

## SHORT REPORT

## Clean the skin: Reducing blood culture contamination in the emergency department

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## Abstract

**Objective:** To determine whether blood culture contamination (BCC) rates could be decreased in the ED by an educational programme.

**Methods:** Educational intervention focusing on a 1-min venepuncture cleaning time and providing a larger chlorhexidine alcohol swab. BCC rates were examined retrospectively 12-month pre-, and 9-month post-intervention.

**Results:** Six thousand nine hundred and fifty-three blood cultures were collected over the study period. The BCC rate was 2.4% pre-intervention versus 1.8% post-intervention, with no significant difference in BCC rates ( $Z$ -score = 1.862,  $P$  = 0.063).

**Conclusion:** This educational intervention focusing on skin clean time did not significantly decrease BCC rates in a setting of an already low (<3%) BCC rate.

**Key words:** blood culture, contamination, education, sepsis.

## Introduction

Bacteraemia, the presence of bacteria in the bloodstream is diagnosed by the blood culture. Blood culture

contamination (BCC) occurs when a non-pathogenic microorganism is introduced at the time of blood culture collection or processing.<sup>1</sup> BCC leads to additional costs to hospitals because of longer length of hospital stay and increased exposure to antibiotics. While guidelines recommend a BCC rate of <3%,<sup>1</sup> rates at our hospital ED have been 3.7%.<sup>2</sup> The objective of the present study was to determine whether BCC rates could be decreased in an ED by an educational programme focusing on a 1-min scrub time.

## Methods

## Study setting and population

A pre- and post-educational interventional study was conducted on ED patients ( $\geq 16$  years) who had blood cultures collected. All positive blood cultures from 1 April 2020 to 31 Dec 2021, 12-month pre-intervention and 9-month post-intervention, were analysed. The study was conducted at a tertiary ED in Sydney, Australia, with approximately 65 000 presentations per annum. Ethics approval was obtained from Local Health District Human Research Ethics Committee.

## Intervention

An educational programme to decrease BCC was developed focussing on a 1-min peripheral venepuncture site cleaning time. Additionally, a larger wipe with a maximum treatment of area of 10 cm  $\times$  10 cm replaced the 6 cm  $\times$  7 cm 2% chlorhexidine and 70% alcohol wipes and were bundled with the blood culture bottles with an elastic band, to increase ease of adherence. The programme commenced on 1 April 2021, and staff (nursing and medical) were educated during the study period through regular educational presentations at staff meetings, posters in the ED (Fig. S1), emails and group messaging.

## Data collection and outcome measures

Patients who had blood cultures taken in the ED were identified via the South-Eastern Area Laboratory Services pathology and clinical data was obtained retrospectively via electronic medical records. Clinical data and blood culture results were collected on a standardised excel spreadsheet. Blood culture isolates were categorised as being either true positives or contaminants. A true positive had pathogenic bacterial growth and was treated with antibiotics. Contaminated cultures were determined based upon the presence of commonly recognised contaminants and if the treating clinician and/or infectious disease clinician documented they were contaminated. If the treating team were unsure but treated the patient as a true positive these were categorised as true positives. Commonly recognised contaminants were defined as coagulase-negative

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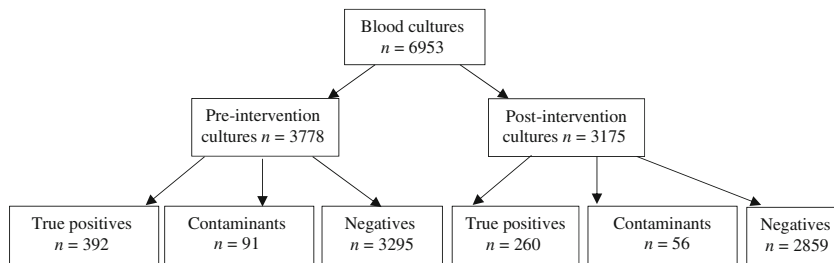


Figure 1. Blood culture results pre- and post-intervention.

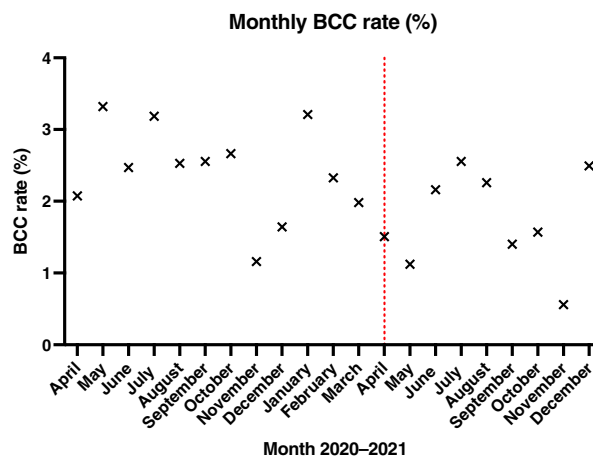


Figure 2. Monthly rate of blood culture contamination (BCC) over time with the red-dotted line indicating the start of the intervention.

staphylococci, diphtheroids, micrococcus species, bacillus species and viridan group streptococci unless isolated from more than one blood culture set.<sup>3</sup> All contaminants were agreed on by both researchers (LM and ALC). BCC rate was defined as a percentage of contaminants compared to the total number of cultures taken.

Descriptive data were reported as means with 95% confidence intervals (CI) for normally distributed data and medians and interquartile ranges (IQR) for non-normally distributed data. BCC rate were calculated pre- and post-intervention and compared utilising a 2-sample, 2-tailed Z test to compare proportions.

## Results

Over the study period 6953 blood cultures were collected from 6767 patients, with a median age of 62 years (IQR 40–78) with 3225 (47.7%) females. Of the cultures

collected, 799 (11.5%) were positive for bacterial growth, with 652 (9.4%) true positives and 147 (2.1%) contaminants (Fig. 1). The BCC rate pre-intervention was 2.4% (12 months) *versus* post-intervention 1.8% (9 months), with no significant difference in BCC rates (Z-score = 1.862,  $P = 0.063$ ). Figure 2 demonstrates the monthly BCC over the study period, pre- and post-intervention. Additionally, over the study period the rate of positive blood cultures significantly decreased from 10.4% of all blood cultures pre-intervention to 8.2% of all cultures post-intervention (Z-score = 3.116,  $P = 0.002$ ).

## Conclusions

Our study did not demonstrate a significant change in BCC with an educational intervention focusing on scrub time in this population of an already low BCC rate (<3%). There are various limitations to the present

study firstly the BCC rate was low <3% and hence the study may not have been large enough to detect an effect in this group. Furthermore, the COVID-19 pandemic may have been a confounding variable with increased hand hygiene and mask mandates from early 2020. However, recent studies have found an increase in BCC during the COVID period, hypothesised to be because of increased workload, exhausted staff, and staff shortages.<sup>4</sup> Furthermore, during the present study there was a significant decrease in the percentage of true positive cultures post-intervention, this may have been the result of larger numbers of patients with COVID-19 or other viral infections being cultured. This finding may indicate the need for more stringent use of clinical decision rules (i.e. SIRS or Shapiro rule) before a blood culture is drawn.<sup>5</sup>

## Acknowledgement

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## Author contributions

LM and ALC were involved in the design, data collection and analysis and drafting and revising the manuscript. WV was involved in study design, implementation and manuscript revisions. EV was involved in acquisition of the data and manuscript revisions.

## Competing interests

ALC is a section editor for *Emergency Medicine Australasia* and was excluded from the peer-review process and all editorial decisions related to the acceptance and publication of this article. Peer-review was handled independently by members of the Editorial Board to minimise bias.

## Data availability statement

The data that support the findings of the present study are available from the corresponding author upon reasonable request.

## References

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## Supporting information

Additional supporting information may be found in the online version of this article at the publisher's web site:

**Figure S1.** Educational poster displayed in the ED during the intervention period.