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Identifying Structural Factors Associated with Central Line-Associated Bloodstream Infections (CLABSI) Risk in a Single-Center Pediatric Academic Hospital

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Introduction

- Outcomes result from processes that occur within systems with a particular structure.
- Efforts to prevent CLABSIs are focused on individual compliance with established care bundles.
- Little is known to what extent organizational structure and process influence CLABSI outcomes.
- Purpose of this study to explore system-level risks for CLABSI within clinical units.

Methods

Objectives: compare unit structure and process-related factors against unit-specific CLABSI rate.

Structure-related factors

- Acuity-based nurse workload represented by the rate of hours per patient day (HPPD)
- Ratio of full to part-time staff (FTPT)
- Number of separations/nurse turnover

Process-related factors

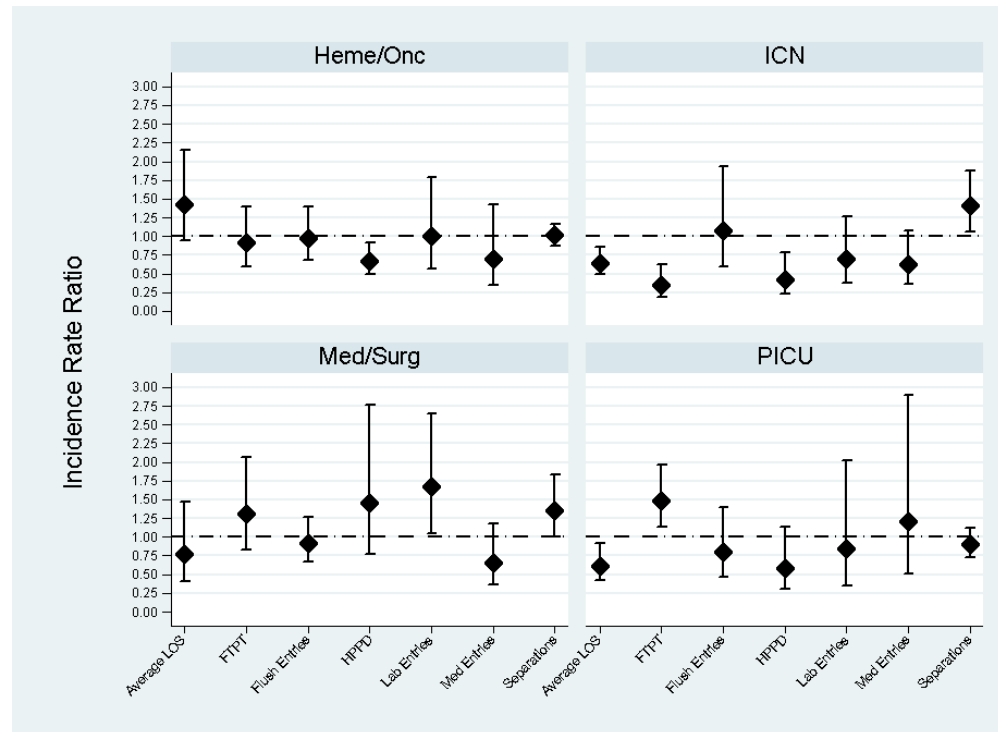
- Average length of stay (LOS)
- Rates of central line entry by type:
 - Laboratory collection
 - Medications
 - Flush

Aggregate monthly data from July 2014 to June 2016 was collected on patients aged 0 months to 18 years.

Nine nursing units were categorized according to four clinical paradigms to analyze factor effect:

- Intensive Care Nursery (ICN)
- Pediatric Intensive Care Unit (PICU)
- Hematology/Oncology (Heme/Onc)
- Medical Surgical (Med/Surg)

Figure 1. Stratified, multivariable Poisson regression produced unit-specific incidence rate ratios (IRR) and accounted for central line days. Factors by unit type were standardized to represent one standard deviation change.



Results

A total of 104 CLABSIs were identified with unit rates per 1000 central line days:

- ICN: 0.95
- PICU: 2.22
- Heme/Onc: 2.11
- Med/Surg: 2.22
- Nurse turnover** was a significant risk in ICN (IRR: 1.41; $p=.018$) and Med/Surg (IRR: 1.36; $p=.046$) but not for the PICU (IRR: 0.90; $p=.341$) and Heme/Onc (IRR: 1.01; $p=.871$) floors
- Increases in the **FTPT staff ratio** had increased risk of CLABSI in the PICU (IRR: 1.49; $p=0.005$), yet protective for the ICN (IRR: 0.34; $p<.001$)
- Increased **LOS** was a risk for Heme/Onc (IRR: 1.43; $p=0.088$), yet protective for the ICN (IRR: 0.65; $p=.002$) and PICU (IRR: 0.62; $p=.016$)
- Central line access** reasons were not statistically significant with the exception of lab entries on the Med/Surg floor (IRR: 1.67; $p=0.030$)

Conclusion

- CLABSI mitigation requires more than individual competence with task-related practices.
- The unique work ecology of each clinical area may broadly influence CLABSI as an outcome.
- Extending analyses to consider organizational structure can inform resource allocation and recalibrate traditional prevention strategies.