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Implementation of a Rounding Tool to Promote Compliance with Central Line Dressing Changes in an Adult Intensive Care Unit

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Abstract

Evidence supports implementing central line (CL) maintenance bundles and nurse-led rounding interventions to prevent central line-associated bloodstream infections (CLABSIs). In a Tennessee intensive care unit (ICU), increased CLABSI rates were associated with inconsistent CL dressing maintenance and documentation. This Doctor of Nursing Practice scholarly project was implemented to improve ICU CLABSI rates and reinforce nursing standard practices for CL dressing care. This quality improvement project used the Institute for Healthcare Improvement (IHI) model for improvement, which used the plan, do, study, act (PDSA) cycles as part of the framework to implement a daily nurse-led rounding tool in the ICU, which involved real-time intervention for CL dressing and documentation. Project planning was from January 2022 to May 2022, the intervention phase occurred in May 2022, and CLABSI rates, dressing compliance documentation, and rounding tool data were retrospectively extracted from May 2022 through September 2022. Data were analyzed using run charts to show trends in data from January 2021 through September 2022. The compliance from the rounding tool with CL dressing changes at seven days or less ranged from 83.2%-100.0%. The *median C*L compliance was 90.4%. The electronic health record (EHR) documentation CL compliance range was 50.0%-77.8%, and the *median* compliance was 61.3%. Baseline 2021 CLABSI ICU rates per 1,000 CL days ranged from 0.00-8.89. The 2022 monthly CLABSI rates were zero during the planning and intervention phase. This quality improvement project established standard accountability and improvement in nursing compliance documentation for CL, which may have contributed to zero CLABSI rates in 2022. Evidence-based nurse-led interventions can lead to high-impact and consistent quality care in complex and busy ICUs.

Keywords: *nursing**,** central line-associated bloodstream infection, CLABSI, central line maintenance bundles, checklists, ICU*

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Introduction

Central venous catheters (CVCs), also known as central lines (CLs), are an essential part of providing care to critically ill patients for administering intravenous fluids, blood products, parental nutrition, vasoactive medications, hemodialysis, and hemodynamic monitoring (The Joint Commission [TJC], 2022; Centers for Disease Control and Prevention [CDC], 2022). However, the utilization of CVCs is the most frequent cause of healthcare-associated bloodstream infections (TJC, 2022). The National Healthcare Safety Network (NHSN, 2023) defines a central line-associated bloodstream infection (CLABSI) as a laboratory-confirmed infection not originating from another infection site and not present at the time of admission. CLABSIs are associated with significant morbidity, mortality, and cost (NHSN, 2023). Several extrinsic and intrinsic risk factors influence the development of CLABSIs in critically ill patients. Intrinsic risk factors for CLABSI development include the patient's age, underlying disease or conditions, prolonged hospitalization before catheterization, concurrent use of catheters, neutropenia, body mass index, parental nutrition, and gender (TJC, 2022; Boetti et al., 2022). CL use is an extrinsic risk factor for developing bloodstream infections, with an estimated 250,000 cases of healthcare-associated CLABSIs yearly (Pitiriga et al., 2020). In particular, the following factors impact the development of healthcare-associated CLABSIs: catheter insertion site selection, insertion techniques, catheter maintenance, and duration of CL utilization (Patel et al., 2019). Despite the availability of CL maintenance bundles and scientific evidence, compliance with infection prevention bundle elements remains challenging in healthcare settings (Buetti et al., 2022).

Problem Description

The Agency for Health Care Research and Quality (AHRQ, 2018) reported that CLABSI contributes to 84,551 to 203,916 preventable infections, 10,426 to 25,145 preventable deaths and $1.7 to $21.4 billion in avoidable costs per year. Additional data estimate that 30,100 CLABSIs continue to develop in intensive care units (ICUs) and medical/surgical floors in acute care facilities across the U.S. (NHSN, 2023). Specifically, ICU patients are at an increased risk for CLABSIs because 48% of ICU patients have indwelling CVCs, accounting for 15 million CL days per year in U.S. ICUs (AHRQ, 2020). The AHRQ (2020) states that as many as 28,000 patients die annually from CLABSIs in U.S. ICUs. The estimated cost of treatment after a CLABSI diagnosis per inpatient day in the U.S. is $2,212; however, this amount is likely to be underestimated (Kaiser Family Foundation, 2020). The estimated additional cost per CLABSI ranges from $17,896–$94,879 (AHRQ, 2017). Tennessee acute care hospitals reported an increase in CLABSI ICU ratios from 0.61 Q1-2019 to 0.87 in Q3-2019. Q4-2019 through Q2-2020 saw lower than expected ICU standardized infection ratios (SIR) ranging from 0.53 – 0.63; however, from Q2-2020 through Q4-2020, there was a persistent rise in ICU SIR to 1.12 (Tennessee Department of Health [TDH], 2021).

Project Site Problem

In Middle Tennessee, a hospital identified increased CLABSI rates in 2021, which were highest in the ICU setting. Upon interviewing stakeholders and observing their processes, gaps in clinical documentation by nursing staff, along with limited oversight/monitoring procedures for CL dressing maintenance were identified. Before implementing this QI project, the ICU team conducted patient safety rounds, the condition of CLs was not systematically assessed, and the last time nurses were formally educated on CL maintenance was unclear.

Available Knowledge

Central line maintenance bundles include protocols requiring Chlorhexidine Gluconate (CHG) dressing changes every five to seven days, gauze dressings every two days**,** or immediately if the dressing is soiled, loose, or damp (Marschall et al., 2016 Grigonis et al., 2016**,** Buetti et al., 2022). The lack of integrity of CL dressings is a known risk factor for developing catheter-associated infections (Grigonis et al., 2016). Furthermore, a study found that catheter-related infections increase by more than threefold after the second CL dressing disruption and more than tenfold after the third CL dressing disruption (Timsit et al., 2012). Consequently, CL dressing maintenance requires frequent vigilance to preserve CL dressing integrity (Grigonis et al., 2016).

CLABSI prevention is possible through proper insertion techniques and CL maintenance (NHSN, 2023). Therefore, decreasing CLABSIs and improving the quality of patient care is paramount (AHRQ, 2020). Research supports implementing CLABSI infection prevention interventions as a standard of care, including CL insertion and maintenance bundles (Hugo et al., 2022; Wei et al., 2021; Gorski et al., 2021; CDC, 2022; Gupta et al., 2021). CLABSI prevention bundles are a collection of evidence-based infection prevention resources and guidelines focusing on CL insertion, maintenance, and monitoring practices (Gupta et al., 2021). Central line maintenance bundle elements include daily assessment of CL necessity, dressing and cap changes at specific intervals, daily CHG bathing for patients, accessing CLs aseptically, standardizing dressing change kits, using CHG containing dressings, appropriate nurse-to-patient ratios, limiting using float nurses to the ICU, intravenous administration set replacement at intervals up to seven days, and performing CLABSI surveillance in ICUs (Hugo et al., 2022; Minnesota Hospital Association [MHA], 2016; Buetti et al., 2022).

As various factors influence CLABSI development, a systematic review and meta-analysis of a subgroup analysis of 19 studies examined the impact of implementing bundles of care using checklist interventions for units with high CLABSI baseline rates to assess CL daily necessity and dressing maintenance (Blot et al., 2014). The results from this review revealed an infection rate decrease in the obtained pooled odds ratios (*OR*, 0.34 [95% CI, .27–.41]; P = .026) suggesting a more substantial risk reduction when implementing CL checklists as a monitoring tool (Blot et al., 2014). An additional study of 984 adult ICU patients found a reduced CLABSI ratio associated with higher compliance with infection prevention bundle components, including CL dressing integrity (Patel et al., 2019). Additionally, a systematic review of 15 studies, including 7 that used checklists to maintain CVCs, reduced CLABSI rates over time, which led to substantial financial savings for healthcare systems (Nuckols et al., 2016). Direct visualization of the CL condition led to significant and sustained improvement in CLABSI rates in the adult cardiac ICUs, with a drop in the CLABSI rates from 3.1 to 0.4 per 1,000 CL days (Gupta et al., 2021). This study showed bundle element compliance increased from 64% to 100%, with improvement sustained over three years (Gupta et al., 2021). A study by Wei et al. (2021) documented that following a comprehensive bundle of interventions for CVC insertion and maintenance, the annual number of CLABSI cases declined by 68% (34 to 11 patients) from 2013 to 2017. Thus, bundles of care assisted in creating reliable and consistent care in hospital settings (Gupta et al., 2021). Quality improvement interventions, including staff education on catheter care bundles and checklists, decreased CLABSIs by improving adherence to prevention measures (Blot et al., 2014). Additional research emphasized the need to adopt CL maintenance bundles and establish a process for monitoring compliance with evidence-based practices (EBPs). Recent evidence suggested that CLABSI bundle initiatives require a monitoring

component to improve implementation efforts and patient outcomes. A U.S. study of 984 adult ICUs found that a decrease in CLABSI was not associated with reported CLABSI bundle implementation alone; instead, reductions in CLABSI occurred when compliance was tracked, and bundle components (for example, hand hygiene and maximal barrier precautions) were higher than 95% (Patel et al., 2019). Using a CL dressing maintenance tool assisted in monitoring progress toward assuring care and CL maintenance per standards of care (Patel et al., 2019).

Rationale

Creating independent redundancies using a checklist is an effective strategy for monitoring adherence to CL maintenance processes (AHRQ, 2020). Standardized CL infection prevention practices supported by feedback and education can decrease CLABSI rates. (Hugo et al., 2022, Gupta et al., 2021, Timsit et al., 2012, Grigonis et al., 2016, Alanazi et al., 2021, CDC, 2022). Hugo et al. (2022) found that nursing-led rounds formalized the CL assessment process and increased transparency by providing real-time feedback with expected practice. A study by Marschall et al. (2016) reported that monitoring compliance in the documentation of CL care was an effective method of reducing CLABSIs. Therefore, a decision to implement a CL rounding tool at the project site was made based on the quality of available literature supporting this intervention, the need to drive improvement in patient care outcomes in the ICU, decrease CLABSI rates, and the feasibility of implementation based on stakeholder engagement. Patel et al. (2019) effectively used CLABSI reduction interventions that designated nurses to observe and review documentation compliance with CVC insertion and maintenance. Per Thate et al. (2020), documentation in the patient's EHR can facilitate effective communication and safe care among the healthcare team. At the project site, EHR CL care documentation compliance had not been

established, but establishing a baseline was deemed essential to identify potential opportunities for improvement with this process measure. Research by Thate et al. (2020) focused on the communication needs to support CLABSI prevention. Thate et al. (2020) identified challenges in managing documentation in multiple places, the absence of formal documentation processes for CVC management (checklists), lack of standardized decision-making processes for managing CVCs, and caregiver preference for oral communication instead of documenting interventions in the patient's EHR.

Specific aims

Preventing CLABSIs remains an essential target for quality improvement efforts because of the negative repercussions on patient outcomes and the budgetary impact on healthcare systems (Ormsby et al., 2020). As challenges with CLABSI prevention continued in this setting, this DNP scholarly project aimed to reduce the ICU CLABSI rates to zero per 1,000 CL days, establish CL dressing change compliance at $\leq$ seven days or less from the rounding tool, and the EHR CL dressing documentation by September 30, 2022. The clinical implications of this project are directly related to quality improvement and safe patient care. This scholarly project benefited critically ill patients admitted to the ICU with CLs by increasing accountability with CL dressing changes.

Methods

This scholarly project involved a quality improvement design using the IHI's Model for Improvement as a framework, which involved implementing the plan, do, study, act (PDSA) cycles. This model is helpful in healthcare for evaluating a change by planning, trying, observing the results, and implementing the knowledge obtained from the process (IHI, 2023a). Each phase of the PDSA is a repeating cycle to improve and guide consequent steps (IHI, 2023b).

Additionally, this model assists teams in assessing whether a change leads to improvement by identifying each step within the PDSA cycle (IHI, 2023b; AHRQ, 2020).

Design

Plan

This QI project included setting a purpose statement, defining measures, and small changes to test and implement successful results or additional changes to the project according to the PDSA cycle. PDSA cycles were used to increase the reliability of CL care delivery. In the first phase of the PDSA cycle, the *plan*, a purpose, goal, timeline, and specific details, including the who, what, when, where, why, and how, were identified (IHI, 2023b). The project's population, duration, implementation location, outcome, process, and balancing measures were identified during this phase. The CLABSI rates and CLABSI counts from January 2021-September 2022 were used as outcome measures in addition to the EHR CL documentation. The compliance from the CL rounding tool with CL dressing changes ≤ seven days and compliance with using the tool for daily rounding were used as process measures. Implementing the CL rounding tool was a new practice, so the time devoted to CL rounding was tracked as a balancing measure.

During the plan phase, the hospital's chief quality officer (CQO) aided in identifying the ICU as a target area for CLABSI rate reduction. The hospital's CQO was the key stakeholder that provided guidance and assistance for this QI project. The CQO assisted with introductions via email and in-person to the ICU team and facilitated nurse leader engagement. The ICU nurse leaders were contacted via email, and meetings were held to obtain additional information related to CL infection prevention practices before this intervention.

Instrument

The project leader identified evidence-based recommendations for CLABSI reduction for patients in this setting, which led to the development of a one-page rounding document based on the hospital's CL policies and procedures, the CDC's Checklist for Prevention of Central Line-Associated Blood Stream Infections, and the Agency for Healthcare Research and Quality's (AHRQ) Central Line Maintenance Audit Form. Data collection included the date of documentation review by the project leader, date of rounds, patient's room number, alphanumeric code assigned to the CL, CL dressing date during rounds, indications for CL necessity, and type of CL. Bundle elements collected from the tool included the condition of the dressing (clean, dry, intact; CHG impregnated disk/dressing, dressing dated and current, tubing dated and current, injection, curos, or end caps on hemodialysis lines); element compliance and corrections of findings, if applicable. Figure 1 depicts the CL rounding tool.

Project predictions were made during this phase, and an increase in CL dressing compliance was expected as a result of this project. Additionally, CL dressing change competency-based training had not been completed for the bedside nurses within the past two years, which the unit's clinical nurse educator identified as an educational opportunity. Subsequently, before the implementation of this project, the ICU clinical educator led CL dressing change competency-based training for approximately 26 ICU bedside nurses.

Clinical Setting

This QI initiative was implemented to improve standard quality practices for CL dressing care in an acute care hospital in Tennessee. The hospital delivers a wide range of primary and specialty care services, including family and emergency medicine, women's health services, general surgery, pulmonology, critical care, heart and vascular clinics, orthopedics, and

hematology-oncology. This QI project was implemented in the hospital's 13-bed adult ICU. The ICU provides care for medical and surgical patients with life-threatening injuries and illnesses. Staff working at this unit include one nurse manager, 24-26 bedside registered nurses (RNs), a clinical nurse educator, and staff from other healthcare disciplines.

Project Population

The setting for this QI project was selected due to the setting of nurses caring for critically ill patients in the hospital's ICU and the need to improve patient outcomes in this setting. The project participants included the bedside RNs working in the ICU, a nurse leadership team involved in improving patient outcomes for the unit, and ICU patients with central lines.

Do

During the second phase in the PDSA cycle, the *do* stage, the project's intervention was implemented. The instrument was introduced to the primary site stakeholder, the project's primary advisor, the ICU nurse manager, the clinical educator, the unit-based charge nurse, and the hospital's infection prevention nurse for review and feedback. Once the initial draft of the tool was reviewed and feedback from the team was incorporated, the ICU stakeholder team received training on using the instrument. The tool's implementation began with nurse leaders identifying patients with CLs in the ICU. During daily rounds, the nurse leaders documented compliance with the patient's CL dressing condition using a paper version of the CL maintenance tool. The use of the tool by the nurse leadership team prompted real-time feedback to the bedside nurses with expected compliance with CL maintenance. During the month-long initial implementation phase in May 2022, the project leader rounded daily with the nurse leadership team for the first week and twice weekly after that to assist with and encourage the use of the tool. During rounds, the nurse leaders reinforced the bedside nurses' education and compliance

with dressing changes if prevention elements were non-compliant. Per hospital policy and patient care practice standards, the bedside nurses were expected to document the condition and the CL dressing date change on the patient's EHR as part of their routine patient care responsibilities.

Data Collection

The project leader used the maintenance rounding tool to identify patients (using their medical record number) with a CL admitted to the ICU starting May 16, 2022, through Sept 30, 2022. During the data collection phase, the project leader followed a systematic process to ensure data extracted for project use remained de-identified and secured separately from hospital data. Data from the EHR and maintenance rounding tool were kept secure by entering de-identified data into a collection survey built in Qualtrics. Instead of recording each patient's medical record number, the data were assigned an alphanumerical code to keep it de-identified yet appropriately counted toward a single individual's CL. Data extraction per patient was completed during one sitting to maintain accuracy but avoid the need to use an identifying key. A stratified sampling strategy was used to ensure an even number of CL data was extracted throughout the project timeframe. Data was extracted per individual CL record regardless of the number of patients admitted to the ICU or the presence of multiple CLs per patient. Each CL was investigated as a separate opportunity for compliance. Central lines for each month were numbered sequentially, and a random number generator was used to produce a list of numbers within a chosen range for the month. A minimum of 20% of the total number of CLs were included for each month of the project duration.

Study

During the study phase, the project leader extracted CL documentation from the patient's EHR, aggregated data collected from the maintenance rounding tools completed by the ICU

leaders, and trended CLABSI rates reported to the CDC's National Healthcare Safety Network (NHSN) by the hospital's infection prevention nurse. Retrospective CL data extraction started in September 2022 and lasted until December 2022. Data extracted to address the outcome measures identified in this QI project included the EHR CL nursing documentation and the ICU CLABSI rates. The process measures studied included an analysis of CL assessment documentation from the rounding tool from May 2022 through September 2022. The project leader determined compliance with CL dressing maintenance using data extracted from the CL rounding tool and the EHR documentation. The project leader created a Qualtrics survey as an instrument for data collection and storage. A retrospective review of CL assessment documentation from the patient's EHR and the CL data from the daily rounding tool included data from May 16, 2022-Sept 30, 2022.

Data Analysis

The surveillance for CLABSIs was an established process at the hospital. Central line infections and rates were monitored and reported by the hospital's infection prevention nurse to comply with federal and state reporting mandates. CL compliance data with dressing changes was analyzed as percentages and medians from EHR documentation and completed rounding tools. The time invested in CL rounding was tracked monthly. The predictions made during the planning stage were compared to the results obtained from the data analysis.

Act

The last phase of this cycle is *act*. During this phase, data results were shared with the primary site stakeholder, the ICU manager, the nursing leadership council, and the bedside nurses. Data analysis assisted in determining opportunities for improvement in infection prevention practices related to CL maintenance. The feasibility of continuing and expanding the

use of the tool was explored during this stage. This phase included adjusting practices, planning for the next PDSA cycle, and marking the start of mini-PDSA cycles. The project leader trended the ICU's CLABSI rates over time to assess the impact of this intervention. The extraction of these data provided details about compliance with care and maintenance of the patient's CL and compliance with RN documentation on the patient's EHR. The findings guided additional recommendations for the care and maintenance of CLs to improve patient care outcomes in the ICU. The results were discussed with the ICU team and shared in an executive summary. Specific details on the next steps for this project are discussed in greater detail in the Discussion section. In conclusion, using the PDSA model as a framework guided this QI project in the ICU to impact patient outcomes by focusing on the care and maintenance of CLs.

Ethical Considerations

All data collected was de-identified and presented in an aggregate format per HIPAA compliance rules. Implementation of the rounding tool did not pose risk to the participating patients or nurses. Identifying information from the nurse leadership team or bedside nurses was not included in the project or linked to data. This project was a unit-wide QI initiative. Per hospital policy and standards of patient care, bedside nurses were not asked to complete additional tasks beyond their current responsibilities. Implementation of this tool was meant to assist nurses with their current responsibilities and did not pose a risk to their employment or jeopardize their current role or monetary wages. The Belmont University Institutional Review Board approved the project as QI Exempt-Not Research in April 2022. The principal investigator did not have any conflicts of interest to disclose.

Results

The outcome measures evaluated included the number of CLs with CL dressing change documentation in the EHR, CLABSI rates, and the number of CLABSI infections. The EHR documentation CL compliance range was 50.0%-77.8%, and the median compliance was 61.3%, as shown in Table 2. Baseline 2021 CLABSI ICU rates per 1,000 CL days ranged from 0.00-8.89. The 2022 monthly CLABSI rates were sustained at zero during the planning and intervention phase. Figure 2 shows CLABSI rates, and CLABSI counts during the baseline, planning, and intervention phase. Two process measures were included in this QI project. The first included monthly compliance analysis with CL dressing changes within 7 days as documented on the rounding tool (the numerator). The denominator incorporated every CL documented in the rounding tool. Compliance with this measure ranged from 83.2% - 100.0%, as shown in Table 1. The median compliance was 90.4%. An additional process measure included the monthly percentage of CLs audited, which was determined by dividing the numerator (number of CLs documented on the rounding tool by nurse leaders) by the denominator (the number of patients listed as having a CL on the ICU daily census). The monthly compliance with the number of individual CLs audited ranged from 79.0%-93%, as shown in Table 3. As a balancing measure, the time for completing CL rounds was tracked in hours, as shown in Table 4.

Discussion

The results were consistent with the purpose of this DNP scholarly project, which aimed to reduce the number of CLABSIs identified in the ICU, evaluate CL dressing care provided by bedside RNs, determine compliance with CL documentation in the EHR, and establish the time needed to use the rounding tool. Compliance with CLABSI prevention bundles with education and audit feedback is supported by available literature as an effective way to decrease CLABSI

rates (Aufricht et al., 2019; Aloush & Alsaraireh, 2018; Borgert et al., 2017). These literature findings support the outcome measures of this DNP project, reflecting a downward trend from 8.8 to zero CLABSI rates per 1000 CL days during the planning and intervention phases. CL rounding has continued, and the unit achieved zero CLABSIs for the 2022 calendar year.

In support of this intervention, Ormsby et al. (2020) found intensive care units that monitored bundle adherence and maintained greater than 95% compliance had significantly lower CLABSI rates. On the other hand, less than 75% bundle compliance has not been associated with CLABSI rate reductions (Wood-Hills et al., 2021). When comparing project site RN compliance with CL dressing changes with existing studies, the CL dressing change compliance at the project site ranged from 83% to 100% during the intervention phase. Although this process measure did not consistently achieve greater than 95% compliance, the project site achieved greater than 75% with CL dressing changes. Overall, improved CL dressing change adherence was noted based on contextual information gathered from the facility stakeholders during the project's planning phase. Gupta et al. (2021) study results reinforced findings from this QI project as increased CL care compliance increased from 64% to 100% with a reduction in CLABSI rates from 3.1 to 0.4 per 1,000 CL days. Ultimately, data analysis supports the conclusion that CL dressing care provided by bedside nurses was compliant but did not achieve 95% compliance with suggested benchmarks.

The completion of the rounding tool varied throughout the project's duration because of competing priorities in this complex setting. Because of this reason, the number of CLs audited utilizing the rounding tool was used as one of the process measures for this QI project. The compliance with the number of CLs audited using the rounding tool ranged from 79% to 93%, with median compliance of 87%. This data reflects a gap in using the CL rounding tool for daily

rounding. According to the ICU manager, a barrier to higher compliance with CL rounding included insufficient dedicated staff and time for completing rounds. As the time dedicated to rounding deterred time from other nursing activities, time was tracked as a balancing measure to aid in understanding the resources needed to complete CL rounding. Analysis of this balancing measure estimated the monthly average time dedicated to CL rounding was 3 hours and 31 minutes. This measurement was calculated based on feedback provided by the ICU manager. This balancing measure highlighted the sustainability of rounds and the feasibility of this intervention going forward. Per nurse leader feedback, the rounding tool did not create a time burden for nurse leaders, especially when considering the potential positive impact on patient outcomes. The ICU will incorporate the instrument as part of its permanent workflow, but rounding will transition to three times a week to support sustainability.

In contrast, results revealed stark differences in RN EHR documentation of CL dressing care compared to compliance gathered from the rounding tool. EHR documentation compliance ranged from 56% to 78%, indicating a gap in patient care documentation. According to Pagulayan et al. (2018), EHR documentation improves clinical outcomes and enhances interprofessional documentation; therefore, recommendations to improve this measure are discussed in the QI recommendations and next steps section.

Ultimately, the CLABSI rate improvement cannot solely be attributed to this project's intervention. Although increased attention given to this problem at the beginning of the planning phase may have contributed to reducing CLABSI rates, other factors may have also influenced these rates. RN awareness of rounds and real-time feedback on expected compliance with CL dressing care at the beginning and as the project progressed may have further influenced

infection rates. The results from this QI project can be used to build future interventions related to CLABSI reduction in the ICU.

Project Implications and Benefits

The project contributed to improved CLABSI prevention, as evidenced by an 8.8 to zero rate reduction from 2021 to 2022. Implementing a CL rounding tool reduced the risk of patients developing a CLABSI from a compromised CL dressing and established an evidence-based process for CL surveillance at the project site. The project site had potential savings from CLABSI infections avoided as an additional of this project. According to AHRQ (2017), the average attributable cost per CLABSI is $48,108. Therefore, an estimated cost saving at the project site from CLABSI prevention in 2022 was approximately $384,864 (AHRQ, 2017).

Project benefits included the CL dressing change competency-based education the ICU nursing staff received. Furthermore, this project set a baseline rate with CL dressing care and created a surveillance process to monitor compliance. The project benefited from strong stakeholder engagement throughout the project's duration and the project's lead expertise in infection prevention.

Limitations

This project's scope did not examine the compliance of other CLABSI reduction strategies used at the study site, including hand hygiene, CL practices before and during insertion, and variability in CL utilization. Analysis of compliance with these elements would increase understanding of their impact on CLABSI prevention as a more holistic approach to infection prevention and may have contributed to reducing CLABSI rates. Patients transferred from the ICU with CLs inserted were lost to analysis at the time of transfer.

Furthermore, dedicating time to completing the daily CL rounds and using a paper version of the tool posed challenges during implementation and data collection. Using a paper tool made it difficult to aggregate and provide data back to the project's stakeholders in a timely manner, limiting the potential implementation of additional PDSA cycles. The PDSA cycles, including planning, implementation, data collection, and analysis, were limited to this scholarly project's academic calendar. The lack of baseline data limited pre- and post-intervention compliance comparison of EHR documentation. EHR CL documentation compliance was wide-ranging, but unlike CL dressing compliance during rounds, EHR documentation feedback was not provided to the bedside nurses and stakeholders until the dissemination of the project results.

Quality Improvement Recommendations and Next Steps

For this project, the CL rounding tool was printed and distributed to the ICU manager and charge nurses to complete during daily rounds. However, manual data collection is tedious and a resource intensive process; therefore, the recommendation for the project site was to transition rounding to three times per week with continued use of the tool. At this time, the unit will not be switching to an electronic version of the instrument but instead focus resources on improving compliance with EHR documentation.

Recommendations from the project leader included increasing the visibility of results in a dashboard to increase awareness of CLABSI prevention performance. Discussing findings during huddles, staff meetings, and safety committees to increase accountability and promote transparency as rounding is incorporated into the permanent ICU workflow. Future QI projects should explore RN barriers to increasing compliance with EHR documentation. A barrier to nurse documentation noted during data extraction included multiple locations for nurses to document CL and CL dressing data, which may have caused confusion and noncompliance with

HER documentation. These findings were discussed with the ICU leadership team and the primary site stakeholder. The results from this QI project can be used to build future interventions related to CLABSI reduction in the ICU. In fact, additional QI initiatives should be implemented to determine compliance with other CL infection prevention elements over a sustained period and extended to other inpatient care areas.

Conclusions

This DNP scholarly project contributed to improving patient outcomes by helping reduce ICU CLABSI counts and rates to zero during the duration of this project. By standardizing audits and feedback using a CL maintenance audit tool and educational opportunities, RNs can reduce patient harm and improve population health outcomes. This DNP scholarly project established standard accountability with CL care and EHR documentation baseline data. Furthermore, the analysis of time dedicated to CL rounding demonstrated the feasibility of implementing and sustaining this QI intervention. By increasing CL care compliance, evidence-based nurse-led interventions can lead to high-impact and consistent quality care in complex and busy ICUs.

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Appendix A. Central Line Rounding Tool

Figure 1

Central Line Rounding Tool

Appendix B. CLABSI rates and CLABSI count during the baseline, planning, and intervention phase

Figure 2

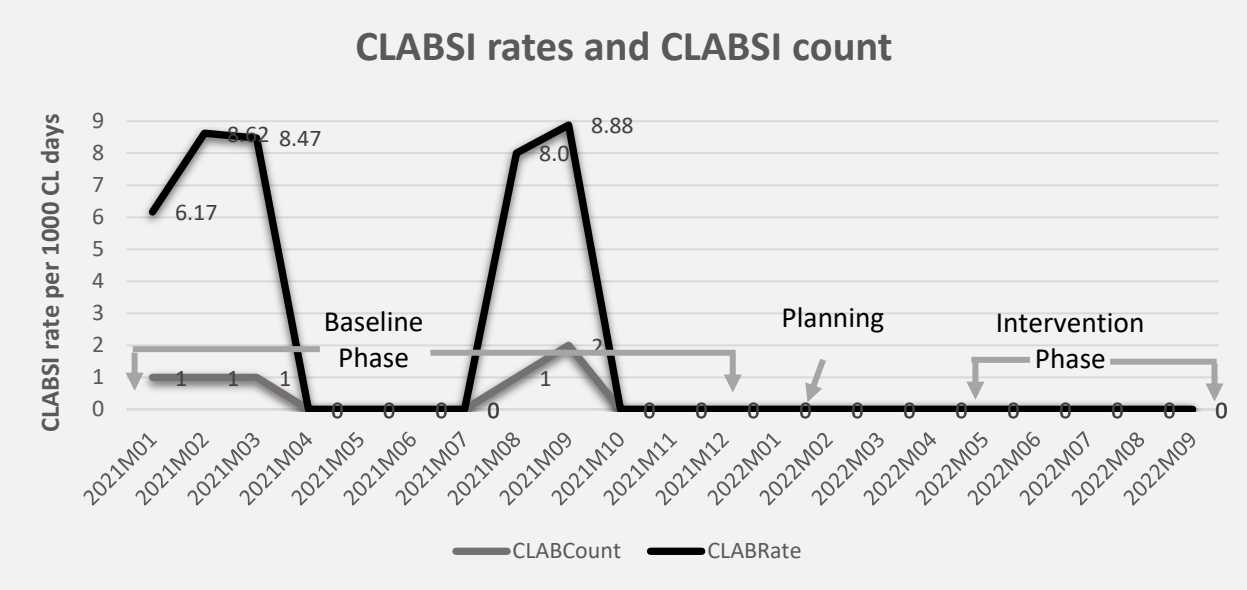

Table 1

Compliance from the CL rounding tool with CL dressing changes ≤ seven days

Month	Dsg changed at 7 days/PRN	
	n	%
May	43	97.6
June	18	99.9
July	16	88.8
Aug	15	83.2
Sept	19	90.4

Note: Denominator, # of CLs inserted/present per month in the ICU

Table 2

EHR documentation CL compliance (N = 118)

Month	Dsg changed at 7 days/PRN	
	n	%
May	27	61.3
June	14	77.8
July	9	50.0
Aug	10	55.5
Sept	14	77.8

Note: *N* = 118

Table 3

Monthly compliance with the number of CLs audited using the rounding tool (N= 299)

Month	Number of CLs audited	
	n	%
May	63	91
June	55	93
July	77	91
Aug	65	82
Sept	39	79

Table 4

Time dedicated to CL rounds in hours and minutes per month

Month	Minutes dedicated to CL rounds
	n
May	3 hrs. 9 min
June	2 hrs. 45 min
July	3 hrs. 51 min
Aug	3 hrs. 15 min
Sept	1 hr. 57 min

Note: *N* = 299