Pediatric Central Line-Associated Bloodstream Infections, Texas, 2023–2024

Sohail Lakhani, MSc; Angie Benedetto, MPH, CIC; Debola Ola, DrPH, MD, MPH, CIC; Leon Kincy, MAG; Whitney L. Ethridge, MPH, CPH, CIC; Jennifer Lee, PhD; Alma Martinez, MS

Texas Department of State Health Services, Office of the Chief State Epidemiologist, Disease Surveillance and Epidemiology Section, Healthcare Safety Unit

TEXAS Health and Human Services | Texas Department of State Health Services

dshs.texas.gov

Introduction

- Central venous catheters are intravenous access tubes that terminate near the heart to deliver medications, fluids, and nutrition, and may remain in place for extended periods.[1] The risk of Central Line-associated Bloodstream Infections (CLABSIs) is higher than short-term peripheral intravenous (IV) line (e.g., lines placed in arm vein) infections.[2s]
- CLABSIs increase morbidity, mortality, and additional costs (up to $55,000 per infection) and are the most common hospital-acquired pediatric infection.[1, 3, 4]
- Statewide CLABSI trends are documented,[5] but studies on pediatric trends remain limited.
  - Pediatric CLABSI distribution and time to infection analyses are needed to support infection control initiatives and reduce CLABSI burden in Texas.
- This study examined time to CLABSI, geographic distribution (i.e., Texas counties), hospital unit bed size, and clinical characteristics (e.g., fever, hypothermia) among Texas pediatric sub-groups (i.e., neonate, infant, pediatric).

Methods

- Pediatric CLABSI cases (N = 570) were reported in Texas to the National Healthcare Safety Network in 2023-2024.
- Cases were classified into three age groups: (1) Neonates (birth to 29 days, n = 198); (2) Infants (30 days to 1 year, n = 183); (3) Pediatrics (greater than 1 to 18 years, n = 189).
- Dependent variable was time to CLABSI (in days) after admission. Independent variables included Texas counties (N = 254), unit bed size, and clinical characteristics.
- Kaplan-Meier curves in RStudio showed the probability of remaining CLABSI-free after admission. Cox proportional hazards models estimated earlier infection risk (Hazard Ratios [HRs]), adjusting for demographics, unit bed size, and clinical characteristics.
- Hotspot analysis, conducted in ArcGIS Pro with the k-nearest neighbors' algorithm, visualized county-level patterns of pediatric CLABSI cases.

Results

Table 1. Risk of Early Central Line-Associated Bloodstream Infection After Admission, Texas, 2023 - 2024

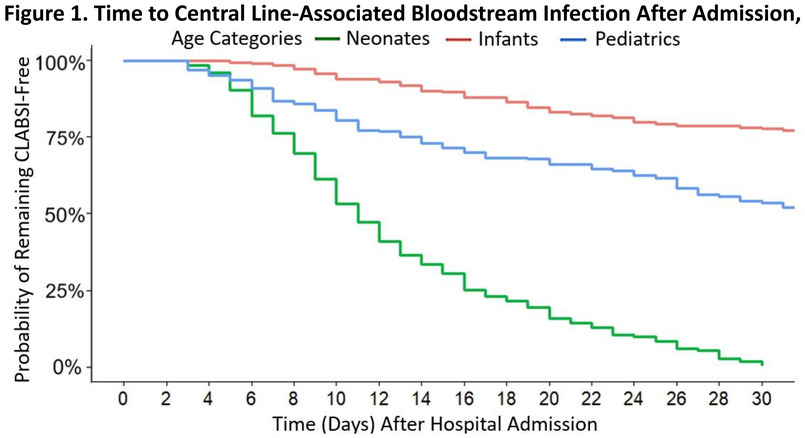
Variable	Categories (n)	Unadjusted Model HR (95% CI)	Adjusted Model HR (95% CI)
Age Category	Pediatrics (189)	Ref.	
	Infants (183)	**0.78 (0.64, 0.96)***	**0.80 (0.65, 0.99)***
	Neonates (198)	**6.46 (4.98, 8.37)***	**6.82 (5.20, 8.94)***
Sex	Female (271)	Ref.	N/A
	Male (298)	1.08 (0.92, 1.27)	
Unit Bed Size	> 15 (526)	Ref.	N/A
	≤ 15 (44)	1.10 (0.84, 1.45)	
Bradycardia	No (544)	Ref.	Ref.
	Yes (26)	**1.76 (1.19, 2.62)***	1.12 (0.75, 1.67)
Fever	No (408)	Ref.	N/A
	Yes (82)	0.87 (0.69, 1.10)	
Hypotension	No (519)	Ref.	N/A
	Yes (51)	1.26 (0.95, 1.69)	
Hypothermia	No (543)	Ref.	N/A
	Yes (27)	1.15 (0.87, 1.69)	
Neutropenia	No (540)	Ref.	Ref.
	Yes (30)	**1.63 (1.13, 2.35)***	2.89 (0.39, 21.22)
Mucosal barrier injury	No (539)	Ref.	Ref.
	Yes (31)	**1.55 (1.08, 2.24)***	0.82 (0.12, 5.90)
Ventricular assist device	No (548)	Ref.	Ref.
	Yes (22)	**0.55 (0.36, 0.84)***	0.68 (0.44, 1.06)

*Statistically significant. Confidence Interval (CI) does not contain 1.00.

- The adjusted time to CLABSI model showed (Table 1):
  - Neonates developed CLABSI faster compared to pediatrics (HR = 6.82, 95% CI: 5.20, 8.94).
  - Infants developed CLABSIs slower compared to pediatrics (HR = 0.80, 95% CI: 0.65, 0.99).
  - Bradycardia, neutropenia, mucosal barrier injury, and ventricular assist device usage were associated with shorter time to CLABSI but were not significant after controlling for age.

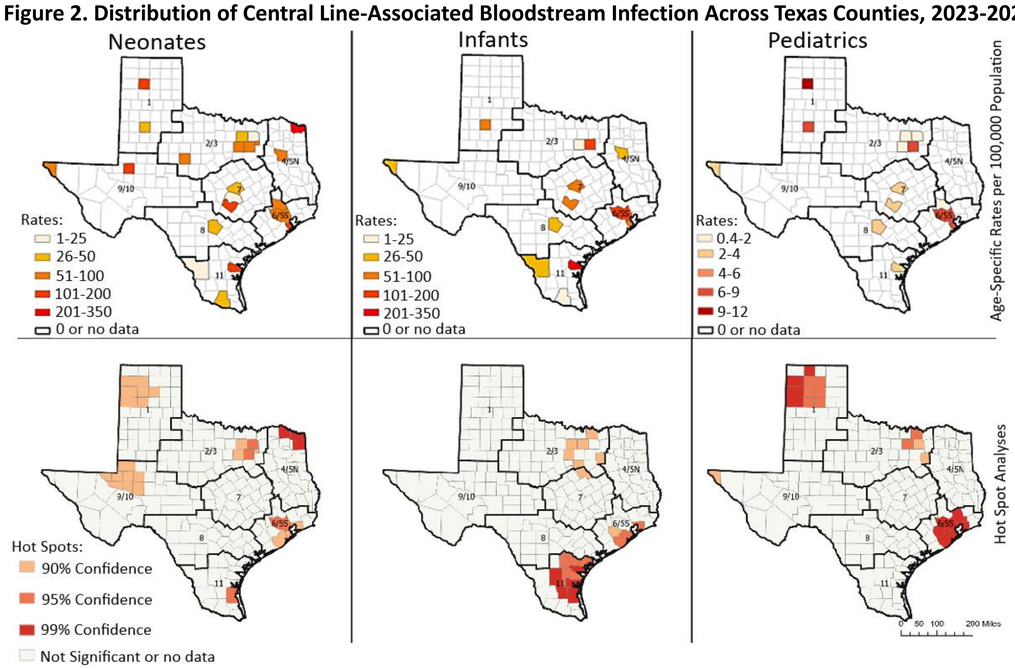
Results

Figure 1. Time to Central Line-Associated Bloodstream Infection After Admission, Texas, 2023-2024



- Figure 1 shows the probability of remaining CLABSI-free within 30 days of admission:
  - Neonates were most likely to develop CLABSIs from six to 30 days after admission.
  - Infants were least likely to develop CLABSIs throughout the first month after admission.
  - Pediatrics were most likely to develop CLABSI three to five days after hospital admission.

Figure 2. Distribution of Central Line-Associated Bloodstream Infection Across Texas Counties, 2023-2024



Note: Top row (left to right) shows county-level age-specific CLABSI rates per 100,000 population for neonates, infants, and pediatric patients in Texas, 2023-2024.

Note: Bottom row (left to right) shows statistically significant infection hotspots identified using spatial cluster analysis for neonates, infants, and pediatrics in Texas, 2023-2024.

- CLABSI rates revealed geographic infection patterns (e.g., higher rates in panhandle, north, and northeast Texas for neonates) (Figure 2).
- Geographic patterns differed by age group (e.g., Infants had significantly higher CLABSIs in the southern Gulf area compared to neonates and pediatrics). Overlapping patterns showed no significant differences in CLABSIs across age groups (e.g., central Texas) (Figure 2).

Conclusions

- Previous studies showed CLABSIs are the most common hospital-acquired pediatric infection. This study showed neonates in Texas experienced the highest CLABSI risk in 2023 and 2024 during the first 30 days after admission, highlighting the first month of life as a critical vulnerability period.
- The Houston area had higher CLABSIs among all age groups. West Texas clustering was most significant for neonates and pediatrics.
- This study reveals the distribution of CLABSI among pediatric age groups, highlighting neonates as the most vulnerable age group. Future studies should focus on understanding the gap in facility-level variation across Texas counties.

References

1. Chesshyre, E., Goff, Z., Bowen, A., & Carapetis, J. (2015). The prevention, diagnosis and management of central venous line infections in children. Journal of Infection, 71(Suppl 1), S59–S75.
2. Centers for Disease Control and Prevention. Central Line-associated Bloodstream Infection (CLABSI) Basics. Last accessed on April 22, 2026. https://www.cdc.gov/clabsi/about/index.html
3. Akinboyo, I. C., Young, R. R., Smith, M. J., Lewis, S. S., Smith, B. A., & Anderson, D. J. (2022). Central line-associated bloodstream infections in children: Epidemiology and prevention. Pediatric Infectious Disease Journal, 41(3), e89–e95
4. Goudie, A., Dynan, L., Brady, P. W., & Rettiganti, M. (2014). Attributable cost and length of stay for central line-associated bloodstream infections. Pediatrics, 133(6), e1525–e1532.
5. Centers for Disease Control and Prevention. Antimicrobial Resistance and Patient Safety Portal. Last accessed on March 17, 2026. https://arpsp.cdc.gov/profile/nhsn/clabsi

Contact: Healthcare Safety Unit Data Validation Team | HAIData@dshs.texas.gov