

Prevention of Central Line Associated Bloodstream Infections: Shuffling Forward or Leaping Ahead?

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As opposed to many types of healthcare-associated infections, with current knowledge and affordable technology, we can prevent many, if not most, central line-associated bloodstream infections (CLA-BSIs), and many institutions and countries have demonstrated impressive reductions in CLA-BSI [1,2]. Unfortunately, despite proclamation and wishful thinking, the same situation does not exist for other healthcare-associated infections such as ventilator-associated pneumonia or nosocomial pathogens such as *Clostridium difficile*, and we continue to struggle to stem the tide against the spread of antimicrobial resistant pathogens such as carbapenemase-producing *Enterobacteriaceae*.

So, how did we get to this lofty place where we can prevent the occurrence of most CLA-BSIs? How can we continue to improve and prevent the remaining CLA-BSIs? How can we extrapolate our experience with CLA-BSI to other healthcare-associated infections?

First, it should be recognized that the CLA-BSI success story did not occur quickly or easily. It took decades of work exploring the pathogenesis of disease, discovering routes of inoculation, devising case definitions and surveillance systems, and developing innovative products and less infection-prone devices. There is a lot more to prevention of CLA-BSI than simply putting together several preventative techniques in a catheter insertion bundle along with a checklist. So, what are the key components of successful and sustainable CLA-BSI prevention? First, a supportive institutional infrastructure is key – without it, sustained healthcare-associated infection prevention is doomed to failure. Systems must be in place to allow for stable staffing and effective education in a culture of patient safety. Seamless communication should flow easily without hierarchical barriers. Next, more specifically with regard to CLA-BSI prevention, vascular catheters must be placed using careful aseptic

precautions- including use of full sterile barrier precautions (sterile gloves, long sleeve sterile gown, cap, mask, head-to-toe sterile drape) and thorough skin disinfection with chlorhexidine. Dressing integrity must be maintained and aseptic practices must be used whenever the catheter is accessed. The catheter should be removed as soon as practical. Innovative products such as antimicrobial-coated catheters, aseptic-impregnated dressings, passive port protectors and antimicrobial flushes are frequently used to further reduce the rate of CLA-BSI– even in small rural hospitals [3].Improvements in CLA-BSI prevention must be sustained. It is critical that that new hires and trainees are inculcated into the system of safety, that checklists and timeouts serve as guides and guardrails, and various visual cues serve as constant reminders for appropriate catheter insertion and care [4].Unfortunately, in some respects, we are now victims of our own success. In many institutions, the rate of CLA-BSI is so low it is cost prohibitive to perform an adequately-powered study examining a preventive modality with bloodstream infection as the measured outcome. Because catheter colonization is a preamble for some of these infections, perhaps colonization should be used as a cheaper and more readily measured surrogate outcome measure [5].

However, resources are not unlimited and at some point the balance tips toward a point of diminishing return on investment. Although in some circles this is not a polite topic, at some point the resources invested in trying to “get to zero” CLA-BSI could probably be more wisely invested in some other venture in which the return on investment would be greater whether that is in reduction of some other healthcare-associated infection, medication safety, falls prevention, or perhaps some other societal priority.

Another unpopular topic is the fact that as a surveillance definition, CLA-BSI is designed to be highly sensitive but not be overly specific and thus will have some degree of inherent “false positivity.” If institutions truly play by the rules, they will never have zero CLA-BSI. An institution that reports zero CLA-BSI for a prolonged period of time is akin to the person who lives in a mansion, drives a luxury car, owns a yacht yet reports no income to the government– they should be a target for an audit. I am a proponent for a new institutional quality measure– nosocomial bacteremia of all causes. Although I genuinely believe that we have substantially decreased CLA-BSI, I also believe that many institutions are lowering their CLA-BSI rates by simply classifying them as bloodstream infections due to another source.

So, what is the bottom line? There are no easy answers or quick fixes. If your institutional rate of CLA-BSI is high, your institution should invest in quality infrastructure, systems to ensure appropriate insertion and care of catheters, and judicious use of innovative technology such as coated catheters and impregnated dressings. To continue to prevent CLA-BSIs and to expand success to other healthcare-associated infections, we must proceed to lay the groundwork through greater understanding of basic science and the pathogenesis of disease. We must continue to do the hard work of discovery and development, and to continue plodding incrementally forward via surveillance networks and comparative preventative trials. Perhaps we'll get lucky and a quantum leap forward will occur, but more likely we'll advance at a more measured pace.

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