



Nurses' competency in drawing blood cultures and educational intervention to reduce the contamination rate



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Received 10 January 2015; received in revised form 18 May 2015; accepted 12 June 2015

KEYWORDS

Pseudobacteremia;
Aseptic technique;
Phlebotomy team

Summary Compared with truly negative cultures, false positive blood cultures (BCs) not only increase laboratory work but also prolong the lengths of patient stays, which are likely to increase patient morbidity and costs. The present study aimed to evaluate the effectiveness of a hospital-wide educational intervention on BC contamination rates. Nurses performed all phlebotomies; therefore, educational workshops were offered to all nurses twice a week over a 3-month period. The workshops consisted of a questionnaire, PowerPoint presentation, video show, demonstration of the different materials used to collect BCs, and question session. Data from the questionnaires and laboratory culture results were compared between the 6-month pre- and post-intervention periods. Of the 503 eligible nurses, 216 (42.9%) attended the workshops. The survey identified areas for improvement, which included time of disinfectant application, volume of blood to be cultured, and disinfection of BC bottle tops. Of the 9903 BC sets that were drawn from 3649 patients during the study period, 676 (6.8%) were contaminated. The monthly BC contamination rates for the 6-month pre- and post-intervention periods were 8.1% and 5.2%, respectively, representing a 36% reduction ($P=0.008$). Only three wards had an acceptable contamination rate of $\leq 3\%$ before the intervention, compared with eight wards after the intervention. While contamination of BCs can never be

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completely eliminated, there is evidence that adherence to best practice BC collection techniques can minimize BC contamination, which might be best achieved with a dedicated phlebotomy team.

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Introduction

Blood cultures (BCs) have an important role in the diagnosis of serious infections and are useful for therapeutic decisions. However, contamination of BCs (i.e., false positive BCs) is a common problem within the hospital setting [1] and represent up to half of all positive BCs [2,3]. In the majority of cases, false-positive BCs are the result of contamination from faulty aseptic techniques; therefore, many cases are preventable. Contamination occurs from the introduction of organisms that originate outside the bloodstream (e.g., skin or environment) into the blood sample obtained for culture [4]. While target rates for contamination have been set at 2–3% [4,5], actual rates seem to vary widely between institutions, from as little as 0.6% to >6% [6].

False positive BCs can lead to errors in clinical interpretation and significantly impact patients, hospital staff, and health care costs [7]. Several studies have shown that false positive cultures are associated with unnecessary antimicrobial use and the need for additional cultures and other diagnostic tests, leading to unnecessarily prolonged hospital stays and significant additional hospital costs [2,8–10]. These findings highlight the need to improve the standard BC collection technique, thereby improving both the quality of patient care and resource use. Several techniques have been employed to minimize the risk of BC contamination, including the use of specific disinfection materials [3,7], educational interventions [3,9,11], collection from separate venipuncture sites [8,10], use of the outmoded double-needle technique [10], and reliance on specially trained staff or dedicated phlebotomists [3,10,12,13]. However, given that none of the currently available skin disinfectants are able to eliminate all bacteria, a zero or even close to zero BC contamination rate is not possible to achieve [14]. The aims of the present study were to assess the degree of BC contamination and to examine the effect of a hospital-wide,

multi-approach educational intervention on contamination rates.

Materials and methods

Setting

This quality assurance study was performed at Qatif Central Hospital, a district general hospital with 335 beds serving a population of more than 500,000. The hospital provides all acute, general medical, and surgical services; supports a range of outpatient facilities; and acts as a center for the coordination of health service provision throughout a defined geographical area in the Eastern Province, Saudi Arabia. The study included units from all services offering in-patient care and emergency departments (EDs). All BCs were collected by staff nurses in all services, including neonatal units, and when a catheter-drawn BC was indicated, nurses also collected these from the lines.

There were 503 practicing nurses during the educational intervention phase of the study. There was no written protocol for BC collection prior to study commencement, and new nurses received instructions from their senior peers and not through a training program. BC contamination rates were not routinely monitored at our institution, and nurses had no information about the monthly contamination rates. This quality improvement project was reviewed and approved by the Institutional Review Board, Education and Research Centre.

Blood culture processing

The BACTEC™ 9240 BC system (Becton-Dickinson, Riyadh, Saudi Arabia) was used for all BCs. Blood drawn from a single venipuncture was regarded as a single set regardless of how many BC bottles were inoculated; routinely, this includes an aerobic and an anaerobic bottle for adults, with or

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