul  
patompong.unp@mahidol.ac.th

Clinical Epidemiology Unit, Department of Research and Development, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.

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## Authors' reply

We thank Patompong Ungprasert and Visanu Thamlikitkul for their interest in our Article.<sup>1</sup> We agree that the totality of evidence should be considered in clinical decision making; systematic reviews are helpful in this regard. We also agree that the evidence for the routine use of chlorhexidine to prevent urinary tract infection (UTI) would be stronger if our study was replicated in different hospitals or countries.

However, we have reservations about simply pooling results from the three studies identified because

they are heterogeneous. The study by Webster and colleagues<sup>2</sup> was done in obstetric patients (n=436) from a single hospital. Similarly, the study by Capareti and colleagues<sup>3</sup> was done at a single centre, with preoperative patients (n=156). The duration of catheterisation in these two populations is likely to be shorter than in our study of 1642 hospital inpatients at three sites.<sup>1</sup>

Additionally, there were important differences in the outcome measures used in the two older studies compared with our study. Both previous studies defined the outcome (UTI) as bacteriuria, assessed by routine culture 24 h after catheter placement in Webster and colleagues' study<sup>2</sup>, and by routine assessment 3 days after the operation in Capareti and colleagues' study.<sup>3</sup> By contrast, in our study, we considered catheter-associated UTI defined by both clinical and microbiological criteria in accordance with the US Centers for Disease Control and Prevention guidelines, as well as asymptomatic bacteriuria.<sup>4</sup>

Both the clinical and statistical heterogeneity of the studies would caution against relying on a pooled estimate of effect size. It might be more useful to consider how the differences in populations, outcomes, and study designs might have affected the results of the three studies.

The available evidence suggests that the benefits of chlorhexidine use in preventing a clinically relevant infection could be substantial, with few potential risks. The routine use of chlorhexidine in hospital inpatients is inexpensive, with our cost-effectiveness evaluation suggesting that it is cost-saving compared with cleaning with saline.<sup>5</sup> Several factors are important in the consideration of evidence and its translation into recommendations: the balance between desirable and undesirable outcomes; the confidence in the magnitude of estimated effect of the interventions on important outcomes;

values, preferences, and variability; and the resources needed.<sup>6</sup> Thus, we feel that the routine use of chlorhexidine for meatal cleaning is warranted while we await further studies.

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\**Brett G Mitchell, Allen C Cheng, Oyebola Fasugba, Anne Gardner, Nicholas Graves, Jane Koerner, Peter Collignon*

*brett.mitchell@avondale.edu.au*

Clinical Education Centre and Faculty of Arts, Nursing and Theology, Avondale College of Higher Education, Sydney, NSW 2076, Australia (BGM); School of Nursing and Midwifery, University of Newcastle, Newcastle, NSW, Australia (BGM); School of Public Health and Preventive Medicine, Monash University, Melbourne, VIC, Australia (ACC); Infectious Prevention and Healthcare Epidemiology Unit, Alfred Hospital, Melbourne, VIC, Australia (ACC); Nursing Research Institute, Australian Catholic University and St Vincent's Health Australia Sydney, NSW, Australia (OF); Lifestyle Research Centre, Avondale College of Higher Education, Cooranbong, NSW, Australia (OF); School of Public Health and Social Work (AG) and Institute of Health and Biomedical Innovation (NG), Queensland University of Technology, Brisbane, QLD, Australia; School of Nursing, Midwifery and Paramedicine, Australian Catholic University, Watson, ACT, Australia (JK); Medical School, Australian National University, Canberra, ACT, Australia; and Australian Capital Territory Pathology, Canberra Hospital and Health Services, Canberra, ACT, Australia (PC).

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## Scaling up diagnostic-driven management of sexually transmitted infections in pregnancy

Curable sexually transmitted infections (STIs), for example *Chlamydia trachomatis* and *Neisseria gonorrhoeae*, are common worldwide<sup>1</sup> and can have severe consequences for women and, when occurring in pregnancy, their children.<sup>2</sup> WHO recommends a syndromic approach to STIs in low-resource settings where laboratory services are scarce, but this approach lacks sensitivity and specificity, missing many infections and causing overtreatment.

An Article by Marijn C Verwijs and colleagues<sup>3</sup> found that incorporating point-of-care (POC) STI testing with GeneXpert into case-finding and infection management improved identification of true infections and prevented overtreatment among women in Kigali, Rwanda. Similar results have been found for Botswana.<sup>4</sup> In their Comment on Verwijs and colleagues' study,<sup>3</sup> Rosanna Wai Wan Peeling and David Mabey<sup>5</sup> stated that POC tests have the potential to revolutionise STI management, but that the high costs of available tests might limit widespread scale-up in the high-burden, low-resource settings where they are needed most.

We agree that development of lower-cost diagnostics should be prioritised and, in the meantime, suggest that implementation research be used to identify approaches for expanding access to STI testing. We developed a decision model to estimate the 1-year costs and outcomes associated with different strategies for scaling-up *C trachomatis* and *N gonorrhoeae* testing for pregnant women in Botswana.<sup>4</sup> We compared syndromic management with three POC strategies: GeneXpert-based POC testing at all hospitals and clinics providing antenatal care, GeneXpert