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Hannah Barry
hpbarry@dons.usfca.edu

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Increasing CLABSI Bundle Compliance in the NICU

Hannah Pozon Barry, RN, CCRN

University of San Francisco

Abstract

Central lines are frequently used in the neonatal intensive care unit (NICU) for the administration of medications and total parenteral nutrition (TPN). Central line-associated blood stream infections (CLABSIs) have the potential to cause harm in the vulnerable neonate. Current evidence shows that having a CLABSI bundle compliance rate of 95 percent or greater correlates with a reduction in CLABSI occurrences. The purpose of this project is to increase compliance to CLABSI prevention practices in the NICU through education and ongoing central line audits. Baseline line audit data revealed an 80 percent compliance rate (n = 50) and 50 percent of nurses answered at least one question incorrectly in a survey of the central line care protocol (n = 10). Post-intervention data showed an increase in CLABSI bundle compliance to 91 percent (n =24). Additionally, after taking a 1-hour CLABSI prevention class, 20 percent of nurses answered at least one question incorrectly on the protocol survey (n = 5). During the time of this study, there were no CLABSIs. It is recommended that central line audits continue in order to monitor for potential CLABSI risks. It is also recommended that ongoing CLABSI prevention education be provided to nursing staff in order to achieve a 95 percent compliance rate.

Increasing CLABSI Bundle Compliance in the NICU

The microsystem assessed for this project is a level three neonatal intensive care unit (NICU) located in the San Francisco, Bay Area. This NICU has 22 beds and primarily treats premature infants in the very low birth weight (VLBW) and extremely low birthweight (ELBW) categories, requiring a higher level of care after delivery including respiratory and nutritional support. The NICU treatment team includes neonatologists, pediatricians, registered nurses, dieticians, and respiratory therapists. These neonates are especially susceptible and a hospital-acquired infection (HAI) has the potential to cause harmful and lasting effects including neurodevelopmental delays (Zachariah, et. al., 2014).

According to Mobley and Bizzaro (2017), central lines "are utilized frequently in preterm infants for nutritional support and medication administration, and central line-associated bloodstream infections (CLABSI) are among the most common HAI encountered in the NICU" (p. 166). While the CLABSI rate in this microsystem has been zero for the past year, there is an increased risk of CLABSI due to knowledge deficits regarding current line maintenance policy, lack of ongoing audits, and an absence of formal training for new hires regarding CLABSI prevention. Through the implementation of a formal CLABSI class, practicing ongoing line audits, and promoting a culture where CLABSIs are preventable rather than inevitable, the goal is to reduce the overall risk of CLABSIs in the future.

Clinical Leadership Theme

The global aim of this project is to reduce the risk for CLABSI in the NICU. According to the American Association of Colleges of Nursing (AACN, 2013), the clinical nurse leader (CNL) must "use evidence to design and direct system improvements that address trends in safety and quality" and "implement quality improvement strategies based on current evidence,

analytics, and risk anticipation" (p. 12). According to Harris, Roussel, and Thomas (2014), risk management includes surveillance, identification, and prevention of circumstances that could result in harm, monetary loss, or noncompliance. The role of the CNL is to improve patient outcomes; this includes anticipating and preventing harm. Quality improvement, risk management, and maintaining safety for the patients of the NICU, are the core themes for this CNL project.

This project aims to improve CLABSI prevention bundle compliance in the neonatal intensive care unit. The process begins with education of new hires on CLABSI prevention and the central line maintenance protocol. The process ends with the discontinuation of a central line. By working on the process, nursing leadership expects to (1) preserve a zero CLABSI rate, (2) educate new hires on the importance of CLABSI prevention, and (3) avoid potential costs to organization to treat CLABSIs. It is important to work on this now because nursing leadership has identified the need to (1) prevent hospital-acquired infections, (2) reduce expenses incurred though preventable infections, and (3) provide a safe environment for one of the most vulnerable patient populations.

Statement of the Problem

According to Mobley and Bizzarro (2017), if a neonate acquires a CLABSI during his or her hospital stay, it is estimated to cost $50,000 to treat and may increase the length of stay for up to ten days. While the CLABSI costs are significant, it is more important to note the detrimental effects on neonatal development and quality of life. CLABSIs are associated with increased morbidity and mortality and compared to other patient populations, neonates have one of the highest CLABSI rates (Zachariah, et. al., 2014). Knowing this, it is essential to continually evaluate CLABSI risk in the NICU.

Through a microsystem assessment, staff surveys, and audits, major gaps in education and compliance were identified. According to Zachariah, et. al. (2014), in order to sustain a zero CLABSI rate, it is not enough to simply implement a CLABSI prevention policy. Institutions who had lower CLABSI rates, continually monitored prevention practices as well as achieved a 95 percent or greater compliance with the CLABSI bundle. The purpose of this project is to close the gaps identified and improve compliance to the CLABSI prevention bundle, thus lowering the risk of CLABSI in the NICU.

Project Overview

The overall goal of this project is to maintain a safe environment for patients in the NICU by preventing central line-associated blood stream infections. This will be achieved by first implementing a 1-hour CLABSI prevention class to all new hires as part of their orientation to the unit. The objectives for this CLABSI prevention course will be to (1) assess current knowledge of new hires regarding CLABSI, (2) provide new hires with thorough understanding of CLABSI prevention and line maintenance bundle, (3) enable new hires to demonstrate proper access of lines, labeling of lines, tubing changes, and dressing assessment, (4) empower new hires to feel empowered to speak up if they encounter any violations of the CLABSI prevention bundle, and (5) emphasize the importance of discontinuing central lines when no longer needed. A secondary goal for this project is to continually monitor compliance of the CLABSI prevention bundle. This will be achieved through ongoing central line audits. The objectives of the line audits are to (1) identify gaps in compliance, (2) increase unit's awareness of issues regarding central line maintenance, and (3) correct problems in central line care before a CLABSI occurs.

The specific aim of this project is to increase CLABSI bundle compliance to 95% by November 30, 2017. The aim of this project relates to the global aim of maintaining a safe

environment for the unit's neonates by focusing on prevention and risk reduction. While the aim of this project has a specific end date, central line maintenance and CLABSI prevention will be an ongoing endeavor in order to maintain compliance and sustain a zero CLABSI rate in the NICU. Safety is the number one priority in this particularly vulnerable patient population.

Rationale

The prevention of hospital-acquired infections has been the focus of many acute care units, including this one. The insertion of a central line on a neonate is one of the most invasive procedures done in the NICU. Those neonates with central lines have the greatest risk of contracting an infection and this has the potential cause long-lasting harm. Due to these reasons, it was important to further investigate central line care and maintenance practices in the NICU. On the surface, the NICU seems to be doing well as evidenced by their zero CLABSI rate for the past twelve months. Data collected through a staff questionnaire (Appendix A), revealed knowledge deficits in the central line maintenance protocol. Fifty percent of staff answered at least one question incorrectly. Additionally, line audits (Appendix B) exposed issues in capping, labeling, and communication of line necessity. The current CLABSI bundle compliance rate is at 80 percent. Furthermore, a root cause analysis (Appendix C) and SWOT analysis (Appendix D) were performed. It is also important to mention the increase in use of travelers on the unit. There is a 30 percent vacancy rate in the NICU, currently being filled by traveler RNs. Traveler orientation is accelerated, consisting of one day of classroom time and two days of orientation on the unit. CLABSI prevention training involves self-led review of protocols on the hospital's intranet system. This process is similar for experienced new hires.

Cost

In order to understand the financial aspect of implementing this project, a projected cost analysis was completed (Appendix F). As shown in the projected cost analysis, the CLABSI class would have an estimated cost of $1718.00 and a month-long line audit would cost $2940.00. The total estimated cost of this project is $4,658.00, with the majority of expenses being the hourly wage of nursing staff. With an estimated cost of $50,000 to treat one CLABSI (Mobley & Bizarro, 2017), preventing a single CLABSI would pay for the project many times over.

Methodology

The objective of this project is to increase compliance to the CLABSI prevention bundle. In order to initiate change in the NICU, Lewin's change theory will guide the process. Lewin's theory involves three stages: unfreezing, change, and refreezing (Harris, Roussel, & Thomas, 2014). Lewin's model is appropriate for this project because in order to be successful, attitudes and behaviors must change. Lewin's model highlights this. In the unfreezing phase, the culture of complacency must be overcome. This will be achieved by presenting auditing data to leadership as well as staff, emphasizing potential harm to patients. This will help to establish the need for change due to flaws in current practice. In the change phase, an attitude shift must occur. Current nursing staff will be active participants in identifying breaches in the CLABSI bundle. Bedside nurses will incorporate consistent communication of line necessity, labeling, and capping of open ports into practice. Additionally, new hires will incorporate new knowledge regarding central line care and infection prevention into practice. In the final phase of refreezing, CLABSI prevention practices and consistent adherence to the bundle will be the new normal. After the initial CLABSI prevention class, it is important to provide feedback to bedside staff

and leadership to maintain interest, involvement, and engagement of staff. Small successes must be brought to light and celebrated.

In order to see if change is effective, new hires will complete a brief questionnaire before and after the CLABSI prevention class regarding central line maintenance and infection prevention practices. This will help determine if education has been effective if there is an improvement in questionnaire results. Additionally, audit data will be collected continually for four weeks after the CLABSI prevention class. This will be compared to baseline data collected before project was implemented. This will enable project leaders to see any changes in CLABSI bundle compliance. Project leaders expect that compliance to CLABSI bundles will increase from 80 percent to 95 percent, four weeks post-implementation.

Data Source/ Literature Review

The focus of this project is CLABSI prevention bundle compliance in the NICU. Data gathered to establish project need came from central line audits as well as staff questionnaires regarding knowledge of current policy. In order to form a clinical question and guide a review of literature, a PICO format was used. The PICO statement was (1) Population: neonatal intensive care unit, (2) Intervention: CLABSI bundle compliance, (3) Comparison: non-compliance of CLABSI bundle, and (4) Outcome: decrease in CLABSI risk. Through a CINHAL search, using the above PICO statement as a guide, several relevant articles appeared in the search results. Overall, the majority of the results found studied central line use in adult ICUs not neonatal ICUs. Phrases used for this article search were “CLABSI prevention”, “CLABSI bundle”, “central line dwell time”, and “central line necessity”.

The first article relevant to the clinical question was by McMullan and Gordon (2016). The authors looked at the effect of implementing a central line bundle in one neonatal intensive

care unit (NICU). Included in this bundle was daily discussions regarding central line necessity. Post-intervention data showed reduced catheter dwell times as well as an overall reduction in central line infections. This study was performed in one NICU in Sydney, Australia. Data was collected before the implementation of a CLABSI bundle and after implementation. After implementation of the bundle, catheter dwell times were reduced through daily assessment of line need. Additionally, the number of initial central line insertions decreased. Overall, CLABSI rates were lower post-intervention. The authors mentioned this may be due to shorter dwell times and decreased catheter use, thus lowering risk of contracting a CLABSI.

Additionally, an article by Weeks, et. al. (2014) further supports the importance of communication and review of central line necessity. The authors specifically looked at promptly removing central lines through enhanced communication and daily review of line necessity. Post-intervention data showed there was a four percent decrease in central line days after implementation of the bundle. The authors looked at data from over 1,000 ICUs in 44 different states. These ICUs implemented bundles according to CDC guidelines. Data was compared quarter to quarter. At the end of the study, CLABSI rates were reduced by 43 percent. The authors mention that there was a reduction in central line days after bundle was implemented and emphasized the importance of communication regarding central line necessity and discontinuing central lines as soon as they no longer needed.

In a study by Dumyati, et. al. (2014), the project spanned over a 4.5-year period involving 37 adult non-ICU nursing units. The authors looked at staff engagement and education, line audits, evaluating bundle competencies, and feedback on CLABSI events. Through these interventions, CLABSI rates decreased and central line-days were reduced. This study illustrates the importance of line audits and bundle compliance. Furthermore, feedback was equally

important to the success of this project. This highlights the importance of implementing a CLABSI prevention class as a means to educate new hires.

Pogorzelska-Maziarz (2016), looked at the effectiveness of CLABSI bundles in the NICU setting by reviewing current literature. The researcher looked at a total of 17 studies on CLABSI prevention practices. Through this review, it was shown that the use of prevention bundles in the NICU demonstrated a reduction in CLABSI rates. This article is especially important because it specifically looks at CLABSI prevention in the NICU setting. The majority of articles found were written about adult nursing units. CLABSI bundles are known to have a direct effect on reducing infection rates. This further supports the global aim of maintaining a safe environment in the NICU.

In an article by Zachariah, et. al. (2014), This project involved 190 NICUs, with the majority having CLABSI prevention bundles in place. The authors discovered that only 28 percent of NICUs reported having a 95 percent compliance rate with all prevention practices. Those NICUs with a 95 percent compliance rate, had lower incidences of CLABSI. This article highlights the importance of compliance and its relation to CLABSI risk, the main focus of this project. The authors give a specific compliance rate that correlates to decreased CLABSI risk. This validates the project's aim statement of increasing CLABSI bundle compliance to 95 percent.

Lastly, Mobley and Bizzarro (2017) looked at several strategies for CLABSI prevention in the NICU setting. These strategies included the implementation of CLABSI bundles, central line insertion teams, and daily baths using antiseptic wash. The authors also mention the importance of data reporting and tracking of CLABSI events. Transparency and reporting of CLABSI events are key to ongoing CLABI prevention efforts according to the authors. These are

learning opportunities for staff as well as organizations. Sharing data with staff is a vital component in this project and contributes to ongoing engagement.

The above literature review supports the project by highlighting the successes of CLABSI prevention bundles, engaging and educating staff, providing feedback, as well as the importance of communication of line necessity. These topics are all included in this CNL project. The review of literature proves this project is an evidence-based endeavor with several established studies done on the topic to prove its validity.

Timeline

This project began with a distribution of an assessment tool to bedside nurses on September 12, 2017. On September 21, 2017, data was presented to nursing leadership and buy-in was established. Development of CLABSI class was done between September 21, 2017 and September 30, 2017. On September 29, 2017, charge nurses used auditing tool to gather baseline data. Initial data collection was completed on October 9, 2017. Additional audit data was reviewed on October 20, 2017. On October 27, 2017, the first CLABSI class will take place. Audits will be performed daily, throughout the project. The first round of auditing data will be presented to staff on October 27, 2017. Data will again be presented on November 3, 2017, November 10, 2017, November 17, 2017, and final data will be presented on November 24, 2017.

Expected Results

It is expected that after formally educating new hires and performing ongoing audits, the CLABSI prevention bundle compliance will increase. New hires will begin their career in the NICU with a thorough understanding of CLABSI prevention as well as fulfill their role in maintaining a zero CLABSI rate. Through ongoing audits and feedback, areas of strengths and

weaknesses will be identified. Additionally, potential threats to patient safety will be recognized early. Overall, the expected result is to support a culture of prevention and safety rather than reactivity to a CLABSI. A conclusion that may emerge from this project is that ongoing surveillance and education are key to CLABSI prevention.

Nursing Relevance

This project has the potential to help nurses and nursing leadership understand how to sustain low CLABSI rates and potentially eliminate CLABSI all-together through bundle compliance. Audits are generally done after a negative event occurs, such as a hospital-acquired infection. There needs to be more of an emphasis on using auditing tools to prevent sentinel events from happening in the first place. Early detection of potential risks and gaps in compliance are key in patient safety and improving patient outcomes.

Summary Report

The global aim of this project was to reduce the risk of a neonate developing a CLABSI in the NICU. This project was specifically aimed at increasing CLABSI bundle compliance to 95 percent by November 30, 2017. In order to achieve these objectives, CLABSI prevention education and ongoing audits were implemented. This project was conducted in a level three NICU at a Bay Area hospital. The patient population involved neonates requiring a specialized level of care including nutritional and respiratory support. Education was focused towards new hires and traveler nurses.

Lewin's theory was used as a model for change. The steps of unfreezing, change, and refreezing (Harris, Roussel, & Thomas, 2014) were used to establish new norms of central line care and maintenance in the NICU. Pre-implementation data demonstrated a knowledge deficit regarding CLABSI care and maintenance, thus establishing a need for change (Appendix A).

Fifty percent of nurses answered at least one question incorrectly in the PICC line assessment questionnaire. Furthermore, there was a lack of ongoing central line audits. These were the two major concerns in the prevention of CLABSI in this vulnerable patient population.

Since the current central line care and maintenance protocol followed the Center for Disease Control guidelines (CDC, 2016), the Infusion Nurses Society (INS) guidelines (INS, 2016), and the National Association of Neonatal Nurses (NANN) guidelines (NANN, 2015), the current protocol was used as a guide to create a knowledge assessment tool (Appendix A). The central line auditing form (Appendix B) was created using the Comprehensive Unit-based Safety Program (CUSP) toolkit established by the Agency for Healthcare Research and Quality (AHRQ, 2014). Additionally, a slideshow presentation was used during the CLABSI prevention class in order to provide information regarding CLABSI statistics, risk factors, importance of hand hygiene and sterile technique, CLABSI prevention guidelines, and a review of the unit's current protocol.

Post-interventional data was collected using the same tools used in the pre-intervention phase of this project. At the end of the new hire CLABSI prevention class, participants were asked to complete the PICC care assessment questionnaire (Appendix A). Compared to pre-intervention data, there was an improvement. Among the five participants of the CLABSI class, only one person answered a question incorrectly. This was question 1, "how often are PICC dressings changed?". It is interesting to note that this was the same question that received the highest number of incorrect answers in the pre-intervention phase. Line audits were performed on every shift and compared week to week. Baseline audits revealed an 80 percent compliance rate to the CLABSI bundle. This data was presented to staff on October 27, 2017 in order to establish awareness of need to bedside nurses and leadership. Data was gathered the following

week (week 1) and presented to staff on November 3, 2017 (Appendix G). During this period, the compliance rate was 88 percent. This fallout was due to incomplete labeling of lines. The following week (week 2), there were no central lines in place on the unit. On November 17, 2017 (week 3), data was again presented to staff (Appendix G). During this period, the compliance rate was 91 percent and fallout was due to an overdue dressing change. During the final week (week 4) of data collection, there were no patients with central lines in place.

While the overall compliance rate increased from 80 to 91 percent, the goal of 95 percent compliance was not met by the end of the project. Fallouts were further investigated and it was found that while the date was written on labels, nurses were not filling out the time the tubing was hung. Additionally, soiled dressings were not changed during nightshift because only PICC nurses are allowed to change dressings based on protocol and there is no PICC nurse on duty between 5pm and 8am. It is important to note that unit census and acuity varied widely throughout the 4-week period of data collection. During periods of low census and low acuity, there were no central lines in use on the unit.

In order to maintain CLABSI bundle compliance, line audits must continue and CLABSI education for new hires must remain in place. In order to sustain a 91 percent compliance rate and achieve the goal of 95 percent in the future, continuous feedback between staff and leadership must take place. This can be achieved during quarterly staff meetings as well as posting CLABSI compliance data on the unit. In order to address the issue of dressing changes during nightshift, either a PICC nurse needs to be hired for nightshift or a handful of night nurses need to be trained to do dressing changes. Additionally, nursing leadership has agreed to incorporate CLABSI prevention and central line care and maintenance into the annual skills competency class in January 2018. This is a mandatory education event for all NICU nurses.

This will not only reinforce current practice, but also address knowledge deficits for all staff, not just new hires. Overall, while the project's goal was not achieved, improvements in compliance as well as CLABSI prevention education were made. This is not only important in maintaining the current zero CLABSI rate but also for reducing risk for developing a CLABSI in the future. Preventing hospital-acquired infections in this patient population is of primary importance and the continuation of this project is key to maintaining patient safety in the NICU.

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Appendix A:

PICC LINE CARE AND MAINTENANCE ASSESSMENT

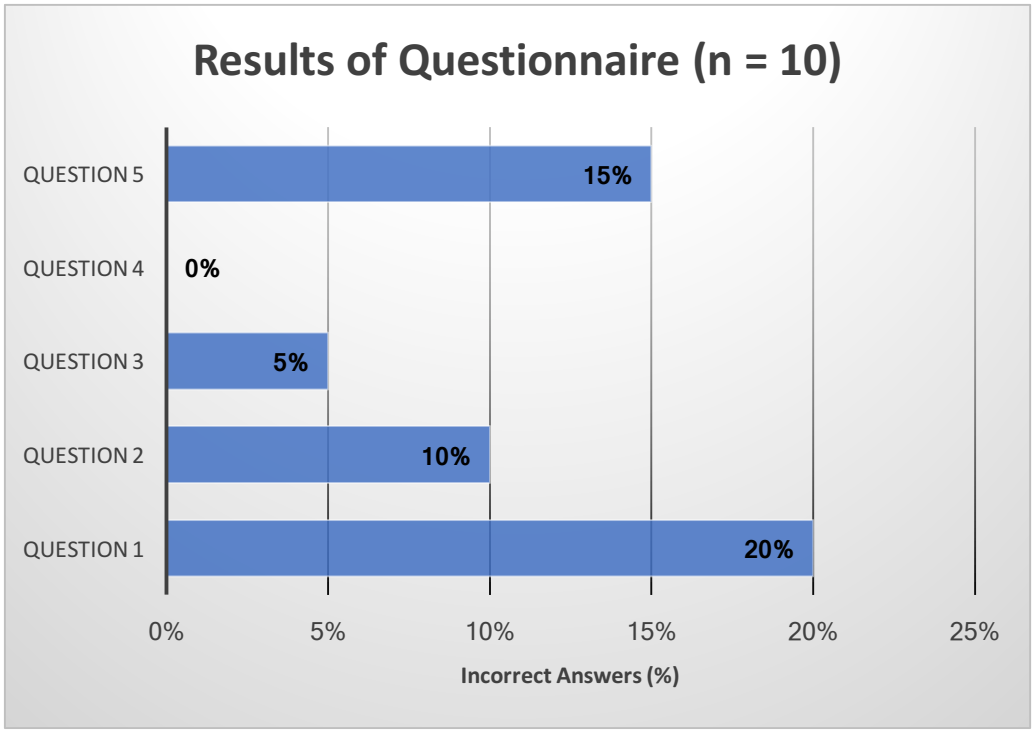
1. How often are PICC dressings changed?
- **a) PRN**
- b) 24 hours
- c) 48 hours
- d) 72 hours

2. Who is responsible for changing PICC dressings?
- a) The primary RN
- **b) The PICC RN**
- c) The charge RN
- d) The MD

3. How often is the PICC dressing and site assessed?
- a) Every 2 hours
- b) Every 4 hours
- c) Once a shift
- **d) Every hour**

4. How long should you scrub the hub?
- a) 5 seconds
- **b) 15 seconds**
- c) 1 minute
- d) 5 minutes

5. How often is tubing changed?
- **a) Every 96 hours for clear fluids (without amino acids), every 24 hours for TPN**
- b) All tubing must be changed every 24 hours
- c) Every 96 hours for all tubing
- d) PRN



Appendix B:

CENTRAL LINE MAINTENANCE AUDIT FORM

Audit Date: ____/____/20____ **Bed_____**

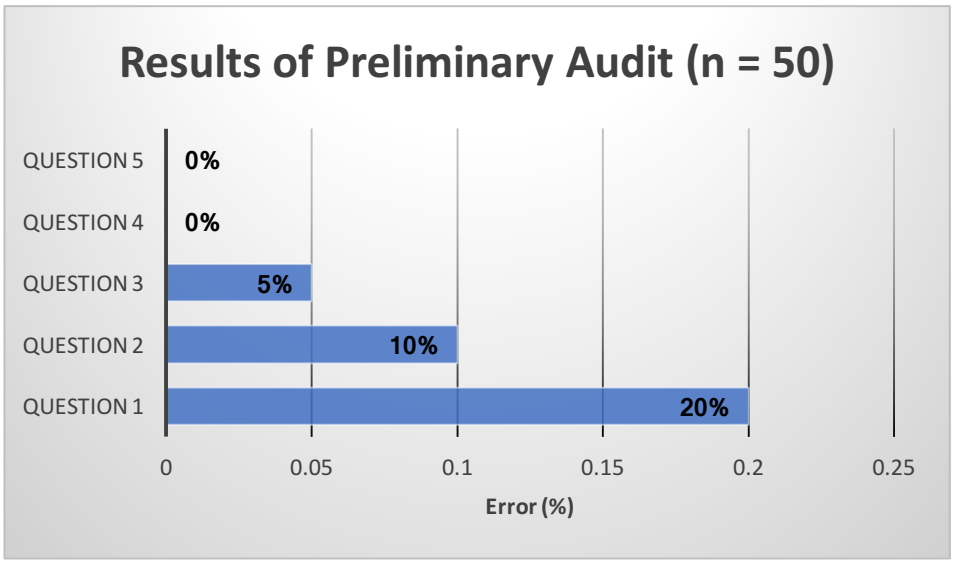
1. Was the need for a central line for this patient discussed on patient rounds?
[ ] Yes [ ] Yes, as part of Daily Goals [ ] No

2. Were all lines labeled correctly?
[ ] Yes
[ ] No
[ ] Time missing
[ ] Date missing
[ ] RN Initials missing

3. Were Curos Caps placed on all exposed ports?
[ ] Yes [ ] No

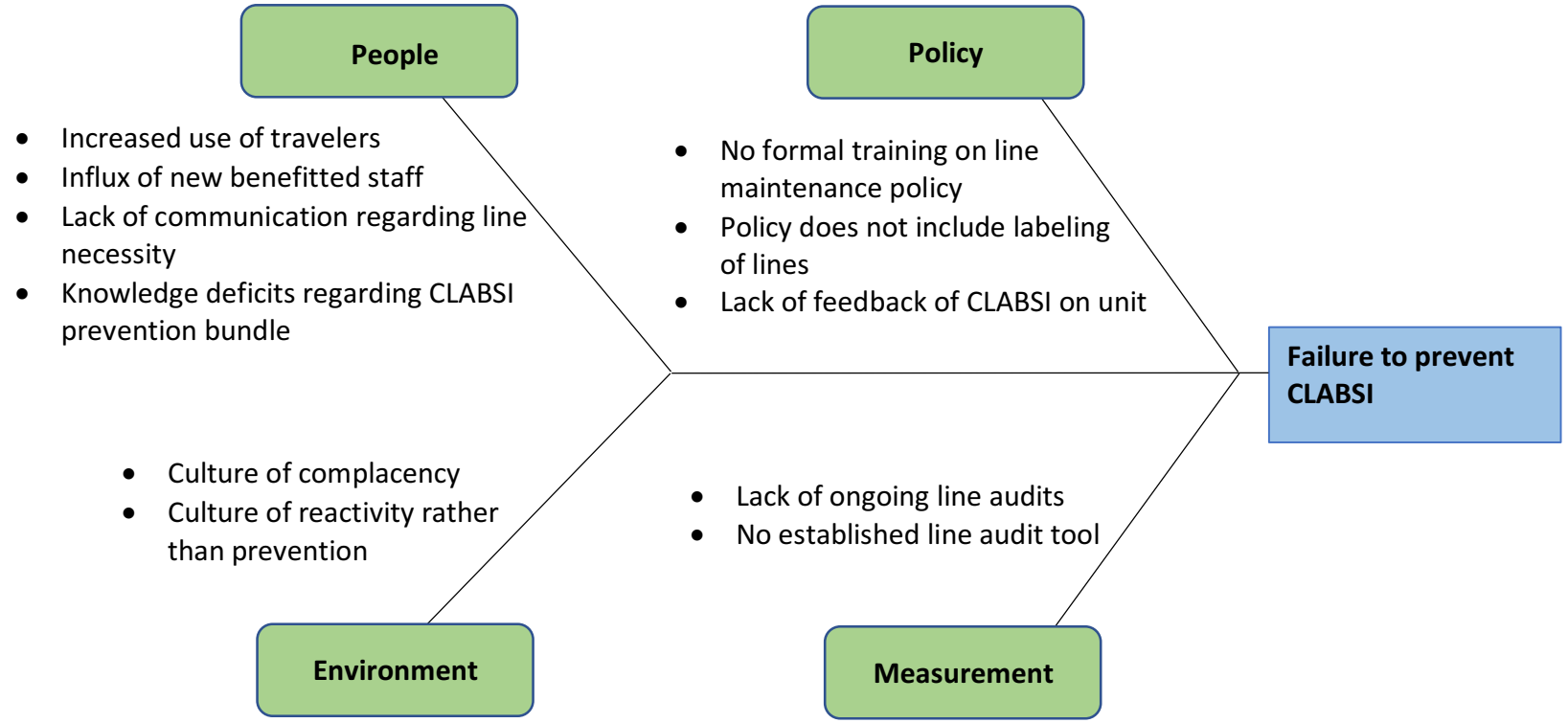
4. Was the dressing changed during this shift?
[ ] Yes, changed because:
[ ] Dressing soiled or wet
[ ] Changed by PICC RN
[ ] No, not changed because:
[ ] It was intact
[ ] It was not intact, but could not be completed.
Explain:

5. Were central line tubing and all additions (secondary tubing, etc.) changed during this shift?
[ ] Yes, completed because:
[ ] 96 hours since last change
[ ] 24 hours for TPN
[ ] No, not completed because
[ ] Not due to be changed
[ ] Due but could not be completed – Explain:



Appendix C:

ROOT CAUSE ANALYSIS



Appendix D:

SWOT ANALYSIS

STRENGTHS (+)

- Dedicated leadership team
- Strong interdisciplinary collaboration
- Zero CLABSI rate for past 12 months
- Infection prevention is a priority

WEAKNESSES (-)

- Culture of complacency with zero CLABSI rate
- No current data regarding line maintenance compliance

OPPORTUNITIES (+)

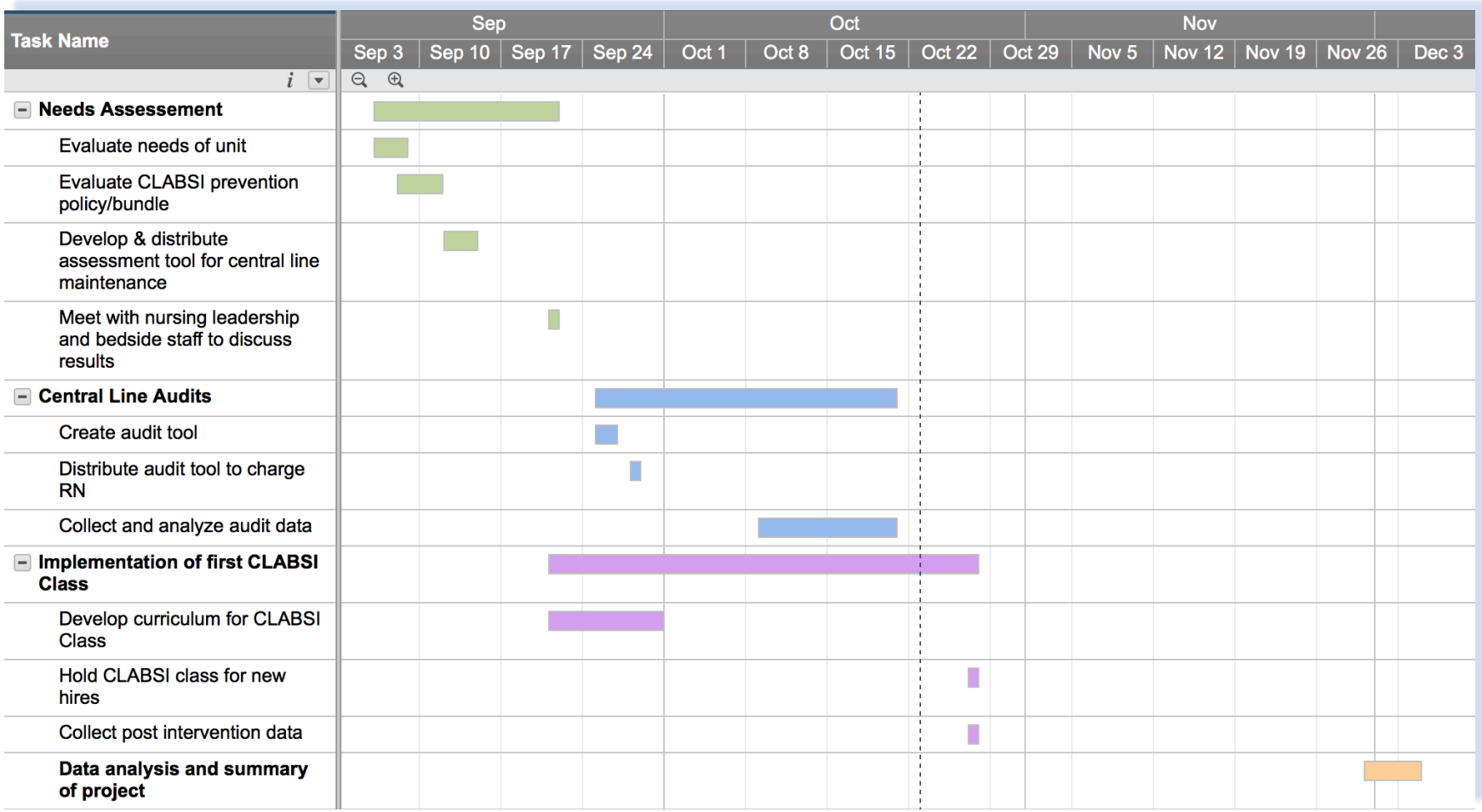
- Ongoing cost savings with sustained zero CLABSI rate
- Empowerment of bedside nurses
- Early identification of CLABSI risks

THREATS (-)

- Time constraints
- Cost to educate nurses on CLABSI prevention
- Adequate staffing while nurses are in CLABSI class
- Disruptions to workflow

Appendix E:

GANTT CHART

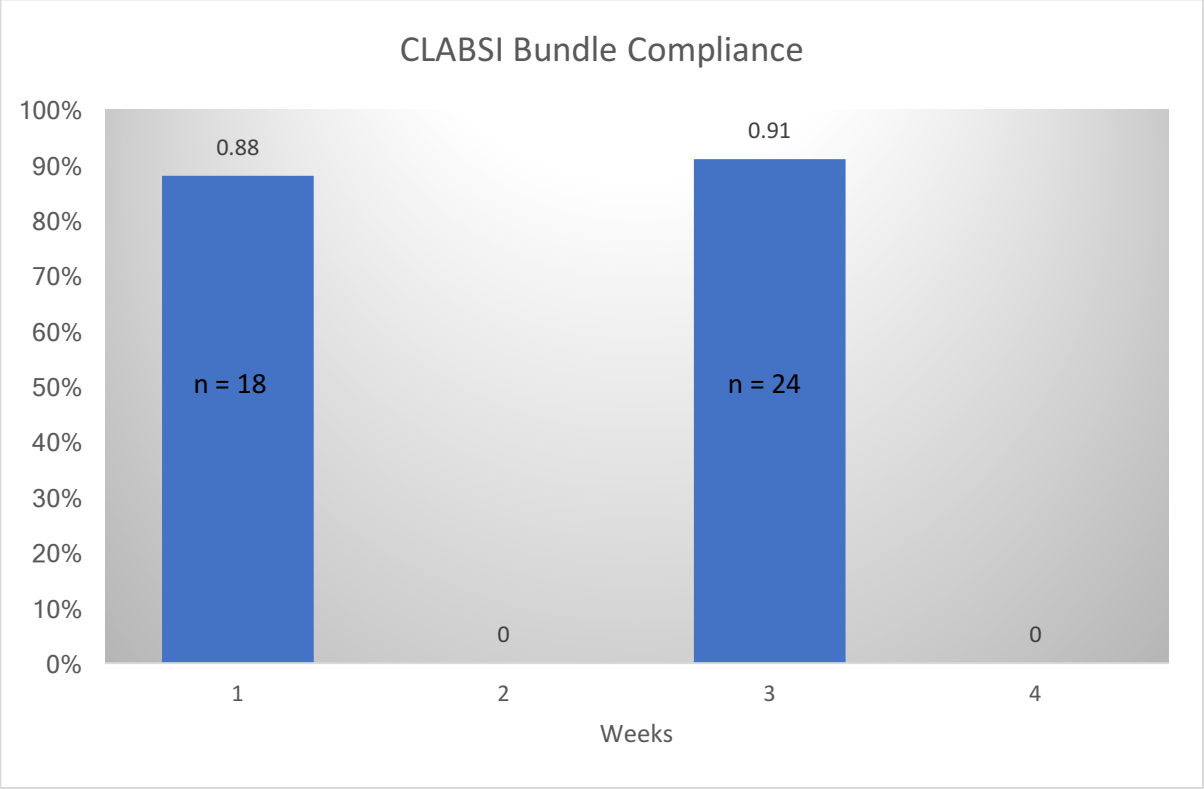


Appendix F:

PROJECTED COST ANALYSIS

CLABSI CLASS COSTS				
Classroom	$0			$0
Education of New Hires	$70/hour pay rate	x 10 new hires/travelers	x 1 hour of class	$700.00
Clinical Nurse Specialist (CNS)	$60/ hour pay rate	x 1 CNS	X 1.5 hours (15min setup/15min cleanup)	$90.00
Central Line Materials (for hands-on demo)	Central line dressing kits $10 x 11 = $110	IV pump tubing $7 x 11 = $77	Curos Caps $1/ cap x 30 caps = $30	$217.00
Educational Materials	$1/Packet	x 11 Packets		$11.00
Replacement staff for nurses in class	$70/hour pay rate	x 10 staff RNs	x 1 hour	$700.00
TOTAL				**$1718.00**

CENTRAL LINE AUDITING COSTS						
Staff	$70/ hour pay rate	x 0.5 hours	x 3 shifts	x 7 days	x 4 weeks	**$2940.00**

Appendix G:

CLABSI Bundle Compliance Weeks 1 to 4