

Commentary

Antimicrobial catheters in the ICU: is the juice worth the squeeze?

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See related research by Halton *et al.*, <http://ccforum.com/content/13/2/R35>

Abstract

Catheter-related bloodstream infection is one of the most serious complications of central venous access devices. Antimicrobial-coated catheters represent one novel strategy to prevent catheter-related bloodstream infection. A comprehensive economic evaluation is essential to guide informed decision-making regarding the adoption of this technology and its expected benefits in healthcare institutions.

'Doubt is not a pleasant condition, but certainty is absurd.'

(Voltaire)

In the previous issue of *Critical Care*, Halton and colleagues provided a comprehensive cost-effectiveness analysis comparing antimicrobial catheters with uncoated catheters for prevention of catheter-related bloodstream infection (BSI) in the intensive care unit [1].

Central venous access is essential in critically ill neonates requiring parenteral alimentation and in children and adults requiring intensive cancer chemotherapy, bone marrow or solid organ transplants, home antibiotic therapy, hemodialysis or total parenteral nutrition [2,3]. Upwards of 5 million US patients require prolonged central venous access each year [4,5]. Although reliable, these devices are nonetheless associated with a considerable risk of catheter-related BSI, with approximately 80,000 catheter-related BSIs occurring in the United States annually. While mortality attributable to catheter-related BSI is uncertain because of conflicting findings from studies [6-9], there is no doubt that catheter-related BSI causes an increased length of stay and increased healthcare costs. Since October 2008 the Centers for Medicare and Medicaid have ceased to reimburse healthcare

institutions for catheter-related BSI, now increasingly recognized as a preventable complication of healthcare.

Several effective strategies for preventing catheter-related BSI have emerged in recent years [10]. These strategies include chlorhexidine rather than povidone-iodine for cutaneous antisepsis, maximal barrier precautions, use of a checklist to guide insertion and maintenance, preferential use of the subclavian vein rather than the femoral or internal jugular vein for insertion and the use of antimicrobial-coated catheters. Several types of antimicrobial-coated catheters exist, including chlorhexidine-sulfadiazine-impregnated catheters, minocycline-rifampin-impregnated catheters and silver platinum-carbon-impregnated catheters.

Although the efficacy of antimicrobial-coated catheters compared with uncoated catheters for reducing BSI has been demonstrated in several randomized controlled trials, systematic reviews and meta-analyses [11], the decision to adopt these catheters is complex because of the increased cost relative to uncoated catheters, uncertainty regarding the magnitude of adverse consequences of catheter-related BSI, and the relative efficacy of the various types of antimicrobial catheters. As a result, it is not surprising that, in a recent survey of hospitals, Krein and colleagues found only 32% of Veterans Affairs hospitals and 38% of non-Veterans Affairs hospitals reported using antimicrobial-impregnated catheters [12].

The most recent Centers for Disease Control and Prevention recommendations for prevention of catheter-related BSI state that: 'antimicrobial or antiseptic-impregnated CVC [central venous catheters] should be used in adults whose catheter is expected to remain in place >5 days if, after implementing a comprehensive strategy to reduce rates of catheter-related BSI, the rate remains above the goal set by the individual

BSI = bloodstream infection.

institution based on benchmark rates and local factors. The comprehensive strategy should include the following three components: educating persons who insert and maintain catheters, use of maximal sterile barrier precautions, and a 2% chlorhexidine preparation for skin antisepsis during CVC insertion (category IB)' [13].

With rising costs of healthcare and increasingly constrained resources, the need for assessment of clinical and economic outcomes of a novel intervention is readily apparent. While other cost-effectiveness analyses of antimicrobial catheters have been reported, many studies have methodologic issues limiting internal validity and, in many cases, external validity. These issues were summarized in a recent review by the authors of the present study [14,15]. Halton and colleagues are to be commended for their careful consideration of estimates of costs, effectiveness and the exploration of uncertainty, all critical elements of a cost-effectiveness analysis. Because the results of cost-effectiveness analyses are very sensitive to the choice of inputs, the source of the estimates should be clearly outlined, as has been done for this study.

The authors chose a broad healthcare perspective for this study, expressed health outcomes in quality-adjusted life years and used detailed previously published costing studies to obtain costs [1]. Key assumptions of the base-case scenario included an overall incidence of catheter-related BSI of 2.5%, a 1.06 relative risk of catheter-related BSI mortality, and an excess length of stay of 2.4 intensive care unit days and 7.5 general ward days. Extensive sensitivity analyses were undertaken varying several parameters to explore uncertainty. Overall the authors found that the minocycline-rifampin-coated catheters dominated the other types of catheters. Fifteen infections could be avoided compared with the uncoated catheters, and 1.6 quality-adjusted life years per 1,000 catheters placed were generated. The cost saving realized with this approach was AUS\$130,000 per 1,000 catheters. There was, however, considerable uncertainty especially when attributable mortality was considered to be low and the baseline infection rates were low.

The findings of Halton and colleagues' study should be interpreted in the context of its limitations [1]. The authors assumed that infection control practices were optimal in the intensive care unit, the causative microorganism was not taken into account when obtaining costs, and additional interventions that are commonly part of catheter infection-prevention approaches, such as the catheter bundle or education of healthcare providers, were not compared with antimicrobial-impregnated catheters.

Halton and colleagues add to the growing body of literature in infection control that incorporates assessments of economic evaluation to guide optimal allocation of constrained resources. Ultimately however, institutions must weigh several factors – including rates of catheter-related

BSI at baseline, costs of treating the infection, the proportion of patients requiring central venous catheters, the duration of catheterization and the use of other preventive measures that may reduce the risk of infection, such as the catheter infection-prevention bundle, to decide whether the juice is worth the squeeze. Future research should examine the comparative effectiveness of the impregnated catheters with other measures that have recently been shown to reduce the risk of infection, such as chlorhexidine-impregnated sponge dressings [16].

Competing interests

The author declares that they have no competing interests.

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