# Association Between Unit Type and Risk of Bloodstream Infection in Pediatric Patients

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## Background

Healthcare-associated bloodstream infections (BSI) are identified by positive blood cultures in a patient with clinical signs of infection such as fever, chills, tachycardia, and hypotension (1). Non-BSI cultures contain a pathogen, but patients do not have clinical signs of infection.

Pathogens can enter the bloodstream by disruption of the skin through a catheter or mucosal barriers (2). Patients in the ICU, acute care, and hematology and oncology unit are at a higher risk of developing a BSI that may be attributed to the use of indwelling devices, immunosuppression, hospitalization, and invasive procedures among many other risk factors (3).

Hospital unit type may influence BSI risk by reflecting variations in patient acuity, immunocompromised status, and clinical practices, making it an important factor to evaluate in infection prevention efforts.

## Objectives

1. To assess the association between hospital unit type and BSI
2. To identify the pathogen distribution associated with BSI cases

## Methods

**Study Design**: Cross-sectional study (December 2024 to August 2025)
**Study Population**: Pediatric hospital patients with blood cultures collected (n= 60)
**Primary Outcome**: BSI cases (n = 30), classified through NHSN criteria
**Statistical Analysis**:

- Descriptive analysis: Frequency distribution was generated to show the characteristics of study cohort. Pearson's chi-square test or Fisher's exact test (cell count <5) was used to assess the association between two variables
- Log binomial analysis was employed to estimate risk ratio of unit type and BSI
  - Adjusted/controlled for sex, race, device and pathogen type.
  - SAS 9.3M2 was used to conduct data analysis

## Results

**Figure 1. Pathogen type in BSI**

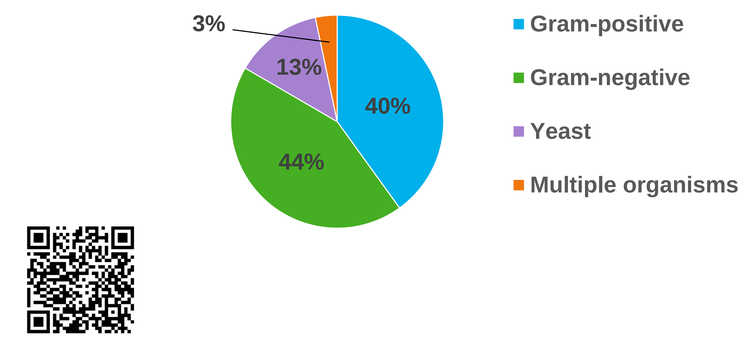



**Table 1.Characteristics of Pediatric Patient with Cultures Collected**

| | | BSI (n=30) No. (%) | Non-BSI (n=30) No. (%) | p-value |
|---|---|---|---|---|
| **Sex** | | | | |
| | Male | 22 (53.7) | 19 (46.3) | 0.4051 |
| | Female | 8 (42.2) | 11 (57.8) | |
| **Race** | Black | 13 (48.1) | 14 (51.9) | 0.8565 |
| | White | 5 (45.5) | 6 (54.5) | |
| | Other | 12 (54.4) | 10 (45.6) | |
| **Unit** | | | | |
| | ICU | 11 (36.7) | 19 (63.3) | 0.1181 |
| | Heme-onc | 9 (69.2) | 4 (30.8) | |
| | Acute | 10 (58.8) | 7 (41.2) | |
| **Device** | | | | |
| | CL | 20 (51.3) | 19 (48.7) | 0.4475 |
| | Midline | 3 (60.0) | 2 (40.0) | |
| | PIV | 9 (40.9) | 13 (59.1) | |
| **Pathogen type** | | | | |
| | Gram-positive | 12 (40.0) | 18 (60.0) | 0.1584 |
| | Gram-negative | 13 (61.9) | 8 (38.1) | |
| | Multiple organisms | 1 (25.0) | 3 (75.0) | |
| | Yeast | 4 (80.0) | 1 (20.0) | |

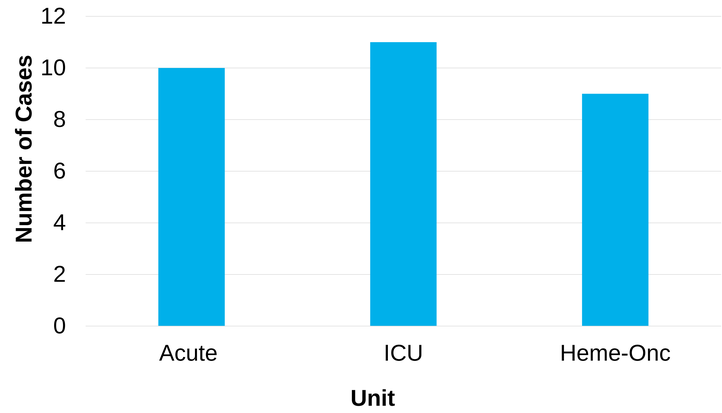
*Abbreviation: ICU, intensive care unit; Heme-onc, hematology and oncology; CL, central line; PIV peripheral intravenous line

**Table 2. Risk Ratio Between Unit Type and Risk of BSI**

| | Model 1 RR (95% CI) | Model 2 RR (95% CI) | Model 3 RR (95% CI) | Model 4 RR (95% CI) |
|---|---|---|---|---|
| Unit Type | | | | |
| ICU (ref) | 1.00 (ref) | 1.00 (ref) | 1.00 (ref) | 1.00 (ref) |
| Heme-onc | 1.89 (1.04–3.42) | 2.06 (1.16–3.65) | 1.23 (0.74–2.12) | 1.21 (0.79–1.86) |
| Acute | 1.60 (0.87–2.97) | 1.61 (0.87–2.96) | 1.31 (0.85–2.02) | 1.23 (0.88–1.73) |

*model 1 is unadjusted, model 2 is adjusted for device type, model 3 is adjusted for sex and race, model 4 is adjusted for sex, race, and device  Abbreviation: RR, risk ratio; CI, confidence interval

**Figure 2. Incidence of BSI by Unit type**




## Discussion & Conclusion

- Most pathogen type among BSI cases were gram-negative (44%) followed by gram-positive (40%) (Figure 1).
- Among patients with cultures collected (n=60), no statistically significant differences were observed between BSI and non-BSI groups across demographic or clinical characteristics. Although not statistically significant, BSI cases appeared more frequent in ICU and acute care units, while gram-negative organisms were more common among BSI cases (Table 1, Figure 2). A total of 20 suspected central line-associated bloodstream infection (CLABSI) cases were identified, and variables including device type, race, and pathogen type were not significantly associated with BSI (Table 1).
- In the unadjusted analyses, patients in the heme-onc unit had a significantly higher risk of BSI compared to the ICU **(RR: 1.89, 95% CI: 1.04–3.42)** (Table 2). However, this association was attenuated and no longer significant after adjustment for sex, race, device type **(RR: 1.21, 95% CI: 0.79–1.86)** (Table 2).
- These findings suggest that the initial association between unit type and BSI risk may be explained by existing clinical conditions and demographic factors rather than unit type alone.
- This study is limited by unmeasured confounding, including illness severity and adherence to infection prevention practices. Strengthening consistent care and early detection are efforts that may help reduce BSI risk and improve patient outcomes.

## References

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