

## Abstract

**Background:** Recurrent central line-associated bloodstream infections (CLABSI) in children present a unique challenge to infection prevention efforts but guidelines for management are lacking.

**Methods:** We reviewed CLABSI data at Texas Children's Hospital (TCH) from fiscal years (FY) 2017-2019. A chart review to characterize clinical features, risk factors, and outcomes of patients with recurrent CLABSIs in FY2019 was performed. Descriptive statistics and Fisher's exact test were used.

**Results:** Recurrent CLABSIs increased from FY 2017-2019 [20% (26/126) to 33% (44/131)] ( $P=0.03$ ). In FY2019, 15 patients accounted for 44 CLABSIs (Figure 1). Underlying conditions included aplastic anemia (4), hemophagocytic lymphohistiocytosis (3), malignancy (4), genetic disease (2), congenital heart disease (1) and biliary atresia (1). Two-thirds of the CLABSIs occurred in the setting of severe neutropenia (ANC <100 cells/mm<sup>3</sup>) though only 16 (36%) were classified as mucosal barrier injury. The median time between line insertion and date of infection was 41 days (range 1-105). Line type included central venous catheters (25, 57%), peripherally inserted central catheters (17, 39%) and implantable ports (2, 5%). Most lines (80%) had double lumens. The most common organisms included: Gram-negative bacilli (15), coagulase negative staphylococci (14), viridans group streptococci (6) *Candida* spp. (5), *Enterococcus faecalis* (3) and *Staphylococcus aureus* (3). Four CLABSIs were polymicrobial. Patients with >2 CLABSIs were more likely to have subsequent infections with the same organism as compared to patients with only 2 CLABSIs ( $P=0.01$ ). Lines were removed promptly (19, 43%), had delayed removal (removal >72 hours from infection date) (10, 23%) or remained in place (15, 34%). Lines were removed for all episodes of fungemia (5/44) and for most Gram-negative infections (10/12). Six of 7 *Escherichia coli* CLABSIs were breakthrough fluoroquinolone-resistant infections in patients on levofloxacin.

**Conclusions:** Recurrent CLABSI accounted for a third of CLABSIs in FY2019. Line mismanagement was not a key contributor to recurrent CLABSI. Breakthrough CLABSIs in patients on levofloxacin prophylaxis need further investigation. For patients with CLABSIs due to *Staphylococci* decolonization may be considered.

## Background

- Recurrent central line-associated bloodstream infections (CLABSI) in children present a unique challenge to infection prevention efforts but guidelines for management are lacking.

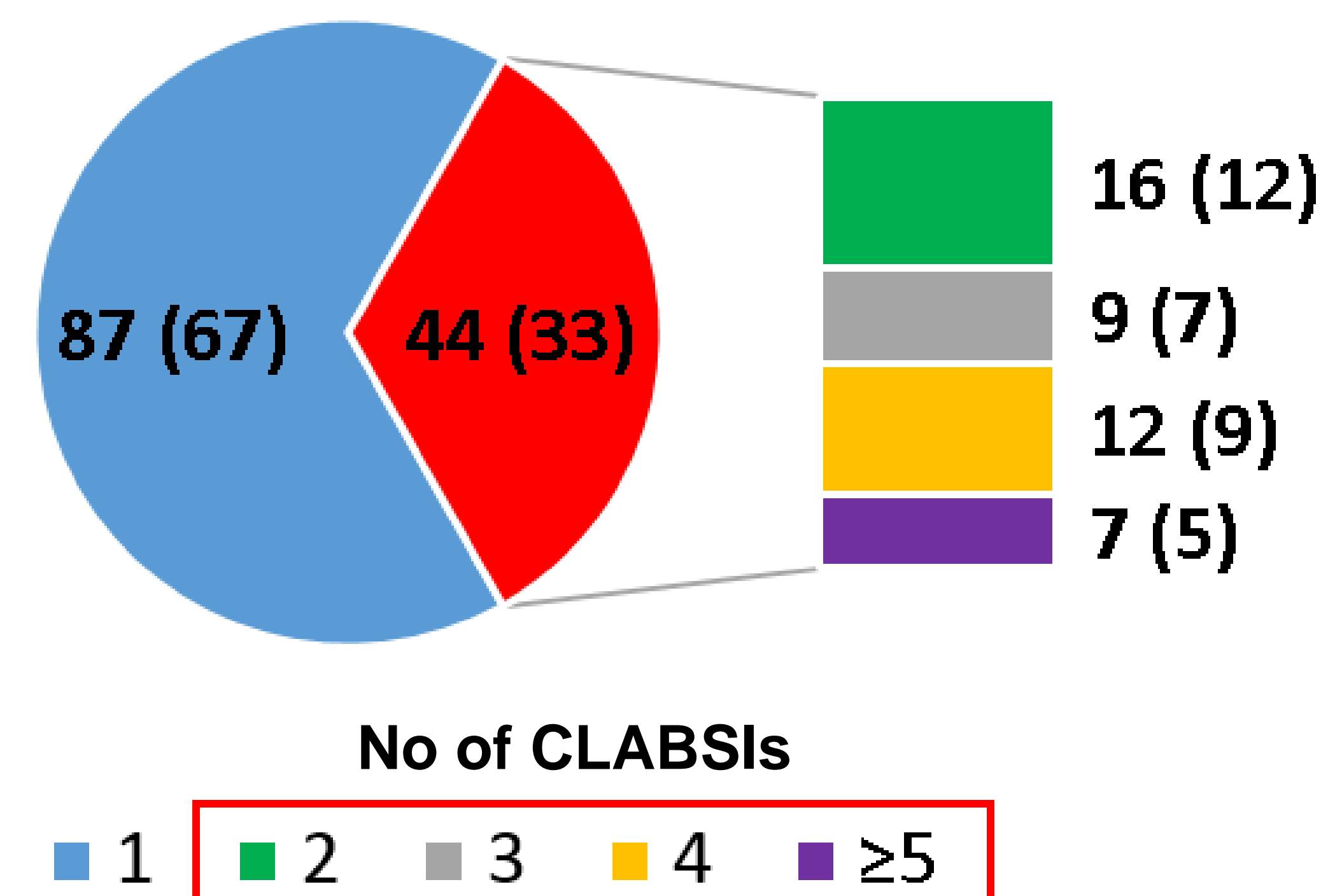
## Methods

- We reviewed CLABSI data at Texas Children's Hospital (TCH) from fiscal years (FY) 2017-2019.
- A chart review to characterize clinical features, risk factors, and outcomes of patients with recurrent CLABSIs in FY2019 was performed.
- Descriptive statistics and Fisher's exact test were used for analysis (STATA11).
- This study was approved by the Baylor College of Medicine Institutional Review Board.

## Results

- Recurrent CLABSIs increased from FY 2017-2019 [20% (26/126) to 33% (44/131)] ( $P=0.03$ ).
- In FY2019, 15 patients accounted for 44 CLABSIs (Figure 1).
- Characteristics of patients with recurrent CLABSIs are described in Table 1.
- All patients had an underlying medical condition.
- Two-thirds of the CLABSIs occurred in the setting of severe neutropenia (ANC <100 cells/mm<sup>3</sup>) though only 16 (36%) were classified as mucosal barrier injury.
- Line type included central venous catheters (25, 57%), peripherally inserted central catheters (17, 39%) and implantable ports (2, 5%).
- Most lines (80%) had double lumens.
- The most common organisms included: Gram-negative bacilli (15), coagulase negative staphylococci (14), viridans group streptococci (6) *Candida* spp. (5), *Enterococcus faecalis* (3) and *Staphylococcus aureus* (3).
- Four CLABSIs were polymicrobial.

**Figure 1. Single Episode and Recurrent CLABSIs at Texas Children's Hospital for Fiscal Year 2019, N (%)**



## Results (cont'd)

**Table 1. Characteristics of patients with recurrent CLABSIs**

Characteristic	Cases (N=15)
Age, median (range)	7.4 years (0.1-19.1)
Gender, N (%)	
Male	9 (60)
Female	6 (40)
Underlying conditions, N (%)	
Aplastic anemia*	4 (26.7)
Malignancy	4 (26.7)
Hemophagocytic lymphohistiocytosis	3 (20)
Genetic disease	2 (13.3)
Congenital heart disease	1 (6.7)
Biliary atresia	1 (6.7)
Time to infection, median (range)	41 days (1-105)

\*All patients underwent bone marrow transplantation

- Patients with >2 CLABSIs were more likely to have subsequent infections with the same organism as compared to patients with only 2 CLABSIs ( $P=0.01$ ).
- Lines were removed promptly (19, 43%), had delayed removal (removal >72 hours from infection date) (10, 23%) or remained in place (15, 34%).
- Lines were removed for all episodes of fungemia (5/44) and for most Gram-negative infections (10/12).
- One patient had 7 CLABSIs due to *Staphylococcus epidermidis* despite adequate therapy with vancomycin, lock therapy, and line replacement. An extensive work-up for an intravascular source was negative.
- Six of 7 *Escherichia coli* CLABSIs were breakthrough fluoroquinolone-resistant infections in patients on levofloxacin.

## Conclusions

- Recurrent CLABSIs accounted for a third of CLABSIs in FY2019.
- Line mismanagement was not a key contributor to recurrent CLABSI.
- For patients with CLABSIs due to *Staphylococci* decolonization may be considered.
- Breakthrough CLABSIs in patients on levofloxacin prophylaxis need further investigation.