Reducing Blood Culture Contaminations in the Emergency Department: It Takes a Team

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Introduction: Healthcare providers rely heavily on blood culture results for developing the patient's plan of care. Contaminated blood cultures can lead to unnecessary treatment, unnecessary hospitalization, and an increase in the patient's length of stay. There was a significant increase in our monthly blood culture contamination rates, over a 3 month period of time, which exceeded a recommended standard of <3%, as high as 4.35%. Given the negative impact this could have on patient outcomes, a quality improvement project was developed in order to ensure delivery of the highest quality of care.

Methods: We reviewed the literature to identify best practices related to blood culture specimen collection and incorporated strategies that proved to be effective in overcoming barriers similar to ours. We also used strategies that were tailored to meet our specific needs. Our plan included targeting environmental and skin contaminates, teamwork, education and feedback.

Results: During the 8 week pilot, the monthly contamination rates were 1.96% and 0.3%, respectively. Subsequent data over 1 year revealed the contamination rates ranged from 0.2% to 1.51%, with a mean of 0.87%.

Discussion: The results show that reducing blood culture contamination rates through the use of a structured plan and teamwork is feasible in the fast-paced emergency department. The commitment from our team was considered the most valuable asset and strategy. Developing a plan that is evidence-based and feasible in the fast paced Emergency Department can help ensure the delivery of high quality care.

Key words: Blood culture contamination; Emergency department; Quality

Health care providers rely heavily on blood culture results for developing the patient's plan of care. Contaminated blood cultures can lead to unnecessary treatment, hospitalization, and an increase in the patient's length of stay.[1–4] Accurate blood culture results are essential for directing the type and course of antibiotic therapy.[4,5] Unwarranted treatment as a result of specimen contamination can compromise patient outcomes and be costly for the health care system.[1–3,6]

Contaminated blood cultures are not the result of any single factor.[5] Contamination can occur at various points in the blood culture procedure, such as at the time of skin and/or bottle preparation, during assembly of the collection equipment, when venipuncture is performed, and at the time of specimen transfer, depending on the type of blood culture processing system that is used. No point has been specifically identified as more common or significant with regard to contamination than the others. A wide variety of practices have been found to contribute to specimen contamination, including, but not limited to, inadequate site preparation techniques, improper glove use, and failure to maintain aseptic technique.[2,5]

Currently, no "gold standard" exists for distinguishing pathogens from contaminates.[4,7] Some organisms are more often associated with contamination than are others.[8] Whereas

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microorganisms such as *Staphylococcus aureus* and *Escherichia coli* are most often indicative of bacteremia, other microorganisms, such as Bacillus species other than *B. anthracis* and Corynebacterium species, are rarely associated with bacteremia.[4,7,8] Contamination can occur from organisms in the environment or on the skin. Bacillus is more often considered an environmental contaminate.[9,10] Despite proper antisepsis of the venipuncture site, skin bacteria may still be present in deeper layers of the skin,[4,8] and thus a goal of 0% contamination rate is not entirely feasible.[11]

Current guidelines from the Clinical and Laboratory Standards Institute recommend maintaining blood culture contamination rates at less than 3%.[12] Although no national data exist regarding blood culture contamination rates in the emergency department, the medical literature shows that rates as high as 10% to 12% have been reported prior to any structured intervention.[4,5]

Local Problem

In our emergency department, we draw approximately 700 blood specimens for cultures per month. From January 2012 through September 2012, our monthly blood culture contamination rates ranged from 0.75% to 3.32%, with an average of 2.3%. For the last 3 months of 2012, however, our contamination rates began to climb—3%, 4.35%, and 4.35%, respectively—with 42% of the contaminated cultures in that last month reportedly growing bacillus, an environmental contaminate. During that time, the 2 other emergency departments within our health care system were maintaining contamination rates of less than 3%. It was essential to determine the factors in our emergency department that were contributing to this problem and affecting our contamination rates.

With this in mind, the ED clinical nurse specialist (CNS) observed ED staff while they collected blood culture specimens. The following staff practices, which have the potential to contaminate blood cultures, were observed: improper hand hygiene, failure to wear gloves, removing a fingertip from a glove to repalpate the disinfected site, failure to properly disinfect the site with the antiseptic and not allowing it to dry, placing supplies on the stretcher or the patient, using nonsterile gauze, collecting specimens from an existing peripheral intravenous line, and improper order of the blood draw. Site preparation was a particular concern. Most often, we observed that our staff prepared the site by using a Chlorascrub Prevantics Swabstick (PDI Healthcare, Orangeburg, NY) for less than 30 seconds, which was a significantly shorter period than is stipulated in our facility's policy/procedure and the manufacturer's recommendations.[13] Clearly, these practices were barriers to optimal blood culture specimen collection in our emergency department and needed to be addressed.

Intended Improvement

Based on the observed practices and rising contamination rates in our emergency department, it was decided that a quality improvement project was warranted to ensure delivery of the highest quality care. Although current guidelines recommend maintaining a contamination rate of less than 3%, evidence from the literature shows that rates of less than 2% can be achieved with the use of an effective procedure and commitment from team members.[1,2,11,14] Therefore, the aim of our project was to reduce the blood culture contamination rates in our emergency department to less than 2% and maintain that rate. The clinical question for this initiative was, "What strategies and practices are effective for reducing blood culture contaminations in the emergency department?"

Methods

ETHICAL ISSUES

The proposal for this quality improvement project was reviewed and approved by our corporate director of clinical education and professional development, the physician chair of the Infection Control Committee, the AVP clinical practice/administrative director of infection control, and the corporate director of laboratory services. Because it was determined that this initiative did not involve any new products or devices and only reinforced standard procedures for collecting blood cultures, submission to the Institutional Review Board was not warranted.

SETTING

This quality improvement project was conducted in the 22-bed emergency department of our facility within the community setting, with approximately 44,000 visits annually. This facility is 1 of 3 campuses that constitute a multisite health care system. Although laboratory personnel collect blood cultures on occasion in the emergency department, only specimens collected by ED staff were included in our data.

PLANNING THE INTERVENTION

We reviewed the literature to identify best practices related to blood culture collection. It was essential for us to use strategies and interventions that had been proven to be effective in overcoming barriers similar to the ones we had identified in achieving optimal blood culture specimen collection. We also used additional strategies that were tailored to meet our specific needs. Several themes from the literature assisted us in