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Implementation of an Evaluation of DaVita CLABSI Protocol to Reduce Bloodstream Infections in Acute Hemodialysis Patients

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Abstract

Problem: Central line-associated bloodstream infection (CLABSI) is the primary cause of morbidity and mortality in End-Stage Renal Disease (ESRD) patients on hemodialysis. It is associated with severe medical conditions, prolonged hospitalization, and financial burden. Despite its convenience and simple operation, central venous catheter (CVC) account for 70% of all CLABSI occurrence and increase the risk for septicemia and death.

Methods: This quality improvement (QI) project utilized a descriptive observational pilot design to identify the effect of DaVita CLABSI Protocol on CLABSI occurrence rate. Quantitative data was collected retrospectively and prospectively via electronic medical record (EMR) review before and after implementation of DaVita CLABSI Protocol. The results were analyzed using the Pearson Chi-Square test and Independent Sample T-test.

Results: Two hundred and fifty-three patients met eligibility criteria for this QI project from November 1, 2021 to March 31, 2022. The relationship between the rate of CLABSI occurrence and group (pre vs. post) was found to be statistically insignificant ($p=0.393$). During the pre-implementation phase from November 1, 2021 to January 31, 2022, there was a total of 147 inpatient hemodialysis patients with CVC access. Of this sample, there were 1 CLABSI (25%), 9 possible (56.3%), and 137 without infections (58.8%). After the implementation phase from February 14, 2022 to March 31, 2022, there a total of 106 inpatient hemodialysis patients with CVC access. The results were 3 CLABSI (75%), 7 possible (43.8%), and 96 without infection (41.9%).

Implications: The results indicates that there is significant influence of risk factors such as location of CVC access, CVC access type, catheter days, and length of stay on

CLABSI occurrence rate. This warrants more studies on the effect of CLABSI on patient outcomes.

Introduction

Bloodstream infection (BSI) is the second leading cause of death in End-Stage Renal Disease (ESRD) patients undergoing renal replacement therapy (RRT) by hemodialysis (HD) (Stefan et al., 2012; Sahli, Feidjel, & Laalaoui, 2016; Thompson et al., 2017; Nelveg-Kristensen, Laier, & Heaf, 2018; Alhazmi et al., 2019; Zanoni et al., 2020). Approximately 250,000 bloodstream infections occur annually in the United States, resulting in an estimated $960 million to $18.2 billion in healthcare costs (McAlearney et al., 2017; Haddadin, Annamaraju, & Regunath, 2021). Bloodstream infections are the primary cause of mortality and morbidity in patients receiving RRT and are associated with severe medical complications, prolonged hospitalization, and high economic burden (Mazonakis et al., 2009; Fysaraki et al., 2013; Fisher et al., 2020; Heidempergher et al., 2021). Dialysis patients have an infection rate 26 to 28 times higher than non-dialysis patients and a 100-fold greater risk of infection-related complications such as septicemia and death (Napalkov et al., 2013; Nelveg-Kristensen, Laier, & Heaf, 2018; Mohamed et al., 2019).

Risk factors such as advanced age, comorbidity, impaired immunity, breakdown of natural skin barriers, and malnourishment contribute to BSI progression in hemodialysis patients (Fysaraki et al., 2013; Nelveg-Kristensen, Laier, & Heaf, 2018; Conwell et al., 2019). An estimated 30% of all hospitalized hemodialysis patients have bloodstream infections (Suzuki et al., 2016). Prolonged hospitalization caused by BSI can average between two to 14 days (Hallam et al., 2018). In patients 65 years and older, BSI raised the average length of stay (LOS) by eight days and increases hospitalization expenses from $17,000 to $32,000 per day, making it a financial concern (Conwell et al., 2019).

Central line-associated bloodstream infections (CLABSI) are among the most conventional and deadly types of BSI, with a mortality rate of 12%-25% (CDC, 2011). CLABSI occurs in 70% of hemodialysis patients with central venous catheters (CVC) access (Heidempergher et al., 2020). According to the National Health Safety Network (NHSN), the rate of CLABSI in 2014 was 2.16 patients per month (rate of infections per 100 patients) for patients with a CVC access compared to the rate of 0.26 patient per month for those dialyzed with arteriovenous fistula (AVF) and 0.39 patient per month for those with arteriovenous graft (AVG) (Conwell et al., 2019). The incidence of CLABSI can be as high as 11 infections per 1000 days of catheter use (Yang et al., 2020). Potential risk factors for CLABSI development include the site of catheter implantation, duration of catheterization, history of bacteremia, advanced age, gender, anemia, diabetes, hypoalbuminemia, concurrent immunosuppressive therapy, and staphylococcus aureus colonization (Zanoni et al., 2020; Stefan et al., 2012). The risk of infection with catheters is almost 10-fold higher than with AVF and AVG access (Al-Barshomy et al., 2021). Nevertheless, central venous catheterization in hemodialysis remains high due to its convenience, simple operation, and minimal invasiveness (Yang et al., 2020).

The growing rate of catheter-related bloodstream infections (CRBI) in patients undergoing hemodialysis over the years has prompted national and international organizations to initiate changes in policy and clinical practices. In 2009, the US Department of Health and Human Services (USDHHS) set a national goal for a 50%

reduction in CLABSIs to be achieved by 2013 (CDC, 2011). The project saw some progress in decreasing hospital-acquired infections (HAI) but failed to meet the national goal (McAlearney et al., 2017). However, evidence has shown that CLABSI reduction is attainable through systematic surveillance, improved patient safety culture, and infection prevention strategies.

The purpose of this quality improvement (QI) project is to implement a CLABSI prevention protocol. This project aims to reduce the CLABSI occurrence rate in inpatient hemodialysis patients by 25% over two months. The evidence-based framework chosen to lead this project is Define, Measure, Analyze, Improve, and Control (DMAIC). This study's outcome measure of interest is the number of CLABSI occurrences. A study question was formulated to guide the review of literature: What is the effect of the implementation of DaVita's CLABSI Protocol in inpatient hemodialysis patients?

Literature Review

A systematic literature search was performed to identify current and past research on CLABSI prevention in acute care hemodialysis patients. The Cumulative Index of Nursing and Allied Health Literature (CINAHL), Summon, Medline (EBSCO), PubMed, and Google Scholar databases were investigated. Key search terms included central line-associated bloodstream infections, bloodstream infections, central venous catheter, central venous-related infection, surveillance, root cost analysis, action plan, prevention intervention, and hemodialysis OR haemodialysis OR dialysis. The search yielded 4,369 articles. The literature search was further refined by applying inclusion criteria for research articles, peer-reviewed articles, journal articles from January 2011 through September 2021, studies from any country published in the English language, acute care

OR inpatient, and studies related to hemodialysis. Exclusion included studies before 2010, males and females less than 18-years of age, chronic hemodialysis, peritoneal dialysis, studies published in a language other than English, and studies with no mention of hemodialysis. Articles were assessed and duplication removed through visual inspection, resulting in 531 full-text articles. Then 32 abstracts of articles were reviewed, and 5 met inclusion criteria for review.

Research findings revealed the magnitude of complications caused by bloodstream infection in hemodialysis patients and highlighted the importance of infection prevention measures. Studies in this literature review are qualitative, retrospective observational, cohort, and systematic reviews. Consistent themes identify the need for infection surveillance, root cause analysis investigation, and CLABSI prevention bundles.

Surveillance is a fundamental component of infection control and prevention. It is defined as a systematic process of continuous collection, assessment, and interpretation of health data crucial to the developing, executing, and evaluating public health practice (Russo et al., 2015). The purpose of infection surveillance is to provide quality data to reduce the rate of preventable infections. According to Chen et al. (2012), infection surveillance could decrease the infection rate to an average of 20-30%. A successful surveillance program will inspire action and drive quality improvement.

A retrospective observational study conducted on the surveillance of nosocomial infections (NIs) and device-associated infections (DAIs) found that data collection in surveillance programs can promote clinical guidelines and prevention measures in hospital settings (Chen et al., 2012). The study was performed over a period of 8 years

(2000-2008) in a major teaching hospital with more than 1500 admission per year (Chen et al., 2012). An ICU-based surveillance program was piloted to monitor for NIs and antibiotic susceptibility. The data were collected weekly in the ICU by trained infection control practitioners (ICPs), and the overall 30-day mortality and in-hospital crude mortality were analyzed by chi-square test.

During the study period, 126,315 patient-days (number of patients per 1000 day) and 275,067 device-days (number of DAI infections per 1000 day) were analyzed, and 2,054 nosocomial infections and 833 device-associated infections occurred in 14,734 patients hospitalized in the medical-surgical ICU (Chen et al., 2012). The mean rates of all DAIs were ventilator-associated pneumonia (VAP), 1.3-13.6 per 1000 ventilator-days, CLABSI, 2.0-7.6 per 1000 catheter-days, and catheter-associated urinary tract infection (CAUTI), 2.0-6.3 per 1000 catheter-days (Chen et al., 2012). The crude mortality rate of DAIs was 32.9-43.7% (Chen et al., 2012). After implementing infection prevention measures and traffic management bundles such as hand hygiene practices and antibiotic stewardship, the results revealed a reduction in DAI and infection rates. The overall rates of NIs and DAIs were 16.26 episodes per 1000 patient-days and 3.03 episodes per 1000 device-days, and the crude rates of 30-day (33.6%) and in-hospital (52.3%) mortality also decreased (Chen et al., 2012). Limitations in the study included a single observation site and the probability of potential biases due to the length of the study period (Chen et al., 2012). The research indicates that adherence to infection prevention measures and surveillance programs can decrease the incident rate of NIs and DAIs.

In a similar study organized by Hallam et al. (2018), infection surveillance and root cause analysis (RCA) were employed in a quality improvement program to explore its effect on catheter-related bloodstream infections (CRBSI). The study was conducted over five years at a large hospital in Northern England (Hallam et al., 2018). A central vascular access devices (CVAD) Steering Group comprised of representatives from multiple units within the hospital were tasked with data collection, RCA investigation, and CVAD management. Through efforts of the CVAD Steering Group, a quality improvement program consisting of a standardized CVAD pathway, audit compliance, and competency training were created to reduce the rate of CRBSI (Hallam et al., 2018). After interventions of the quality improvement program, the study demonstrated a reduction in the rate of CRBSI from 5 per 1000 line-days (number of infections per 1000 days) in 2011 to 0.23 per 1000 line-days 2017 (Hallam et al., 2018). The researchers determined the study was successful due to the impact of infection surveillance, enabling them to examine CRBSI occurrence in each division and the uses of RCA to assess the problems accurately and identify trends to make the appropriate change (Hallam et al., 2018).

Over the years, modern medical technology and treatment have led to the prevalence of adverse events caused by active errors and latent failures. The growing concern for patient safety and quality improvement in healthcare has led to adopting risk management techniques used in other industries. Root cause analysis (RCA), one of the most common risk management techniques, is an analytical tool that combines components from system engineer, psychology, and the human factor approach to inhibit adverse events (AEs) incidence (Abdi & Ravaghi, 2016). It is a linear process that involves a systematic investigation into the root cause of a problem.

In a qualitative study exploring health providers' experiences and perceptions of RCA, Abdi & Ravaghi (2016) identified the challenges and benefits of RCA utilization. Thirty-two health professionals who met the criteria of a national RCA training program completion within a year and were engaged in at least two RCA investigations were selected to participate in a semi-structured interview. Some respondents (19%) argued that RCA is hindered by time constraints, insufficient resources, and the lack of workplace and system support (Abdi & Ravaghi, 2016). Most participants (91%) perceived RCA as a vital tool for enhancing work procedures and patient safety (Abdi & Ravaghi, 2016). The study indicates that RCA implementation in healthcare substantially impacts patient outcomes (Abdi & Ravaghi, 2016).

Matrin-Delgado and associates further studied root cause analysis in a systematic review to determine its effectiveness in reducing adverse events (AEs) (2020). In a sample collection of 127 studies, only 21 met the RCA evaluation criteria. Of these 21 studies, two studies (9%) could establish an improvement in patient safety due to RCA recommendations, three studies (15%) were inconclusive, and ten studies (50%) indicated that RCA recommendations were ineffective and did not decrease the rate of AEs (Matrin-Delgado et al., 2020). Adverse events were classified as communication problems, human error, and deficits in the organization (Matrin-Delgado et al., 2020). Researchers suggested that the participation of frontline professionals in proposal development and a formalized system that enables RCA recommendations to be delivered in a definite timeframe would decrease AE recurrence (Matrin-Delgado et al., 2020). The limitation of this study includes a small sample size. In summary, RCAs are valuable tools for identifying safety incidents but not for implementing adverse events prevention measures (Matrin-Delgado et al., 2020).

The detrimental effect of healthcare-associated infections (HAIs) on hemodialysis patients has prompted national efforts from organizations such as the US Department of Health and Human Services (USDHHS) and the Agency for Healthcare Research and Quality (AHRQ) to identify evidence-based clinical strategies for HAI prevention. The National Action Plan to Prevent Healthcare-Associated Infections in End-Stage Renal Disease Facilities was designed to target vascular access-related complications and infections associated with hepatitis B and hepatitis C (Gupta et al., 2013). The National Action Plan stimulated HAI prevention efforts through the application of surveillance, infection prevention protocols, and program evaluation (US Department of Health and Human Services, 2021). Evidence from the health initiative has shown a reduction of CLABSI rates from the implementation of "bundles" that focused on five clinical domains: 1) full-barrier precautions, 2) chlorhexidine antiseptic and sterile dressing, 3) optimal access selection, 4) adherence to hand hygiene and 5) prompt removal of unnecessary central venous catheters (McAlearney et al., 2017). When combined with HAI prevention education and training, the clinical bundle can substantially reduce CLABSI rates (Gupta et al., 2013).

Following the USDHHS example, AHRQ initiated a national collaborative project titled “On the CUSP: Stop BSI” to reduce the prevalence of bloodstream infections. The study was led by three organizations: the Health Research and Educational Trust (HRET), Johns Hopkins Medicine Armstrong Institute for Patient Safety and Quality (AIPSQ), and the Michigan Health Hospital Association (MHA) Keystone Center for

Patient Safety and Quality. The purpose of the national program was to attain a unit-level mean CLABSI rate of less than 1 case per 1,000 catheter-days and to improve unit safety culture (Berenholtz et al., 2014). A total of 1,071 adult ICUs representing 792 hospitals from 44 states participated in the collaborative cohort study, reporting 26,588 ICU-months (the number of ICUs per quarter) and 4,454,324 catheter-days (the number of infections per 1000 catheter days) of data (Berenholtz et al., 2014).

The program was coordinated and executed as a state-level collaboration during the two years, but national organizations provided resources (e.g., integrated education, data collection, and coordination meetings). HAI prevention education and training began the first 6-8 weeks through a series of weekly immersion calls, semiannual 1-day face-to-face meetings, monthly coaching calls, and periodic supplemental expert calls (Berenholtz et al., 2014). Three multifaceted interventions were then implemented to prevent CLABSI. The first contained evidence-based practice (EBP) specifications for catheter insertion and preservation, tools to recognize local impediments, and ideas to ensure patient compliance with these practices (Berenholtz et al., 2014). The second intervention was the Comprehensive Unit-based Safety Program (CUSP) to improve safety culture and team cooperation (Berenholtz et al., 2014). The last intercession was the program's evaluation process, which included measurement and feedback of CLABSI data (Berenholtz et al., 2014). Monthly CLABSI data were aggregated into 3-month periods (quarters) and collected at baseline (up to 12 months before the intervention), during the implementation period, and postimplementation periods (occurring up to 18 months after intervention) (Berenholtz et al., 2014).

The national program achieved its goal with the overall mean CLABSI rate showing a significant reduction from 1.96 cases per 1000 catheter-days at baseline to 1.15 cases at the 16-18 months after application (Berenholtz et al., 2014). The CLABSI rates decreased during all observational periods compared with baseline, with adjusted incidence rate ratios gradually declining from 0.87 at the first quarter to 0.57 at the sixth quarter after program execution (Berenholtz et al., 2014). Limitations of the study included no randomized design, no concurrent control group, results influenced by ephemeral changes (e.g., CLABSI rates, patient population, and other interventions), no sufficient data on CLABSI prevention compliance, and no resource to validate CLABSI surveillance data (Berenholtz et al., 2014). Based on the national study results, the researchers concluded that CLABSI prevention measures could decrease the overall CLABSI rates by 43% (Berenholtz et al., 2014).

The Define, Measure, Analyze, Improve, and Control (DMAIC) model was chosen as the evidence-based practice (EBP) frameworks to guide this project. The model is a data-driven quality improvement approach that enhances processes (American Society for Quality, 2021). The acronym in the DMAIC model embodies the five stages that make up the method. The DMAIC method involves identifying the problem, measuring performance, process analysis, eliminating the root cause, and quality control. This quality improvement project used the DMAIC model to identify issues and pilot process changes in the DaVita CLABSI protocol for quality improvement.

Central line-associated bloodstream infections (CLABSI) profoundly impact hemodialysis patients through prolonged hospitalization, morbidity, and mortality. Many studies indicated that a comprehensive approach involving data surveillance, infection prevention bundles, education and training, and program evaluations are essential to preventing CLABSI. However, gaps in the literature were found to include lack of variable research, resource limitation, poor adherence to infection control guidelines, and limitation linked to data collection and methodology. Recommendations were made to involve leadership support, standardized infection control practices, strength data surveillance methods, and more research on bloodstream infection prevention at the state and national levels. This QI project attempted to address some of the gaps and recommendations in the literature.

Methods

Design

This quality improvement (QI) project utilized a descriptive observational pilot design. Quantitative data was collected retrospectively and prospectively via electronic medical record (EMR) review. A retrospective record review containing quantitative descriptive data on the number of CLABSI occurrences from November 1, 2021, through January 31, 2022, was performed. Data collected included the length of hospital stay, number of catheter days, type of CVC access, location of CVC access, CVC assessment completion, presence of infection, blood cultures ordered, blood culture results, source of infections, type of interventions, and completion of a plan of action. Prospective data was generated after implementing the DaVita CLABSI Prevention toolkit, and post-implementation data was abstracted regarding the number of CLABSI occurrences from February 14, 2022 through March 31, 2022.

Setting

The project occurred at a large, Midwestern, suburban medical center. The healthcare organization has approximately 2000 employees and an annual admission of 20,000 patients. Patients seen within the medical center are primarily from the surrounding community.

Sample

This project used a convenience sample of adult patients aged 18 years and older with CVC access seeking acute care hemodialysis services. Patients younger than 18 years of age, on peritoneal dialysis, and who have AVG or AVF access for hemodialysis were excluded.

Data Collection/Analysis

All patients were 18 years of age or older, on inpatient hemodialysis, and have at least one CVC access. A retrospective record review containing quantitative data on the number of CLABSI occurrences from November 1, 2021, through January 31, 2022, was collected. Demographic variables collected included the patient age and gender. By February 1, 2022, a CLABSI Prevention Plan of Action was implemented to reduce the rate of CLABSI occurrence in acute care hemodialysis patients. To assess the effect of DaVita CLABSI Prevention Protocol on inpatient hemodialysis patients, descriptive statistics were analyzed using both a Pearson Chi-Square test and an independent sample t-test via Statistical Package for the Social Sciences (SPSS).

Approval Process

Formal, written approval was obtained from the DaVita Institutional Review Board and SSM Institutional Review Board. University of Missouri St Louis MSL IRB was received prior to implementation.

Procedure

This quality improvement project was led by the Doctor of Nursing Practice (DNP) candidate. Upon a patient admission, the Dialysis CVC Process Algorithm was activated to streamline the DaVita CLABSI Prevention Protocol process. After identifying a CVC access, the hospital staff notified the dialysis unit/nurse to begin the CVC Initial Assessment. The nephrologist was notified when an infection was detected, and blood cultures ordered if applicable. When a blood culture returned a positive result, an investigation was performed using the CLABSI Investigation Report – Sleuth Tool. Afterward, the CLABSI Prevention Plan of Action was implemented, and a performance evaluation occurred monthly following the event (See Appendix A).

Results

Demographics of sample

Two hundred and fifty-three patients met eligibility criteria for this QI project from November 1, 2021 to March 31, 2022. Of the 253 patients, 51.4% were female (130) and 48.6 % were male (123) (see Table 1 and Figure 1). The patient age ranges from a minimum of 23-years-old to a maximum of 94-years-old. The mean age of the patients was 64 ± 14.76 years of age (see Table 2 and Figure 2).

Catheter Analysis

The average hospital length of stay was 18 ± 13.62 days with a minimum of 1 day and a maximum duration of 87 days (see Table 3 and Figure 3). The mean catheter days was 10 ± 10.18 days with a minimum of 1 day and a maximum duration of 107 days (see Table 3 and Figure 4). An evaluation of 253 patients with CVC access revealed that 29% (75) had a tunneled catheter versus 70.4% (78) with non-tunneled catheter (see Table 4 and Figure 5). Further analysis indicates that out of a sample of 253 patients, 79.8% (202) had a jugular access, 16.2% (41) had a subclavian access, and 4.0% (10) had a femoral access (see Table 5 and Figure 6).

Infection Results

Review of descriptive statistics shows that 100% (n=253) of CVC assessment were completed and 7.9% (20) were identified with presence of infection while 92.1 % (233) of access shows no signs of infection. This data correlates with the 7.9% (20) of blood culture drawn and found positive for bacteria growth. Of the 20 CVC access found with presence of infections, the source of infections was found in 1.2% (3) in HD lines, 0.4% (1) in non-dialysis CVC, and 6.3% (16) in more than one source. As a result, only 20 of these patients received a plan of action with interventions for medication treatment and line removal.

A Pearson Chi-Square test was performed to identify the relationship between the rate of CLABSI occurrence and group (pre vs. post) and was found to be statistically insignificant (p=0.393) (see Figure 7). During the pre-implementation phase from November 1, 2021 to January 31, 2022, there was a total of 147 inpatient hemodialysis patients with CVC access. Of this sample, there were 1 CLABSI (25%), 9 possible

(56.3%), and 137 no infections (58.8%). After the implementation phase from February 14, 2022 to March 31, 2022, there a total of 106 inpatient hemodialysis patients with CVC access. The results were 3 CLABSI (75%), 7 possible (43.8%), and 96 with no infection (41.9%).

Due to the higher rate of CLABSI occurrence in the post-implementation phase compared to the pre-implementation phase, Pearson Chi-square tests were conducted to show the correlation between the location of CVC access to infection occurrence (p=0.008) and the relation between the type of CVC access to infection occurrence (p=0.005) were found to be both statistically significant. Crosstabulation statistics indicates that when comparing the relationship between type of CVC and rate of occurrence: CLABSI were found in 4 tunneled CVC (compared to 0 found in non-tunneled CVC), 3 possible found in tunneled CVC (compared to 13 found in non-tunneled CVC), and 68 with no infection in tunneled (compared to 165 in non-tunneled CVC) (see Figure 8).

When reviewing the crosstabulation statistic for location of CVC to infection occurrence: 2 jugular (50%), 2 subclavian (50%), and 0 femoral were found with CLABSI, 12 (75%) jugular, 1 subclavian (6.3%), and 3 femoral (18.8%) were found with possible infection, and 188 jugular (80.7%), 38 subclavian (16.3%), and 7 femoral (3%) were found with no infections (see Figure 9).

Further analysis was conducted to test the statistical relation between rate of occurrence and catheter days using an independent samples t-test. It was indicated through group statistics that there was a higher standard deviation of 12.34 (N=106) in the post group compared to 8.08 (N=147) in the pre group. The Levene’s Test for

Equality of Variances show a t-value of -2.39 and p=0.009. The same test was performed on hospital length of stay and revealed a higher standard deviation of 16.44 (N=147) for post group as compared to 11.03 (N=147) in the pre group. The Levene's test for length of stay revealed a t-value of -1.76 and p=0.040.

Discussion

Implementation of DaVita CLABSI Prevention Protocol did not improve CLABSI occurrence rate in this QI project as anticipated. CLABSI occurrence rate increased from 25% (1) in the pre-implementation phase to 75% (3) in the post-implementation phase despite medical interventions and staff education. Although there were no statistical significant between occurrence and group, there were evidence of significant differences in type of CVC access, location of CVC access, catheter days, and length of stay in relations to occurrence rate.

Limitations

This study had some limitations related to its short period of observation and small sample size. The study was completed in a single hospital in one geographical area, thus represents a small population of inpatient hemodialysis patients. The period of observation was shortened from 7 months (3 months of retrospective data, 1 month of implementation, and 3 months prospective data) to 5 months (3 months of retrospective data, 2 weeks of implementation, 6 weeks of prospective data) due to the nature of the project. During the QI project, the hospital of study had implemented a regional wide campaign involving the change of CVC caps to Clear Guard. This may or may not have changed the outcome of the project. Additionally, one of DaVita biannual skills day was cancelled due to weather conditions and staff education only consisted of policy and procedure review. DaVita did not implement an electronic CLABSI prevention educational course for its staff until the completion of this project.

Recommendations

Based on the results of this QI project, hospital units and dialysis staff should consider better education for CLABSI prevention measures. When root cause analysis was conducted on CLABSI cases, it was found that dressing changes were not completed as recommended every 7 days or when soiled. There were some confusions around which staff can or cannot change a hemodialysis catheter dressing on the unit. In addition, patient education on CVC access care were not conducted consistently. Patients were found with disheveled dressing and refusal to bathe for days. These behaviors can introduce and create a breeding ground for bacteria growth and infection. Infection occurrence rates were found to be higher in long dwelling catheter as opposed to temporary placement. Due to the risk associated with BSI in patients undergoing hemodialysis with CVC access, patients should be considered for an alternative vascular access such as an AVF or AVG when possible.

Conclusion

Although this QI project did not achieve a 25% deduction in CLABSI occurrence rate post-implementation as initially proposed, it did reveal that risk factors such as length of hospital stay, prolonged catheterization, location, and type of CVC access can influence infection occurrence. Future studies are recommended on this topic and a re-evaluation of DaVita CLABSI Prevention Protocol should be performed when a complete education system is available. As evidenced in literature, significant CLABSI reduction is made possible through the application of surveillance, infection prevention protocols, and program evaluation. DaVita CLABSI Protocol has the potential to achieve CLABSI reduction when all three modalities are implemented.

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Appendix A

CLABSI Prevention Plan of Action

Meeting Date: ____________________

Meeting Participants: ____________________

Topic	Actions	Level of Importance 3 = high importance 2 = medium importance 1 = low importance	Who Needs to be Involved	Date Due	Date Completed
Communication - Nephrologist - Infection Preventionist - Liaison - Hospital Nurse - Anesthesia - Radiologist - Dialysis Nurse	Notify Dialysis Nurse of all dialysis CVC admissions				
Education - Access Care - Non-dialysis use of CVC - Include patient/family - Blood Cultures - CVC Dressing - Competencies - Hospital P&P	Review Hospital P&P Discourage use of triple lumen catheters Appropriate end caps, dressings & line labels				
Reporting - Hospital - Dialysis - Chronic Outpatient	Monthly Performance				
Monitor Performance - CVC Assessment (7 data points) - EMR Documentation - Quality Indicators	Determine critical performance data points				

Table 1

Gender Demographic of Sample

Gender	Frequency	Percent
Female	130	51.4
Male	123	48.6
Total	253	100

Figure 1

Gender Demographic of Sample

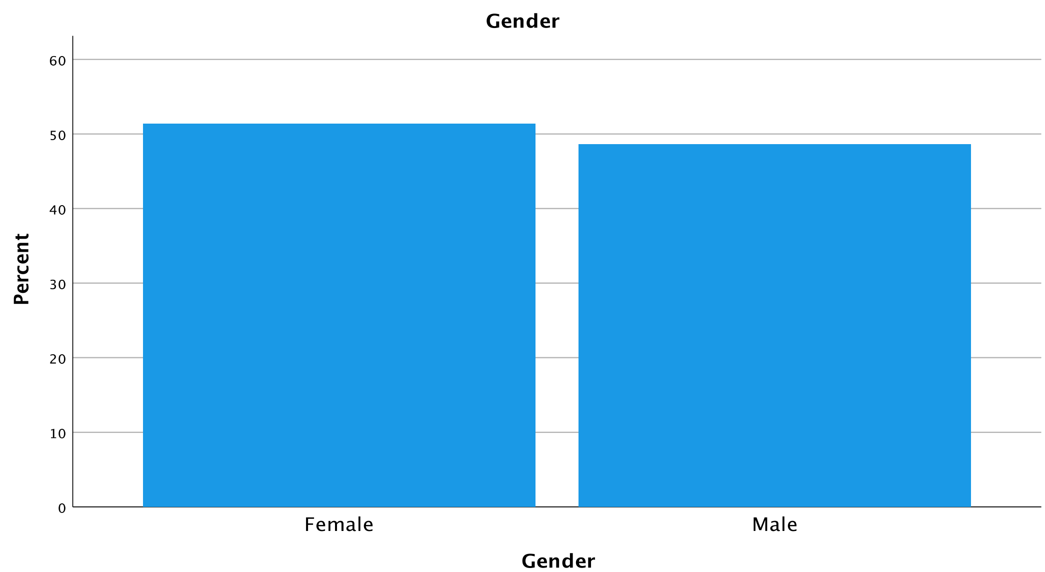

Table 2

Age Demographic of Sample

	N	Mean Age (years)	Median Age (years)	Minimum Age (years)	Maximum Age (years)	Standard Deviation
Patient Age	253	63.97	65.00	23	94	14.768

Figure 2

Age Demographic of Sample

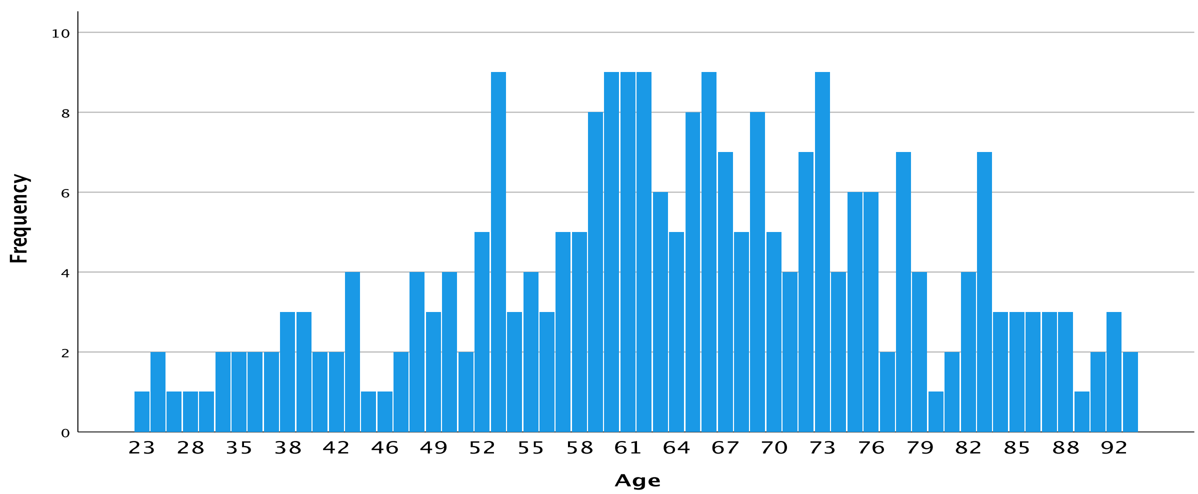

Table 3

Length of Stay vs. Catheter Days

	N	Mean (days)	Median (days)	Minimum (days)	Maximum (days)	Standard Deviation
Length of Stay	253	18	15	1	87	13.619
Catheter Days	253	10	7	1	107	10.178

Figure 3

Hospital Length of Stay

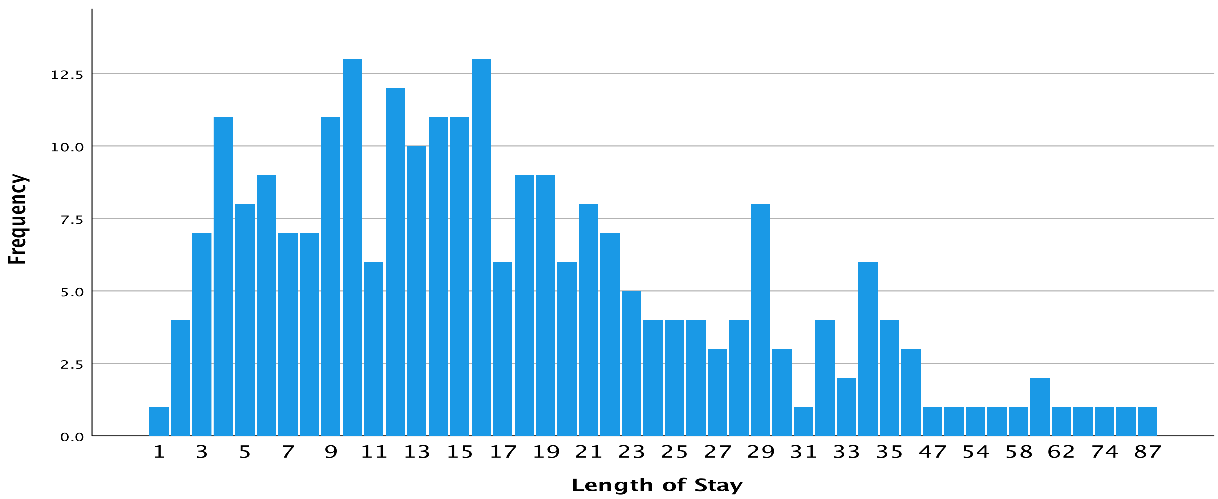

Figure 4

Number of Catheter Days

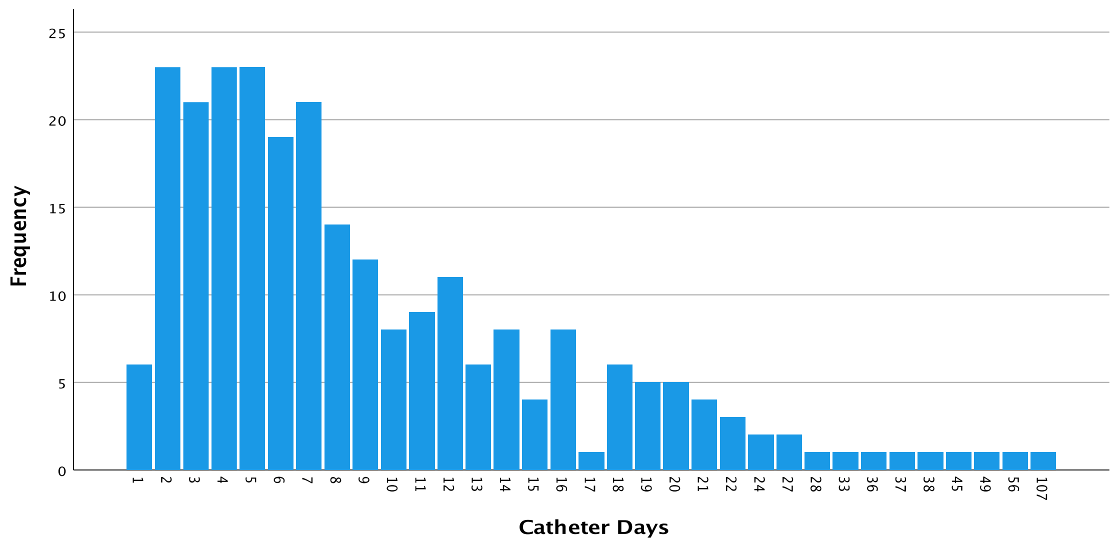

Table 4

Types of Central Venous Catheter Access

Type of Catheter	Frequency	Percent
Tunneled	75	29.5
Non-Tunneled	178	70.4
Total	253	100

Figure 5

Types of Central Venous Catheter Access

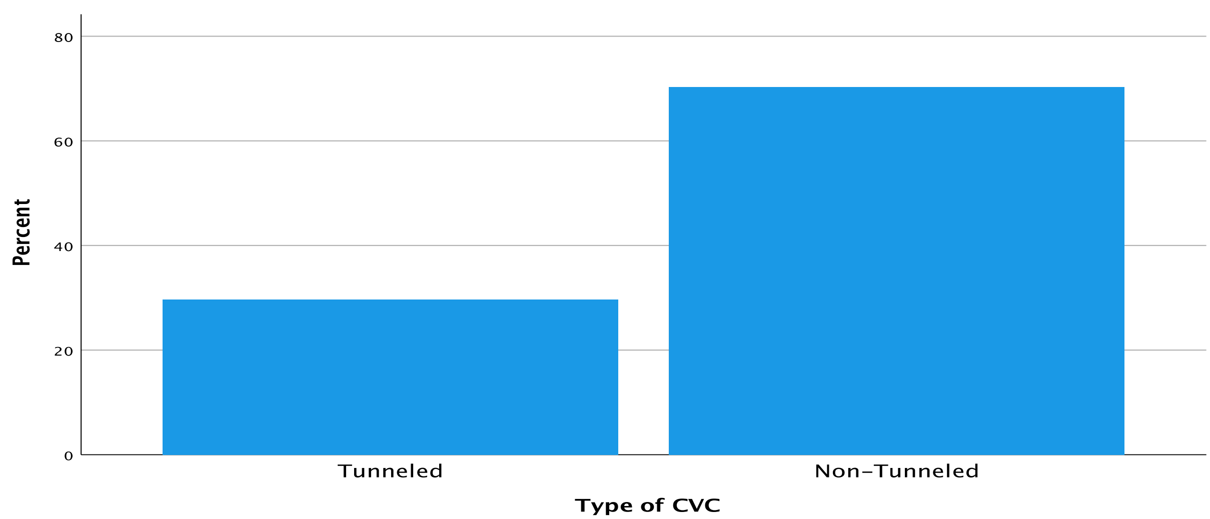

Table 5

Location of Central Venous Catheter Access

	Frequency	Percent
Jugular	202	79.8
Subclavian	41	16.2
Femoral	10	4.0
Total	253	100

Figure 6

Location of Central Venous Catheter Access

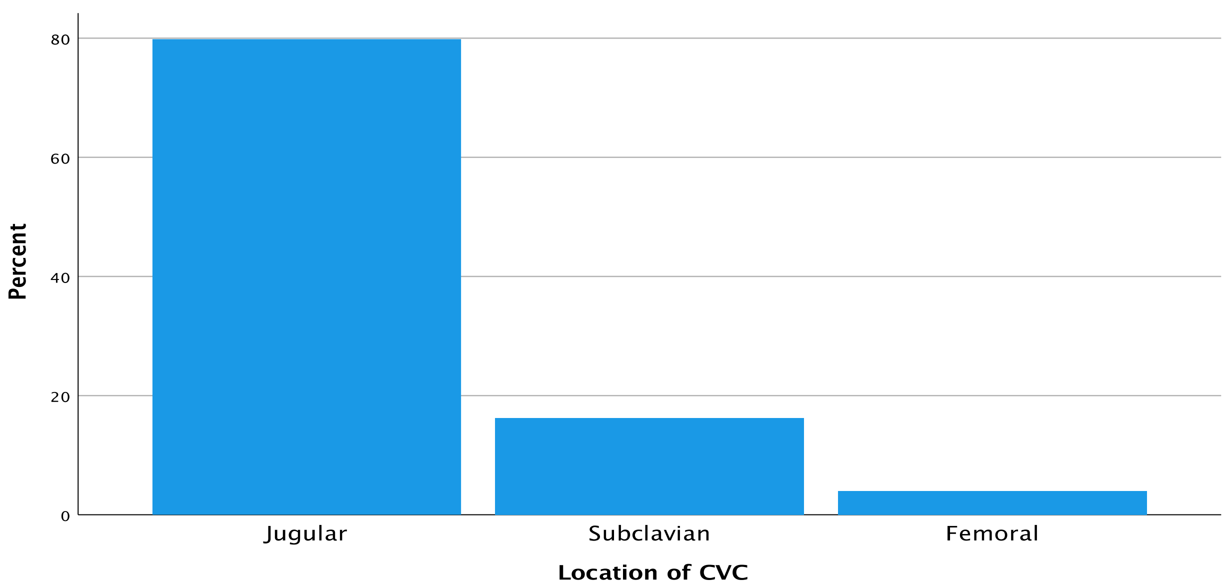

Figure 7

The Rate of Infection Occurrence in Pre vs. Post Group

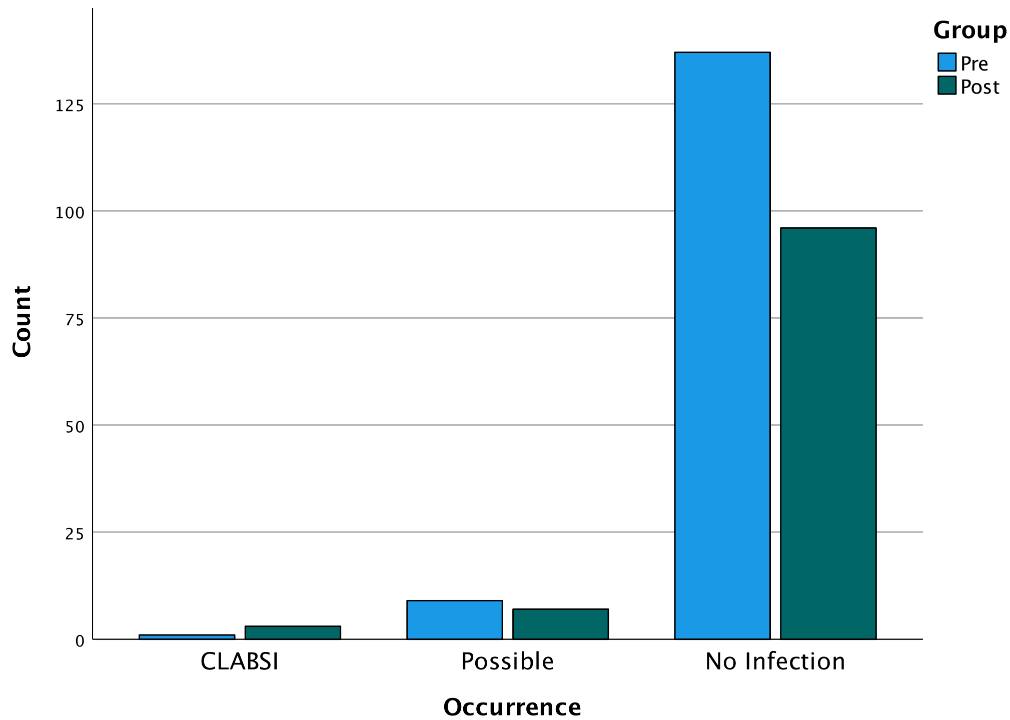

Figure 8

Types of Central Venous Catheter Access vs. Occurrence of Infection

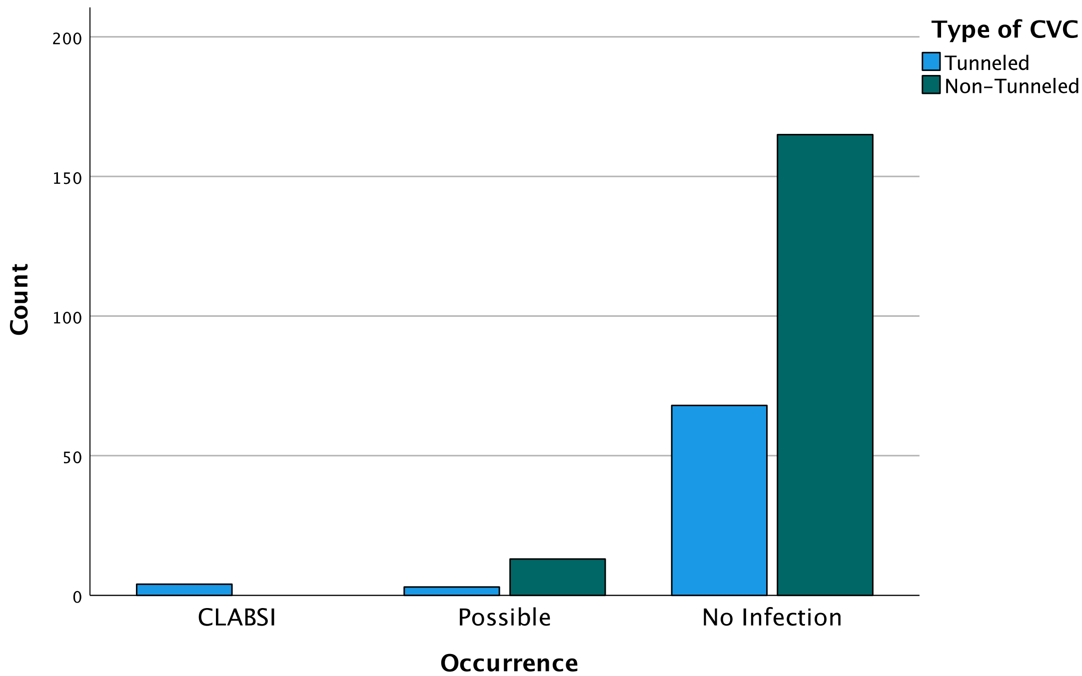

Figure 9

Location of Central Venous Catheter Access vs. Occurrence of Infection