



Analyzing The Association Between Blood Culture Algorithm Implementation and Clinical Outcomes in the ICU

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Background

- Blood cultures are vital in ICU patient management, particularly for individuals at high risk for infection.
- However, they are occasionally drawn for low-risk patients, resulting in unnecessary positive cultures and premature antibiotic use.
- Reducing blood cultures and antibiotic usage could enhance ICU patient outcomes.

Goal

- Assess changes in patient outcomes and blood culture utilization rates post implementation of a medical decision-making algorithm across ICUs within Duke Health.

Implementation

- Data sourced from the Duke Critical Care and Perioperative Population Health Research program's ICU universe.
- Study period: January 2019 to December 2023.
- Participants: Hospitalized ICU patients meeting specified inclusion criteria.
- Variables measured include length of ICU stay, mortality rates, readmission rates, percentage of patients receiving a blood culture, total number of blood cultures per patient

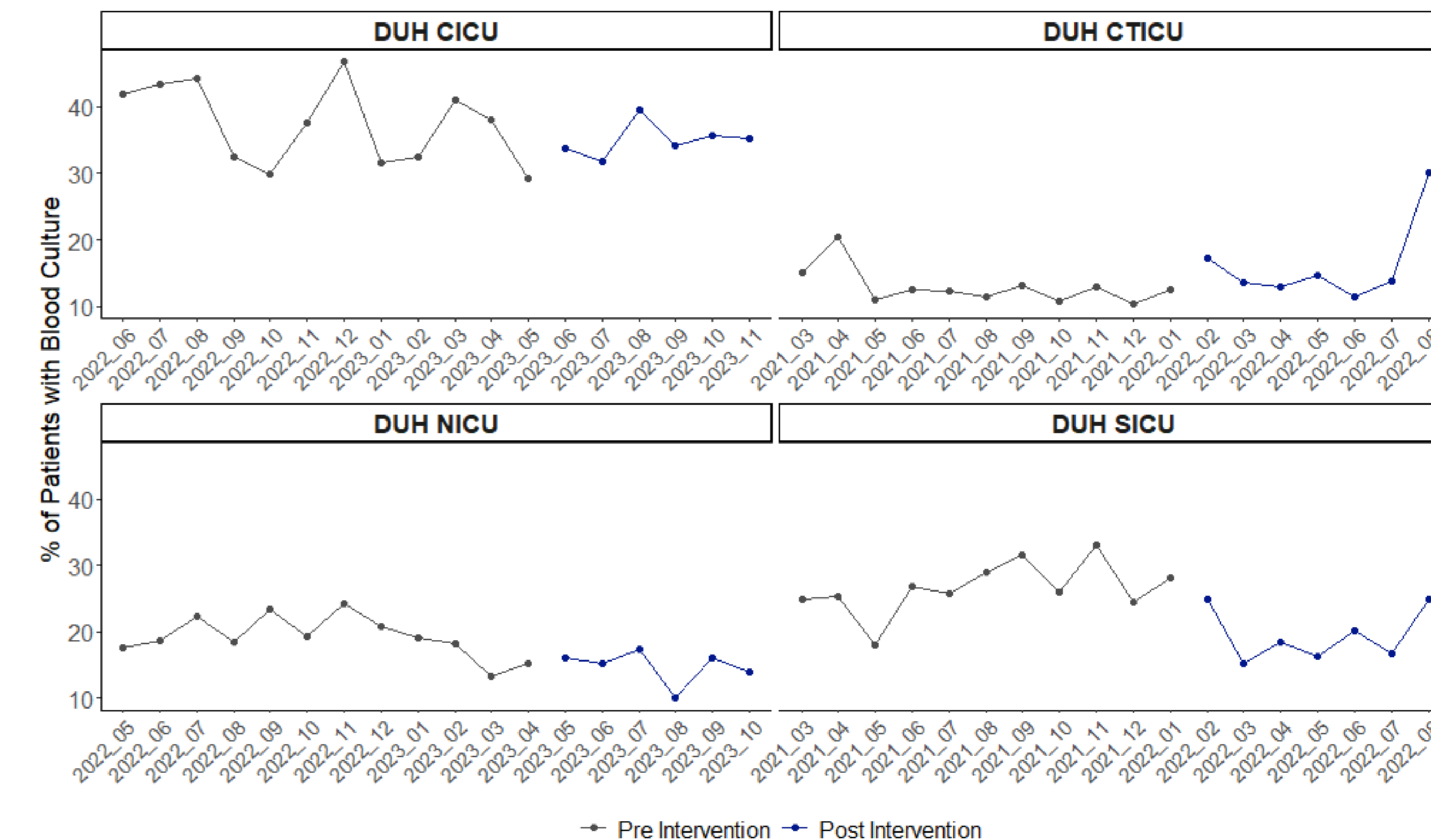
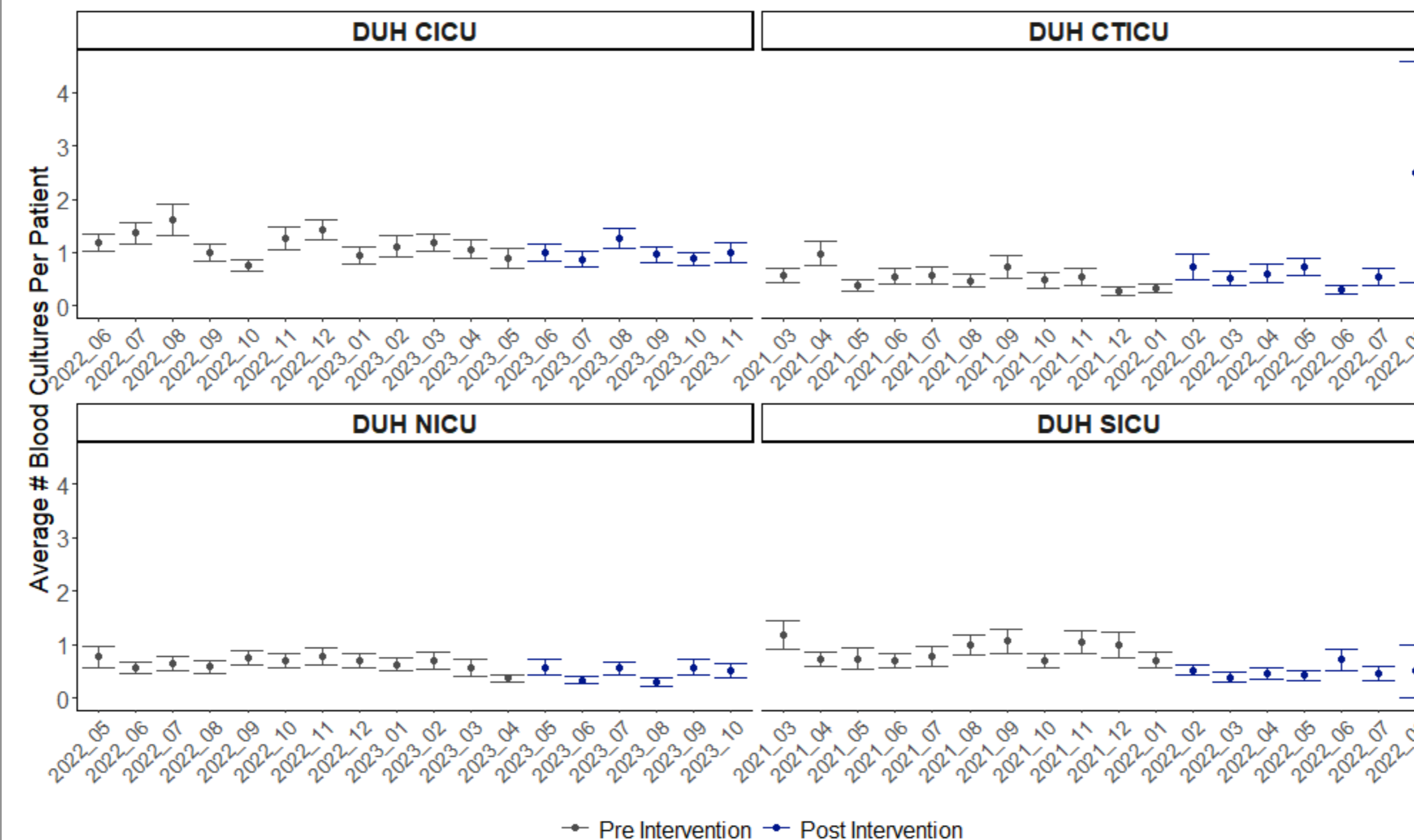
Unique Patient Hospitalizations with an ICU visit between January 2019 and December 2023 (N = 51,008)

- Removed: Pediatric Patients (N = 152)
- Removed: ICU visit not in DUH SICU, NICU, CICU or CTICU (N = 19,455)
- Removed: Missing ICU start/stop timestamps (N = 15)
- Removed: ICU visit falls outside 1 year prior/first 6 months of BCA implementation date (N = 21,599)
- Removed: ICU start before BCA implementation date and ICU stop after BCA implementation date (N = 80)

Final Cohort (N = 9,707)

Outcomes

- Our analysis included a cohort of 9,707 patients, with 2316 in the CICU, 2935 in the CTICU, 2741 in the NICU, and 1715 in the SICU. The percentage of patients who had blood cultures taken was reduced significantly post-intervention. Additionally, the total number of blood cultures per patient was significantly reduced. Despite an unchanged median, there was also a significant change in the variability of ICU length of stay as indicated by an increase in IQR post-intervention compared to pre-intervention. No significant change was observed in ICU mortality. Similarly, the rate of readmission to the ICU during the same hospitalization was not significantly affected by the intervention.



Conclusion

The integration of the blood culture algorithm into medical decision-making guidelines was associated with a significant decrease in the number of blood cultures per patient and a slight but significant increase in the variability of patients' ICU length of stay. However, it did not significantly affect ICU mortality or readmission rates.

Next Steps

- A multicenter study with a larger and more diverse patient population would help to strengthen the generalizability of the findings.
- Identification of what factors may be associated with increased length of ICU stay variability, such as disease severity, specific diagnoses, or delayed identification of positive cultures due to the algorithm's influence would provide a more complete picture of the algorithm's impact.

References

- O'Grady, N. P. et al. Society of Critical Care Medicine and the infectious diseases society of america guidelines for evaluating new fever in adult patients in the ICU. *Critical Care Medicine* 51, 1570–1586 (2023).
- Siev, A. et al. Assessing a standardized decision-making algorithm for Blood Culture Collection in the intensive care unit. *Journal of Critical Care* 75, 154255 (2023).