Journal of Pediatric Nursing 49 (2019) 37–42

Contents lists available at ScienceDirect

Journal of Pediatric Nursing

journal homepage: www.pediatricnursing.org

Standardize, Engage, and Collaborate: An Initiative to Reduce Community Acquired Central Line Blood Stream Infections Across the Continuum of Care

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ARTICLE INFO

Article history:
Received 3 January 2019
Revised 21 August 2019
Accepted 22 August 2019

Keywords:
Community acquired central line associated blood stream infections
Home health
Home care

ABSTRACT

Background: Community acquired blood stream infections (CA-CLABSI) are a major source of morbidity and mortality for pediatric patients. Many organizations discharge pediatric patients to home health agencies to care for central lines. To reduce the incidence of CA-CLABSIs requires a concentrated effort between hospitals and home health agencies. It is important for home health agencies to be accountable for the care and maintenance they provide to patients with central lines. Local Problem: At a large children's hospital, CA-CLABSI metrics and collaboration with home health agencies to reduce CACLABSI events lacked organizational standardization. Methods: An organizational committee was formed to establish standards of care for CA-CLABSI follow-up and reduction. Results: As a result of the committee's work, several best practices resulted including the creation of a CA-CLABSI resource booklet; a screening tool to identify contributing risks associated with a CA-CLABSI, and increased awareness of CA-CLABSIs. Since implementation of these best practices, the organization has seen a 30% reduction in the number of CA-CLABSIs. Standardization of CA-CLABSI efforts and proactive surveillance of central line care may lead to decreases in the number of CA-CLABSI events. Collaboration between service lines may identify siloed best practices that can be implemented organizationally that may have a large impact.

Introduction

Since the mandate requiring public reporting of hospital acquired conditions in 2010, central line associated blood stream infection (CLABSI) reduction in the inpatient setting has been a major focus of hospitals (CDC, 2014). The same focus has been slow to shift to the outpatient setting, despite the high frequency of central line management (Wong Quiles, Gottsch, Thakrar, Fraile, & Billett, 2017). Several studies suggest that patients in the outpatient setting have a higher burden of CLABSI occurrences (Nailon & Rupp, 2015; Rinke et al., 2013; Rinke et al., 2013). CLABSIs that occur greater than or equal to three days outside of a hospital admission are considered community acquired. Community acquired CLABSIs (CA-CLABSI) result in unplanned admissions, increased morbidity and mortality, and treatment delays. Studies report 9.5% to 13% of CA-CLABSI infections result in patient transfer to an intensive care unit within 24 to 72 h of hospital admission (Downes et al., 2008; Rinke, Milstone, et al., 2013). Sixty-two percent of CA-CLABSI patients are hospitalized for seven or more days, and 1% die during their hospitalization (Downes et al., 2008). It is also estimated that a CA-CLABSI event alone has a median charge of $35,489 (Wong Quiles et al., 2017).

These alarming statistics emphasize the need for a focus on CLABSI reduction strategies in the outpatient setting. Outpatient management of central lines has historically lacked standardization, monitoring, and overall caregiver knowledge of CLABSI prevention strategies. The central line can be maintained by multiple providers in the community. These providers may be home health nurses, clinic nurses, parents, or the patient themselves. Rinke et al. surveyed home health agencies and found that only 25% of agencies knew their overall CLABSI rate (Rinke, Bundy, et al., 2013). These knowledge deficits and lack of standardization in the outpatient setting make it difficult to track and trend infections and begin efforts to decrease infection rates.

Local problem

The quality improvement initiative takes place in a large academic pediatric medical center that is licensed for 616 beds spread across 3 campuses and includes a home health department. The organization is Magnet designated and recently completed their second redesignation. The home health department is licensed in 12 counties surrounding a large metropolitan area in the Unites States.

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https://doi.org/10.1016/j.pedn.2019.08.018
0882-5963/

The organization began efforts to reduce inpatient CLABSI rates in 2006 through standardization of central line practices. As a result, the inpatient CLABSI rates were greatly reduced and have been sustained over time. Inpatient nurses and clinical nurse specialists (CNS) identified the importance of mirroring inpatient practices to the outpatient setting and began CA-CLABSI reduction efforts.

CA-CLABSI surveillance occurs for the entire organization. The organization attributes the infections to the primary service line of the patients with the following three categories: hematology/oncology, gastroenterology (GI)/solid organ transplant (SOTP), or other service line. The other service line category includes nephrology, pulmonology, cardiology, and general pediatrics. Of the 76 CA-CLABSI infections in 2016, 43% (33/76) were attributed to hematology/oncology patients, 38% (29/76) to GI/SOTP, and 18% (14/76) to other service line.

Despite our organization having a home health department, patients must be given an option of which agency they would prefer to provide their home health care. Patients admitted for CA-CLABSI events reported variations between home health agencies and inpatient central line maintenance practices such as sterility during cap and dressing changes and the duration of scrubbing skin or cap prior to accessing central lines among inpatient and home health agencies. These reports alerted the CNSs that there are needs to collect data on the home health agency central line practices and follow up with the agencies to address their learning needs. Inpatient nurses and CNSs facilitated an educational program for home health and school nurses on central line care and maintenance that resulted in significant decreases in CA-CLABSIs events (Falder-Saeed, McClain, Patton, Langford, & Flom, 2016). In addition to the class, the hematology/oncology and home health departments both were involved in separate collaboratives to benchmark and review central line care practices. The collaboratives identified opportunities to standardize efforts to reduce CA-CLABSI rates. The success of standardizing patient education, the educational program for home health and school nurses, and participation in collaboratives led to the brainstorming of how to further improve outpatient central line care.

Specific aims

The primary aim of this quality improvement initiative was to standardize and develop organizational processes to reduce CA-CLABSIs. Secondary aims included the development of processes to track the number of home health agencies involved in the care of patients' central lines, increase CA-CLABSI awareness in the community, and transition CA-CLABSI events to a CA-CLABSI rate for each service line.

Methods

Context

The quality improvement initiative began by creating a committee consisting of inpatient and outpatient representatives from GI/SOTP, hematology/oncology, pulmonology, home health, infection prevention, and vascular access. CNSs representing GI/SOTP, hematology/oncology, pulmonology, and home health led this initiative. To ensure a multidisciplinary approach, representatives included registered nurses, nursing leadership, case management, patient educators, and physicians. Quarterly meetings were held beginning March 2016. Each meeting followed a standardized format where representatives shared infection rates, CA-CLABSI admissions, and challenging case studies. Meeting time was also allotted to begin interventions to further standardize and develop organizational processes to reduce CA-CLABSIs. All interventions were finalized in quarter four of 2016 and the quality improvement interventions were implemented in January of 2017 with the exception of the screening tool.

Interventions

CA-CLABSI resource booklet

The initial intervention was the development of a CA-CLABSI resource booklet and standardization of the contents. The resource booklet outlined various processes for inpatient personnel responding to a CA-CLABSI admission. To create the resource booklet, the workgroup combined each service lines' processes to standardize best practices for admitted patients with CA-CLABSIs (Table 1). Fig. 1 outlines the contents of the resource booklet. Once the contents of resource booklet were identified, additional work was done on content requiring standardization. The finalized resource booklet is available on the organization's policy and procedure online portal.

Letter to home health agencies. Communication with the home health agency caring for the central line occurs through a HIPAA compliant e-mailed or faxed letter detailing that one of their patients was admitted with a CA-CLABSI. The home health agency is asked to complete a questionnaire to gain the home health nurses' perspective on central line care and maintenance in the home. The information collected aids in determining contributing factors of the CA-CLABSI. The follow-up communication also includes a flyer for the home health and community nurse education classes offered at the organization.

Patient and family questionnaire. Once a patient was identified as having a CA-CLABSI, several service lines had existing questionnaires to engage patients and families in the review of the event. The committee combined all existing service line questionnaires into one standardized format. The questionnaire focused on the home environment, central line care practices, and home health agency involvement (Fig. 2). Upon CA-CLABSI inpatient admissions, the patient educator or CNS completed the questionnaire once with the patient/family on paper. To ensure the entire medical team had access to the patient's history leading up to the CA-CLABSI event, the workgroup collaborated with the clinical informatics team to transition the questionnaire to the patient's electronic medical record (EMR).

Home health agency tracking

The committee identified that our organization did not have a method for monitoring the quality of home health agencies' managing central lines. The organization's comprehensive system for event reporting was used to create an electronic report to track and trend home health agencies associated with CA-CLABSI admissions. The committee reviews the tracking report quarterly.

Table 1
Best practices identified by each service line.

Service line processes	
Newly placed central lines	Existing CA-CLABSI admission
Handouts given to caregiver	Home Health agencies notified of CLABSI: Letter, questionnaire, bundle education, educational program flyer
Daily teaching at bedside	Parent and Family CLABSI questionnaire
Demonstration of all skills by caregiver	Demonstration of skills by caregiver
Rooming in for 24 h	Tracking for CA-CLABSI
DVDs given	Trends followed
Go-bag with emergency supplies	CA-CLABSI resource booklet utilized
Optional processes	
Newly placed	Existing CLABSI admission
Home health required to assist with first access at home	Monthly CLABSI meetings to discuss CA-CLABSIs and case studies Clinic staff education

1. Letter to home health agencies
2. Questionnaire for home health agencies
3. Educational central line bundle handout
4. 2018 Community nurse class flyer
5. Patient and family questionnaire
6. CA-CLABSI event reporting instructions

Fig. 1. Community acquired CLABSI resource booklet table of contents.

Screening tool

A secondary intervention was the creation of a screening tool to proactively identify patients at risk for a CA-CLABSI. This intervention identified patients with a central line at admission. After it is identified that the patient has a central line, the bedside nurse asks the patient cascading questions (Fig. 3). If a need for further education, troubleshooting, or issues with home supplies is identified, the EMR sends a communication to a team who ensures the patient's needs are addressed. The team includes CNSs from each service line and patient educators. The implementation of this added screening tool allowed for improved communication and collaboration for the management of the patient's central line in the home environment.

Standardization of rate tracking

The final intervention was designing a process to calculate each service lines' central line CA-CLABSI rates. CA-CLABSI rate tracking is an obstacle in the outpatient setting due to the variations in types of lines and removal dates. Our organization defines outpatient line days as any days that the patient has a central line and is not admitted. The goal was to establish outpatient line days for each service line to calculate a CA-CLABSI rate. Historically, line days were tracked manually by running operating room reports on all lines placed and removed, as well as deaths of patients in the hematology/oncology clinic. Due to the functionality of the EMR, this method required frequent chart audits to establish if the line was removed or placed. The committee collaborated with the data intelligence team to design an automated report to calculate each unit's line days. The plan was to validate hematology/oncology outpatient line days prior to implementation of rate tracking for other service lines.

Results

Community-acquired CLABSI events

For the purposes of this manuscript, data is reported through 2017. Overall there was a 30% reduction in total CA-CLABSIs from 2016. Specifically, hematology/oncology achieved a 24% reduction, GI/SOTP a 17% reduction, and other service line a 71% reduction in the total

Community Acquired CLABSI Questionnaire	
1. Did the patient experience any issue with line integrity (contamination, occlusion, breakage, etc.)?	
2. Were there any mechanical problems with the line (Not drawing, difficult to flush, repositioned, TPA given)?	
3. Were there any breaches of proper hand hygiene and/or wearing clean gloves by anyone involved in line care for this patient?	
4. Were all connections scrubbed with alcohol for 15 seconds and allowed to dry at least 15 seconds prior to accessing the line?	
5. Was tubing disconnected for any reason during your shift (changing clothes, drawing blood, administering medication, etc.)? If so, did you use a port protector or dead end cap to protect the line?	
6. Was the line frequently accessed for lab draws, IVF's, or medications?	
7. Was a cap change or dressing change performed on your shift? If so, why (blood in cap, soiled cap, blood culture, date due, etc.)? If so who performed or participated in the process (home health nursing staff, family members?)	
8. Was the line secured up and away from any sources of contamination? (diapers, ostomies, mucous fistulas, gtubes, tracheostomies, soiled linens, etc.)	
9. Is the patient and their environment/surroundings clean (patient's room, bed, clothes, flooring, toys, and area that CVL supplies stored)?	
10. Are you receiving proper supplies to care for CVL (injection cap, "dead end caps," alcohol swabs, saline/heparin flushes, dressing change supplies, port protector caps)?	
11. Overall, do you have any thoughts on how this infection may have occurred or how it might have been prevented?	
Comments	

Fig. 2. Patient/family CA-CLABSI questionnaire.

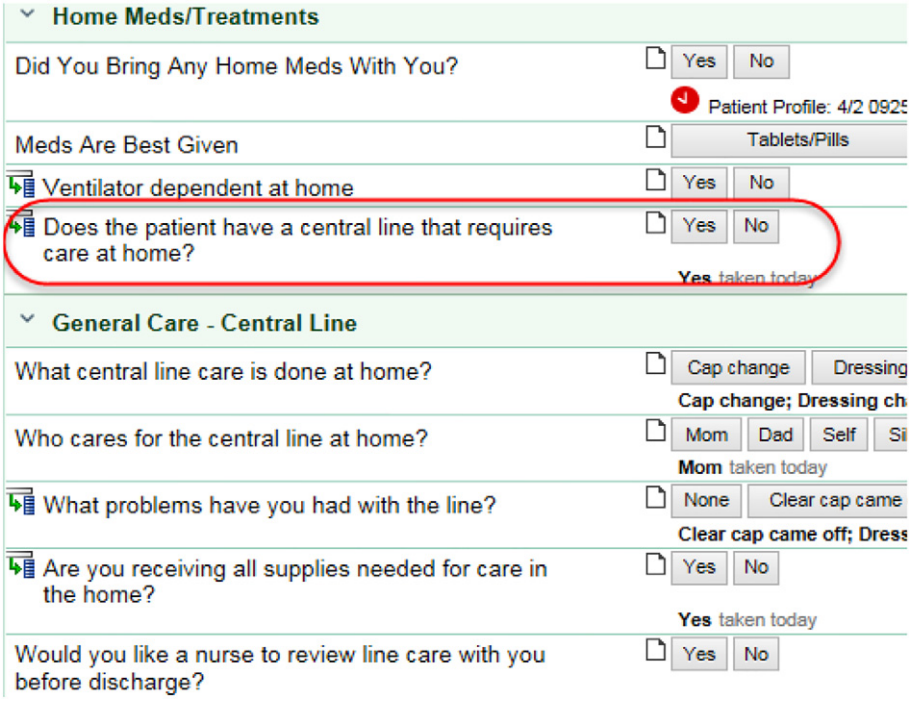

Fig. 3. CA-CLABSI screening tool in the EMR.

number of CA-CLABSIs compared to 2016 (Fig. 5). The overall reduction in total number of CA-CLABSI events has a projected potentially preventable charge avoidance of $567, 824 based on the Wong-Quiles (2017) estimated CA-CLABSI charge.

CA-CLABSI resource booklet

As result of the creation of the CA-CLABSI resource booklet, a standardized process now exists throughout the organization. All elements of the CA-CLABSI resource booklet were implemented in January of 2017.

Patient/family questionnaire

The transition to completing the questionnaire in the EMR was unsuccessful. The lag time between the patient admission and the determination of a CA-CLABSI made it difficult for the bedside nurses to complete the questionnaire upon admission. Upon admission, the bedside nurse did not know the patient had a CA-CLABSI, only the patient's chief complaint. There is a large population of patients who present with a chief complaint of fever with a central line that do not result with a positive blood culture. After trialing the questionnaire in the EMR, the committee determined the questionnaire was best suited to remain on paper to administer once a CA-CLABSI was determined and instead shifted focus to the development of a screening tool. The patient educators or CNSs continue to complete the questionnaire with the patient/family.

Home health agency tracking

In 2017, 18 infections were reported for patients receiving central line care by a home health agency. Out of the 18 infections, 8 different agencies were identified. There have been no reported infections affiliated with a home health agency as of quarter one 2018. The organization's system for event reporting changed in quarter two 2018 resulting in delayed data reporting for the remainder of 2018.

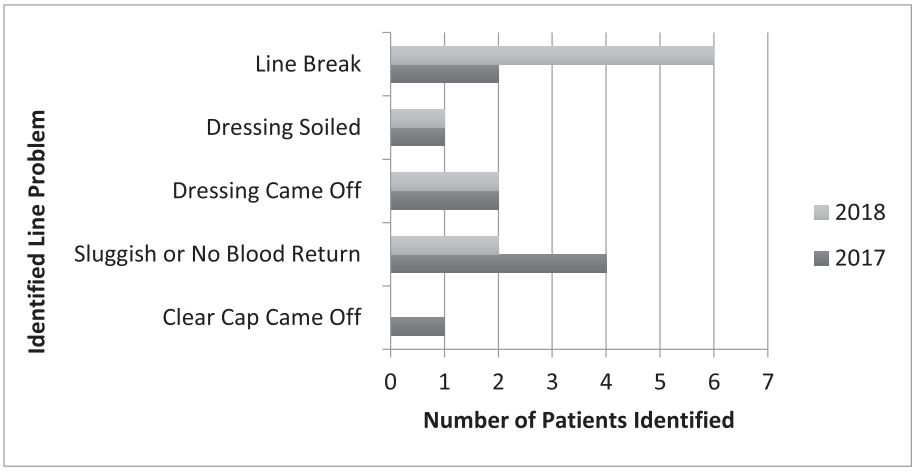

Fig. 4. Screening tool for CA-CLABSI in EMR results.

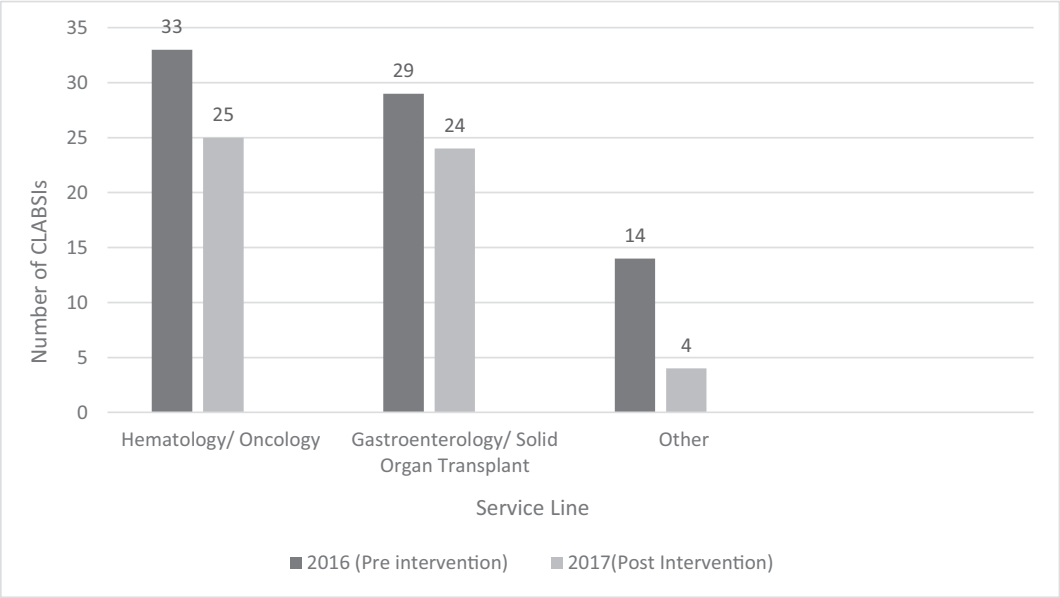

Fig. 5. Community-acquired CLABSI events.

Screening tool

For purposes of this manuscript, data on the screening tool is reported through quarter three of 2018. Since implementation in June 2017, the screening tool has identified a total of 61 patients as needing further education, troubleshooting, or assistance with home supplies. Identified line complications are described in Fig. 4. The tool allows service lines with low central line volumes to have a central line expert follow up with the patient. Based on the Wong-Quiles (2017) estimated CA-CLABSI charge, the screening tool helped proactively mitigate complications for 61 patients that could lead to $2,164,829 of potentially preventable charges.

Standardization of rate tracking

The workgroup created an automated method of calculating central line days in the outpatient setting. Unfortunately, the report was found to be inaccurate during validation. Further work continues with the data intelligence team to help streamline and standardize this process.

Discussion

CA-CLABSI management and prevention begins with every patient admission, not just at discharge. This initiative has shown the impact of an organizational collaborative effort to reduce CA-CLABSIs. Historically CA-CLABSI surveillance occurred within each individual service line. While each service line may have seen improvements in their CA-CLABSI rates, drastic decreases have been shown when silos are broken down, organizational standardization occurs, and there is transparency in data sharing. The decrease in the total number of CA-CLABSIs demonstrates the value of an organizational approach to standardized care.

The tracking of home health agency affiliation with CA-CLABSI does not represent an agency's CA-CLABSI rate. Committee work continues to establish a breakdown of the home health agencies involved in central line care. This data allows the organization to evaluate home health agencies' care and maintenance of central lines and provide recommendations on line care practices.

Limitations

Competing priorities and initiatives challenge the ongoing CA-CLABSI reduction efforts. These efforts require a multifaceted approach to effectively standardize central line care and maintenance both within and outside of the organization. It is difficult to maintain engagement when multiple care settings and various factors may have attributed to the CA-CLABSI.

Underreporting in our electronic tracking report is a factor in the tracking and trending of home health agencies affiliated with CA-CLABSIs. The reported number of CA-CLABSIs is substantially higher than the number of event reported. Continued collaboration is needed to further improve surveillance of CA-CLABSIs and home health agencies involvement.

Lastly, the accuracy of line days in the outpatient setting is challenging to assess and maintain. All service lines that track this data use a manual, time-consuming process. In addition, home health agencies may have difficulty calculating line days accurately due to the frequency at which pediatric patients admit and discharge from the organization.

Practice implications

All pediatric organizations may benefit from development of a resource booklet for CA-CLABSI guidance and a similar screening tool to proactively address risk. Collaboration among service lines and home health agencies is essential to break down siloes and improve the quality of care. Home health agency engagement and education on best practices for central line care may demonstrate a decrease in the number of CA-CLABSIs.

Conclusion

While the organization has made great strides in the reduction of CA-CLABSIs, enhanced engagement of home health agencies in central line care and maintenance is projected to further improve the care patients receive in the outpatient setting. The committee intends to collaborate with case management to improve the tracking of home health agencies involved in central line care and determine a method of obtaining the total number of patients referred to agencies to determine

a rate of CA-CLABSIs. The committee's work has shown how emphasizing CA-CLABSI reduction strategies can both decrease CA-CLABSIs and avoid additional healthcare charges.

References

Centers for Disease Control and Prevention (CDC), National Healthcare Safety Network (2014). Operational guidance for acute care hospitals to report central line-associated bloodstream infection (CLABSI) data to CDC's NHSN for the purpose of fulfilling CMS's hospital inpatient quality reporting (IQR) requirements. Retrieved from https://www.cdc.gov/nhsn/pdfs/cms/Final-ACH-CLABSI-Guidance-2015.pdf.

Downes, K. J., Metlay, J. P., Bell, L. M., McGowan, K. L., Elliott, M. R., & Shah, S. S. (2008). Polymicrobial bloodstream infections among children and adolescents with central venous catheters evaluated in ambulatory care. *Clinical Infectious Disease*, *46*(3), 387–394. https://doi.org/10.1086/525265.

Falder-Saeed, K., McClain, K., Patton, L., Langford, M., & Flom, L. (2016). Teaming up to take down community-acquired bloodstream infections: A program aimed at educating and training nurses in the community. *Journal of Vascular Access*, *21*(4), 217–222.

Nailon, R., & Rupp, M. E. (2015). A community collaborative to develop consensus guidelines to standardize out-of-hospital maintenance care of central venous catheters. *Journal of Infusion Nursing*, *38*(2), 115–121. https://doi.org/10.1097/NAN.0000000000000092.

Rinke, M. L., Bundy, D. G., Milstone, A. M., Deuber, K., Chen, A. R., Colantuoni, E., & Miller, M. R. (2013). Bringing central line-associated bloodstream infection prevention home: CLABSI definitions and prevention policies in home health care agencies. *Joint Commission Journal on Quality and Patient Safety*, *39*(8), 361–370 Retrieved from https://www.jointcommissionjournal.com/.

Rinke, M. L., Milstone, A., Chen, A. R., Mirski, K., Bundy, D. B., Colantuoni, E., & Miller, M. R. (2013). Ambulatory pediatric oncology CLABSIs: Epidemiology and risk factors. *Pediatric Blood Cancer*, *60*(11), 1882–1889. https://doi.org/10.1002/pbc.24677.

Wong Quiles, C. I., Gottsch, S., Thakrar, U., Fraile, B., & Billett, A. L. (2017). Health care institutional charges associated with ambulatory bloodstream infections in pediatric oncology and stem cell transplant patients. *Pediatric Blood Cancer*, *64*(2), 324–329. https://doi.org/10.1002/pbc.26194.