

Introduction

Blood cultures are considered the premier diagnostic test for diagnosing bacteremia or sepsis. This test provides essential information for clinicians regarding dangerous pathogens. Obtaining blood cultures has become a vital clinical adjunct for diagnosis of these conditions in the emergency department.

Complicating these diagnoses, blood culture specimens can be contaminated during the specimen collection process (Park et al., 2015). Contaminated specimens cloud the clinician's ability to diagnose bacteremia and/or sepsis thus extending the time it takes for a patient to receive appropriate definitive care.

Clinical decisions based on contaminated specimens can lead to unnecessary interventions (Park et al., 2015). Evidence has shown that contaminated blood cultures adversely affect patient outcomes and health care organizations.

Patton and Schmitt, 2010, introduced the concept of a small amount of skin cells caught during obtaining the specimen leading to contamination. This has given rise to the creation of diversion devices. These devices are costly.

CLSI, 2022, recommended an overall blood culture contamination rate of less than 1% a change from the previous acceptable rate of under 3% (Doern and DeBaun, 2021).

Aim/Methodology

AIM: This quality improvement project aimed to reduce the number of contaminated blood cultures in a community hospital emergency department by using an initial specimen diversion tube to meet the new national benchmark of below 1% contamination rate.

METHODS: Twenty-seven diversion specimens were collected over an eight-week period via initial intravenous catheter insertion in a community hospital emergency department.

Funding

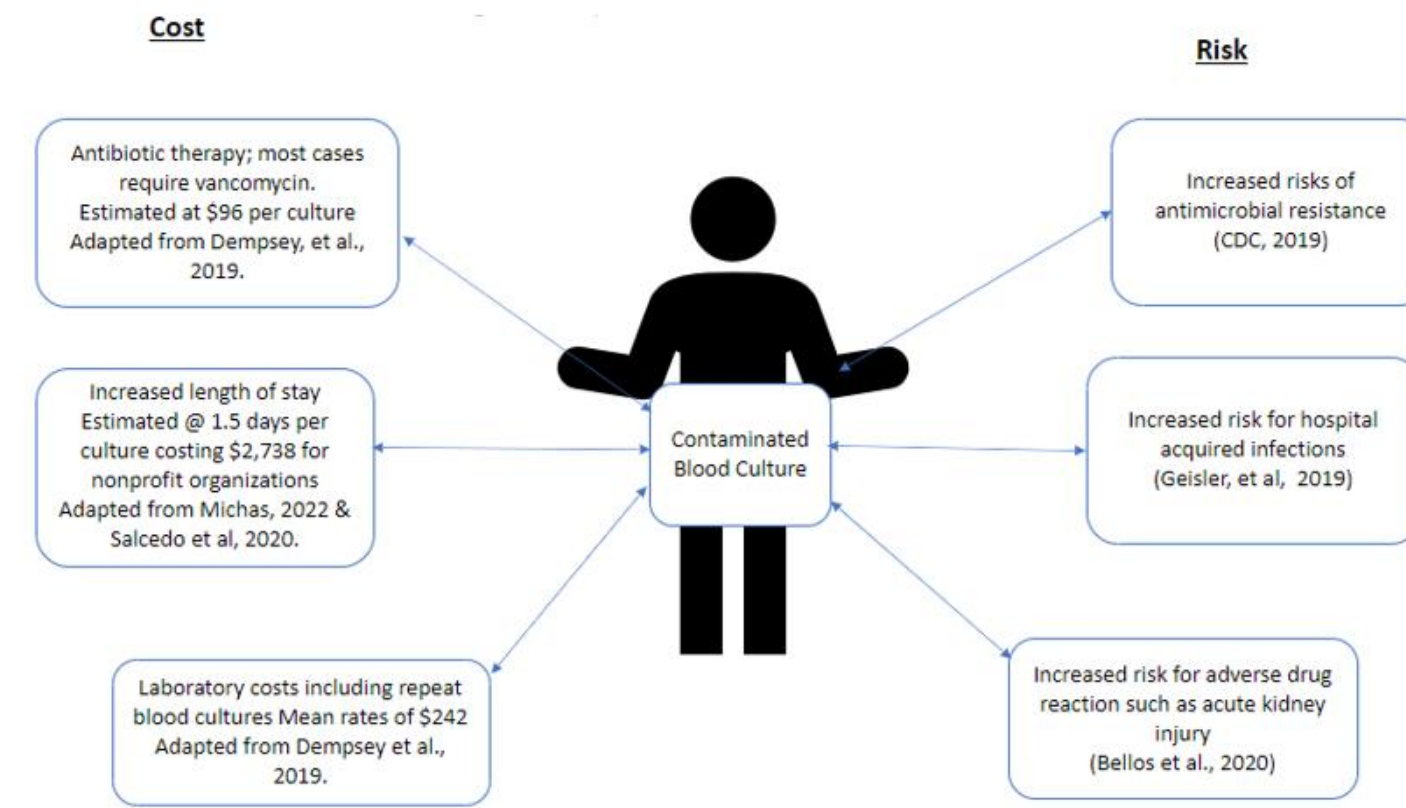
This project was made possible with research grant funding made available from Eta Iota at-Large Chapter of Sigma Theta Tau and through the collaboration of Beth Israel Lahey Exeter Hospital staff.

Acknowledgements

A special thank you to Jim Miller, Ellen Simms, Vas Collins, Lindsey Boschetti, and Judy Waite of BILH Exeter Hospital. As well as Drs. April Phelps, Dayle Sharp, and Cathleen Collieran for all their support.

Available Knowledge

Figure 1 Negative Sequelae associated with a contaminated blood culture



Contamination Rates and Cost

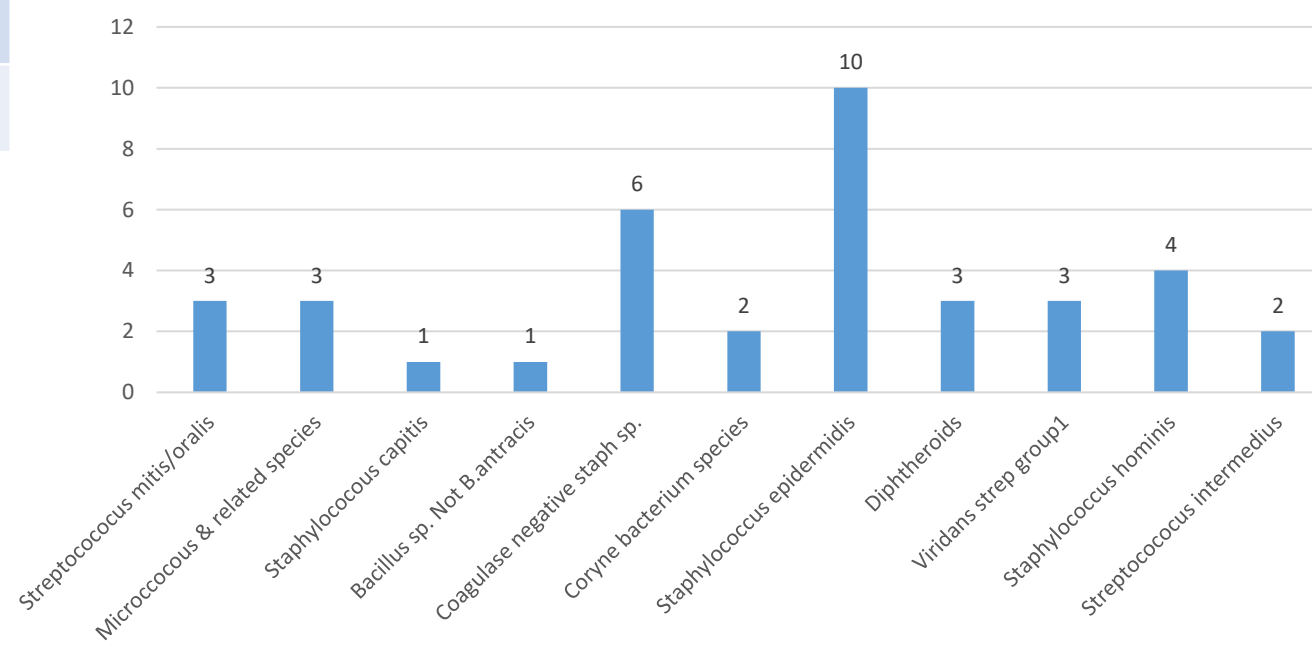
Table 1 Data on Contamination Rates

	May	Contaminated	June	Contaminated	July	Contaminated
Diversion Tube Method ED IV	9	0	13	1	4	0
Standard Procedure ED IV	138	5	221	3	154	7

Table 2: Institution Specific Estimated Cost of Contaminated Blood Cultures

Year	Number of Contaminated Blood Cultures	Cost per Contaminated Blood Culture	Total Cost of Contaminated Blood Cultures	Potential Cost Savings
2022	84	\$3,078	\$258,552	N/A
2023	74	\$3,078	\$227,772	\$30,780

Figure 2 Pathogens Isolated in Contaminated Specimens from IV Sources October 2023 to April 2024



Intervention Data

Figure 3 Blood Culture Contamination Rates for Project Period

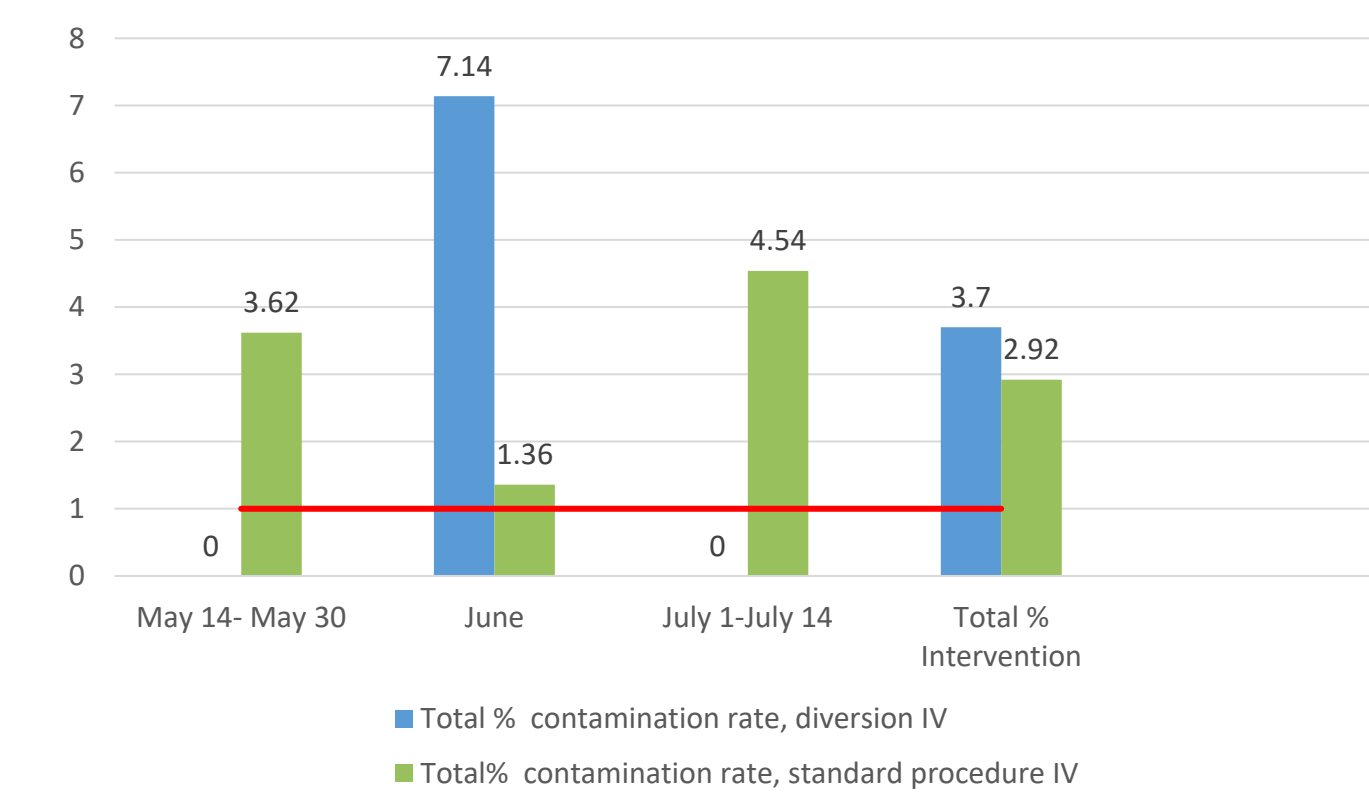


Figure 5 Total Specimens Sent in the ED During Data Collection Period

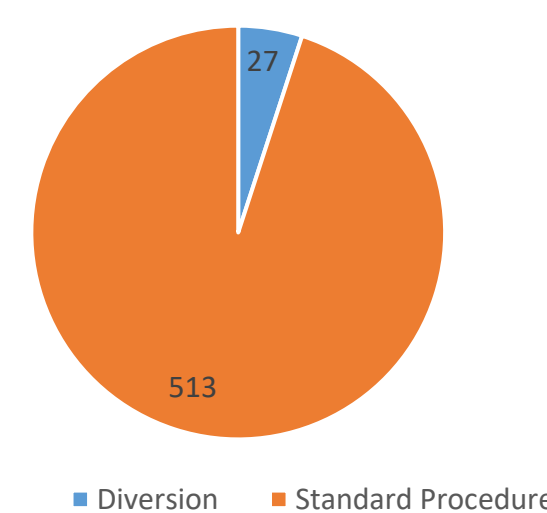


Figure 4 Total & Mean Contamination Rates

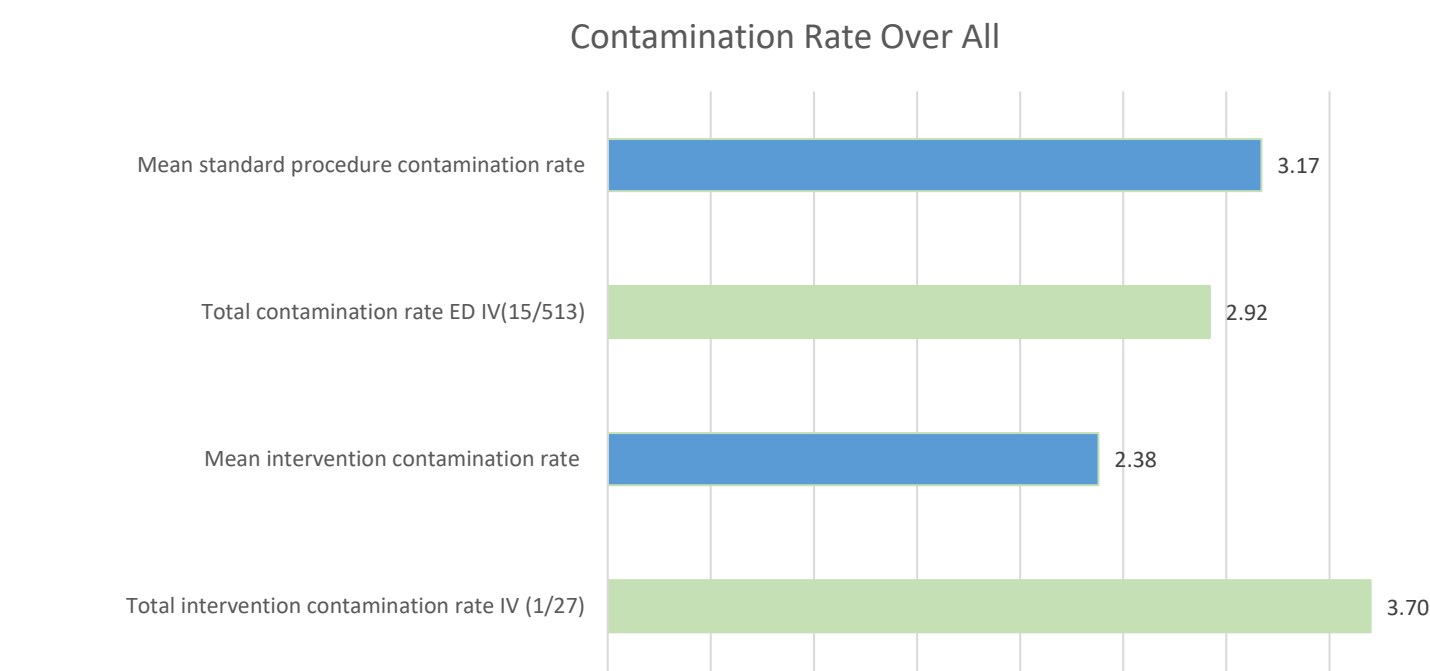
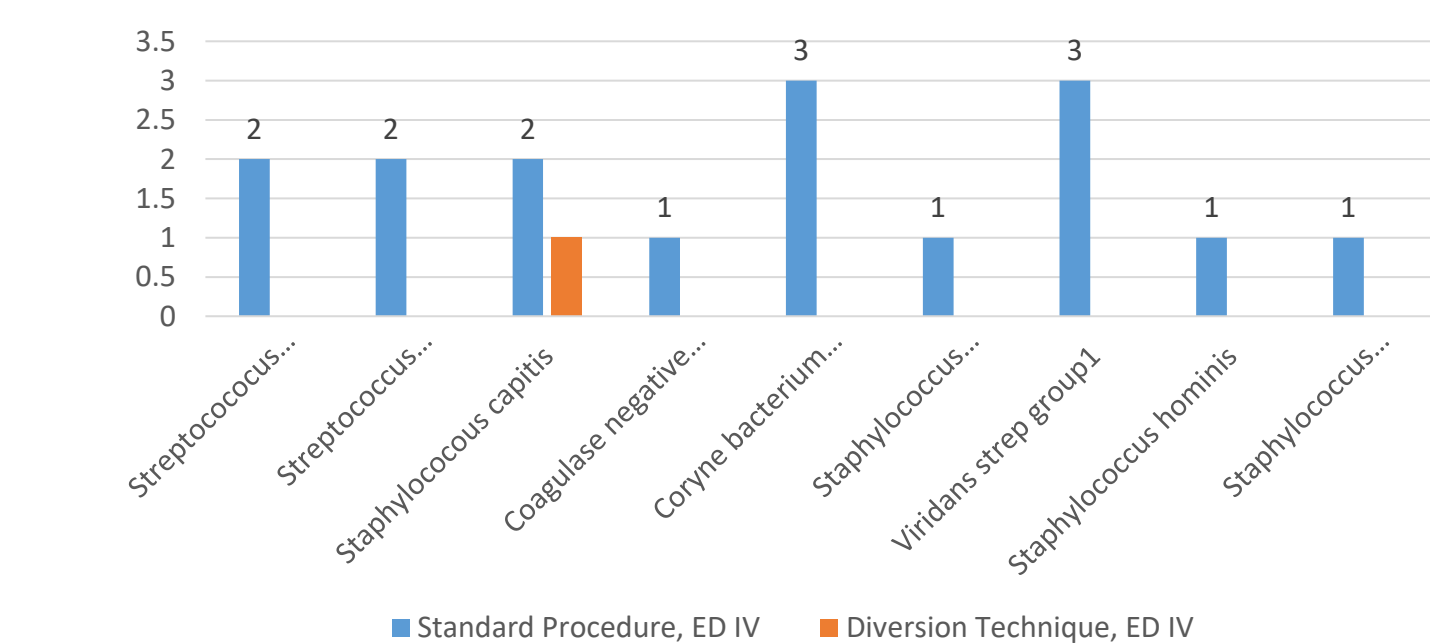


Figure 6 Pathogens Isolated With and Without Diversion Techniques



Results

The overall contamination rate during the study period for the standard procedure group yielded 2.92% rate with a mean contamination rate of 3.17%.

The diversion protocol group's overall contamination rate yielded 3.70% rate with one contaminated specimen resulting in a mean contamination rate of 2.38%.

Nine pathogens were isolated in the standard procedure group compared to one in the diversion group. Superuser performance was variable.

Conclusions

The contamination rates exhibited significant fluctuation across the 8-week intervention period. Despite the fluctuation in contamination rates, the data does suggest a notable decline in contamination rates for the intervention group during May 14 – May 30(0%) and July 1 – July 14 (0%).

These findings are congruent with Syed et al. (2020) findings in which a diversion tube protocol was utilized over an 18-month period and produced a statistically significant reduction in contamination rates.

Although the rates were below 1% during the 8-week data collection period, the project failed to maintain a rate below 1% and the results were not statistically significant.

The results do suggest that this method could be a potentially viable solution to assist in reducing blood culture contamination as evidenced by the reduced number of pathogens isolated in the diversion group and a lower mean contamination rate.

Limitations

- Small sample size limiting the statistical power of the findings, reducing the ability to detect significant effects.
- Findings cannot be generalized to a larger population.
- Participants may not adequately represent the broader limiting the external validity of the results.
- There was a low occurrence rate for contamination.
- The short timeline of the study constrains the conclusions that can be drawn. The study period coincided with a national shortage of BD BAVTEC blood culture bottles leading an abrupt end to the project which may have influenced the results. Further study is needed.

References

