

**Peripheral Intravenous Catheter Compliance
In the Acute Care Setting**

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Authors Note

It should be noted, the researcher of this project was employed at Facility A, on Unit B during the time of the project proposal.

Abstract

The intent of this quality improvement clinical project aimed to improve peripheral intravenous catheter (PIV) compliance and reduce poor patient outcomes on Unit B. Currently, there is a lack of compliance with PIV standards, poor documentation, and no data collection for closer monitoring. The Model of Improvement and establishing SMART goals, with subsequent PDSA cycles was used as the premise framework for this quality improvement project. To establish PIV knowledge of the initial PDSA cycle, the use of a single page questionnaire and education sessions interventions was proposed. In the acute care population, reducing PIV complications and maintaining continual focus on improvement measures, can directly impact a patient's length of stay, and be a cost saving measure for the facility.

CHAPTER 1

The insertion of peripheral intravenous catheters (PIV, PIVC) is among the most common nursing interventions associated with patient care in acute care settings. An estimated 80% of hospitalized patients receive intravenous therapy during their care (Berger et al., 2022). Peripheral intravenous catheters come with complications. Standards need to be followed by nursing staff to avoid poor patient outcomes and failure of the PIV. The most common complications of PIV's include phlebitis, infiltration, extravasation, and dislodgment (Catarino F. et al., 2022), all of which cause discomfort to the patient.

The researcher is a cardiac nurse, working in an acute care setting and noticed discrepancies in simple standards of patient care. Increased issues with infiltration, potential infections, although monitored and cascading standards lacked adherence. Recently, PIV observable standards have lapsed on an acute care patient setting identified as Unit B, with a decrease in compliance and use of standards in the insertion, maintenance, documentation, and removal of PIVs. It is plausible the lack of compliance surrounding PIVs potentially be causing poor patient outcomes and recurrent failures of the PIV, consequently leading to increased infections rates, multiple insertions of the PIVs in the acute care patient population and decreased patient satisfaction.

The use of PIV in patient care acute settings requires nursing staff to become trained on the insertion, assessment, removal, and delivery of intravenous medications following standards and protocols for maintenance. In Montana, nursing students are taught this technical and cognitive skill during their two-or four-year nursing program and the training is considered part of the standard of practice for nurses (Mt.gov, 2006). During nursing students' education, practice is completed on PIVs within their laboratory and clinical rotations. Upon graduation, the

new nurse follows a preceptor in their work location, during orientation for guidance and education as they begin their career learning the facility's standards of care and learning the scope of practice within their chosen field.

Based on discrepancies of care, the researcher proposed a quality improvement (QI) to create training and communication methods that will result in compliance of PIV standards of care. The use of the Model of Improvement framework with subsequent PDSA cycles implementation of the catheter care bundled approach will assist in addressing each aspect of care. Due to the inexperienced RNs on the Unit, the target population in the success of the QI project, the initial PDSA cycle will address PIV education. Establishing baseline data will prevent assumptions of staffs' knowledge surrounding PIV care standards.

Background and Purpose

Nelson, Batalden, and Godfrey (2007) describe the purpose of a clinical microsystem assessment, and utilizing the *5P's* allows a microsystem to immediately begin improvements toward patient care without postponement. The *5 P's* assessment assists to "inform improvement activities and planning now and in the future" (p 260), and consists of *Purpose, Patients, Professionals, Processes, and Patterns*.

Professionals

Currently, Facility A is a tier III trauma regional hospital, serving about 230,000 residents in a 14-county region in Montana. Facility A holds the mission of "we provide excellent care for all, healing body, mind, and spirit", and the vision "to be the best health system in Montana". Facility A employs 348 physicians covering over 40 specialties and operates with a staff of over 3000 employees. Unit B, the microsystem assessed in this paper, is a 33-bed acute care unit. Unit B is a progressive cardiovascular unit, caring for cardiovascular and step-down intensive care

patients and more acute medical/surgical patients requiring critical care medications, attention, and continuous telemetry monitoring.

The unit employs 43 registered nurses: 21 full-time, six part-time, and 16 registry nurses.

Table 1.1

Years as RN	Part-Time RN	Full-Time RN	Registry RN	TOTAL RNS
<1 year	0	8	1	9
1-3 years	0	5	1	6
3-5 years	0	2	4	6
5-10 years	2	2	8	12
10 + years	4	4	2	10
			Total on Unit	43

(T., Eckstein, personal communication, October 2023).

In addition, the unit currently has 10 nursing interns paired with a nurse to complete rotations. An intern is an unlicensed nursing student, given the opportunity to shadow a registered nurse to gain nursing experience in the clinical setting. The current turnover rate on the unit has been high for the past two years and the contributing factors related to individuals transferring to another unit within the facility, quitting to work at a different location, or seeking retirement (T., Eckstein, personal communication, October 2023).

The current staffing matrix on the unit, has not changed per shift the past few years; however, there has been a change in what is considered “acceptable” in the reality of nursing and ancillary staff shortages (T., Eckstein, personal communication, October 2023). The budgeted staff for the unit overall is 53.53 full-time employees (FTE) consisting of 33.03 registered nurses (RNs) including the manager, and 16.3 FTE certified nursing assistants (CNAs). Also, there are 4.2 FTE patient care techs, who fulfill the roles of unit secretary and telemetry monitor techs.

The daily staffing matrix for the unit floor for a single day shift (0700-1500) is nine nurses, four CNAs, one monitor tech, and one secretary. Evening shift coverage (1500-1900) is nine nurses, including the charge nurse, three CNAs, one monitor tech, and one secretary. At

1900 hours, operates with a reduced staff with one fewer nurse, CNA, secretary and monitor tech. The night shift coverage (2300-0700) operates with a staff of eight nurses, including the charge nurse, two CNAs, and without a monitor tech or secretary (T., Eckstein, personal communication, October 2023).

Table 1.2

	0700-1500	1500-1900	1900-2300	2300-0700
<i>Charge Nurse</i>	1	1	1	1
<i>Registered Nurse</i>	8	8	8	8
<i>CNA</i>	4	4	3	2
<i>Secretary</i>	1	1	0	0
<i>Monitor Tech</i>	1	1	0	0

(T., Eckstein, personal communication, October 2023).

Due to staffing shortages on the Unit, there are often only five to six nurses scheduled per shift. This reduced staffing is not optimal but considered "survivable" with nurse-to-patient ratios. Mandatory staffing ratios are not required or established in the facility. The Unit self-schedules 12-hour shift rotations, but staff does have the option to work additional shifts in four- or eight-hour increments. Additionally, full-time, and part-time nurses and CNAs are required to complete 12 "team coverage" hours during the six-week schedules. Team coverage is defined as extra work hours mandated above the individual's current FTE status. However, the required number of hours of team coverage changes every six weeks based on the department's staffing needs (T., Eckstein, personal communication, October 2023).

Patients

The acute setting of Unit B, cares for the adult population 18-years-old and over. The Unit is a continuous telemetry monitoring unit and intended for patients needing closer observation. Patient populations on the unit are primarily those with cardiovascular disorders such as myocardial infarctions, coronary artery disease, stroke, and those undergoing coronary

catheterization or pacemaker placement. In addition, to patients suffering from chronic health problems such as congestive heart failure, diabetes mellitus type 2, chronic kidney disease, peripheral or arterial vascular disease, and alcoholism. Patients who do not require the intensive care unit, but still require closer monitoring, include patient populations diagnosed with sepsis, electrolyte imbalances, altered mental status, and heart arrhythmias. The patient population served in Unit B is at higher risk for medical complications, and in this Unit, a simple issue can cause severe problems for patient outcomes.

Processes

Currently, the guideline at Facility A for PIV maintenance, including insertion, assessment, and removal, is based on literature provided from the Infusion Nurses Society (Infusion Nurses Society [INS], 2021). A supplemental guideline also referenced is the *Manual of Nursing Practice Elsevier Clinical Skills* for step-by-step instructions on PIV insertion, maintenance, dressing change, and removal. The Facility's guideline standards of a PIV insertion, include placing the PIV away from a joint, utilizing chlorhexidine to clean the skin, covering the site with a transparent dressing, and labeling the site with date, name, and time. Maintenance of a PIV includes assessing the site every shift and as needed (PRN) and the guideline states to change the PIV every 96 hours (See Appendix A).

The guideline of the Facility also addresses the maintenance of PIV primary and secondary tubing used for medication administration. Under the guideline, all tubing should be marked with a label indicating date, time, and initials and directions. for continuous medication administration to be changed every 96 hours. The intermittent medication administration requires changing the tubing every 24 hours if disconnected from the patient. Some specific medications, such as blood products, require a different timeline of tubing changes.

Despite guidance from two forms of literature and care instructions, adherence is not compliant and lacking in consistency.

Patterns

Staff on Unit B are required to document per shift in the electronic health record (EHR). Documentation is to include PIV placement, gauge size, utilization of ultrasound, and dressing changes occurring, in addition to the site assessment for signs of edema or erythema. Additional documentation required, is the number of attempted tries to insert the PIV and who inserted the PIV. Best practice states that individuals are allowed to attempt insertion two times before requesting additional support. On removal of the PIV, documentation includes whether the catheter remained intact, and if the documentation of the PIV was updated and inactivated from the EHR.

Further investigation of the Unit is needed to determine the compliance standards of the PIVs of patients on the Unit. Currently, the infection control department of Facility A does not track data on the PIVs placed in patients. Throughout the Facility, is only mandated by the Centers for Disease Control and Prevention (CDC) for monitoring central intravascular lines. Additionally, recurrent rounding or patient observing, is not occurring to ensure compliance in the care of PIVs in the acute care setting of Unit B (T., Eckstein, personal communication, October 2023). Retrieval of data information on PIV's was not easily accessed and further complicated with Informatics (IT) availability time shortages, due to the conversion of electronic health record (EHR) platformr EPIC from Meditech; electronic health record platforms (V. Nelson, personal communication, November 2023). Threats to the Unit potentially impairing the QI project, include poor staff satisfaction related to patient-to-nurse ratios, high turnover rate on the Unit and staff struggling to maintain standards of PIV compliance on the Unit.

Problem

The critical care patients within Unit B require close attention and care to prevent poor patient outcomes, including but not limited to proper care of PIVs. Currently, there is a lack of compliance with PIV standards, poor documentation, and no data collection for closer monitoring. Improvement of Unit B's compliance of PIV standards illuminates point to opportunities to enhance care through communication and education. These opportunities include use of the units' communication binder, education in daily huddles and monthly department meetings, using the bedside shift report time to complete bedside checks of PIVs in each patient's room, and publishing compliance data of PIV standards of the unit for easy visualization. The main problem is consistency of care of PIVs and compliance of standards.

Significance

Due to the sheer number of patients in acute care receiving PIV's regularly and with continuous and intermittent medication administration, there is a concern of an increased risk of complications related to poor compliance with the insertion, maintenance, and removal of PIVs. The complications of phlebitis, infiltration, and extravasation cause undue discomfort to the patient, increasing hospital stays and, thus, ultimately driving up healthcare costs (Bahl et. al, 2022). The most significant problem is bacterial phlebitis due to the potential of a severe complication in patients developing systemic sepsis. "Intravenous catheter-related bloodstream infections have become the leading cause of healthcare-associated bloodstream infections" (Welyczko, 2020). Additionally, international studies have shown the relationship between PIV complications leading to increased patient mortality risk and morbidity rates.

Noncompliance with PIV standards and following the current non-evidence-based practices surrounding PIVs on Unit B, can lead to alarming consequences for the acute care

population it serves. The fact that a large percentage of the current full-time and part-time staff are new nurses, adds to the concern of inadequate education, experience, and suboptimal care. Additionally, 10 nursing interns are learning through observation, inadequate PIV standards from the new nursing staff on the Unit.

Purpose

The QI project aims to improve the compliance and utilization of evidence-based practice standards of PIV insertion, maintenance, education, and removal within the acute care Unit B at Facility A to improve patient outcomes and reduce PIVC failures. The utilization of the Model of Improvement with multiple PDSA cycles, will allow for each standard of PIV care to be addressed for improved compliance.

Definitions

For this professional paper, the following definitions are used.

- Peripheral intravenous catheter- PIV and PIVC are interchangeable. It is a thin, flexible tube (catheter) utilized in healthcare to administer medications. Other names used are peripheral IV catheter, peripheral venous catheter, and peripheral IV line (Cleveland Clinic, 2023).
- Peripheral Care bundle- A collection of evidence-based interventions placed into practice to maintain standards of care (IHI, 2021).

CHAPTER 2

Overview

The peripheral intravenous catheters are no less important than central lines, in the care delivered to the acute care population. It is well noted in the literature the frequency of use and problems arising from peripheral IV's extravasation (Bahl et al. 2022; Berger et al., 2021;

Blanco et al., 2020; Casanova et al., 2021; Hontoria-Alcoceba et al., 2023; Oh et al., 2020; and Slater et al., 2019). To prevent the poor patient outcomes, it is important to address all aspects of the compliance of PIV's, including those of hand hygiene (Slater et al., 2019) to prevent contamination of the site. The importance of identifying and utilizing the appropriate site location for a PIV (Berger et al., 2021; Blanco et al., 2020; Casanova et al., 2021; Hontoria-Alcoceba et al., 2023) has a large impact on the longevity of the PIV. In addition to the assessment of the site location, other factors to consider are dressing and integrity of the PIV (Bahl et al., 2022; Berger et al., 2021; Blanco et al., 2020; Casanova et al., 2021; Woda et al., 2022). Lastly, documentation of the PIV from the time of insertion to the time of removal has significance to identifying areas of concern to improve processes and prevent poor patient outcomes. The remainder of the chapter addresses the theoretical framework for this improvement project, the review of the literature, and the proposed method to improve the compliance surrounding peripheral intravenous catheters.

Search Strategy

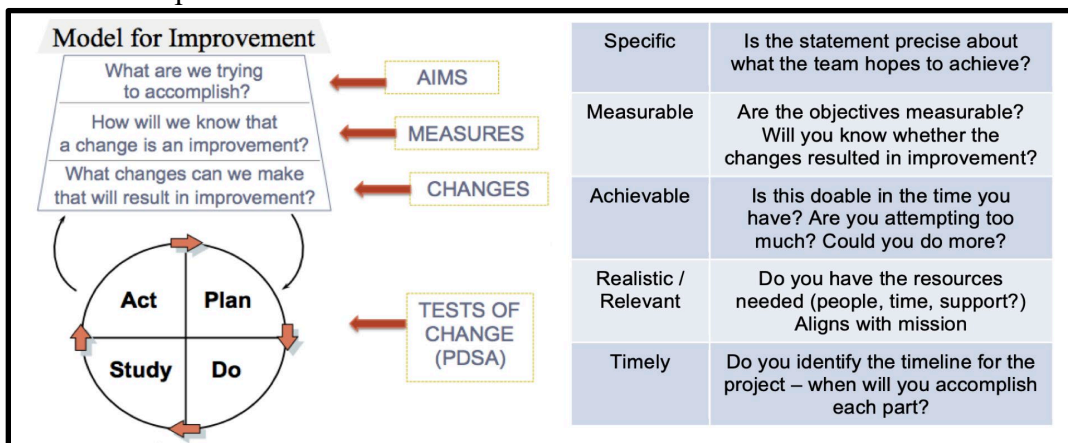
Topics utilized included those discussing or evaluating peripheral intravenous catheter practice, compliance, or standards in the acute care setting. Databases used in the search included the Montana State University Library and Allied Health Database (CINAHL), Web of Science, and ProQuest. Key search terms used were nursing, standards of practice, intravenous, intravenous catheters, peripheral intravenous catheters, IV, I.V., COVID, standard or protocol, infection \ intravenous catheters, nurs*, compliance or non-compliance. Inclusion terms were those of adult populations within the acute care, English language, peer reviewed and from 2016 to 2023. Articles from 2016 and 2017 were included for the purpose of information of pre-COVID pandemic information comparison. The search resulted in 147 articles. After review of

the produced articles, any articles with topics regarding central (catheters), pediatrics, central lines, intravascular, vascular, intravascular catheters were excluded. Twenty-three articles were kept for further evaluation. Continued investigation into the literature resulted in 15 articles being excluded due to (1) neonatal study; (2) protocols, (9) not relevant to the improvement project investigation, (3) journalistic articles. Eight articles were selected for this literature review.

Theoretical Framework

The Model of Improvement was used as the premise framework for this quality improvement project. The tools within the Institute for Healthcare Improvement (IHI) model for improvement will be a guide utilized in the next steps moving forward. The model of improvement stemmed from Plan, Do, Study and Act (PDSA) cycles of quality improvement, originally intended and designed for the manufacturing industry in 1939. Since the PDSA invention, the Six sigma and Lean were created which informs all factors for operation and considers cost analysis. In 1996, the healthcare industry expanded on the PDSA cycles to create what is known as the Model for Improvement, and now is the most common quality improvement model within the healthcare industry (hopkinsmedicine.org, 2023).

Model for Improvement



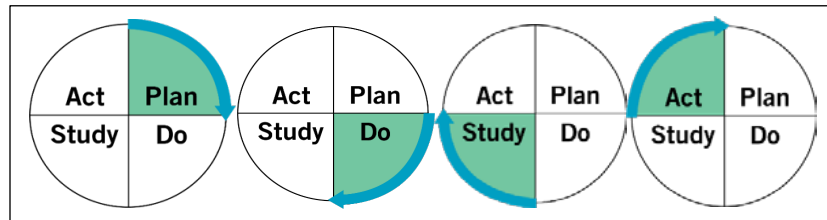
(hopkinsmedicine.org, 2023).

The IHI model discusses three main tools. Part one of the model includes Aim, Measure, and Change. The model clarifies the intention of each tool to improve organization and clear planning for the proposed change. The Aim section of the model is intended to identify the purpose of a project and establishing goals that follow the Specific, Measurable, Attainable, Realistic, Time (SMART) goal setup. The Measure portion is determining how to identify (measure) improvement is occurring (establishment of measurement) and often there are four types of measurement used in quality improvement projects (structure, process, outcome, and balance). Structure is the measurement of having the tools (items) needed for a project (infrastructure). Process is reviewing the act or activity involved. Outcomes is the measurement of results and Balance is looking at the potential negative impacts of a process. The final stage of the Model of Improvement is Change; the determination of what interventions to put into action for the improvement project.

Identification of the aim in this project is reestablishing compliance of peripheral intravenous standards within the acute care setting to ultimately improve patient outcomes and prevent harm. To ensure progress through the steps of the model successfully, the utilization of SMART goals (Specific, measurable, attainable, realistic and time). The use of SMART goals ensures the ability to identify specifically; the intention of the project, measurable actions to track progress, determination if the goal is attainable and confirming the necessary resources are available. The project must have realistic and relevant goals for the microsystem of healthcare. Establishing a timeline forces an end point, allowing the project to move forward to part two of the improvement model (hopkinsmedicine.org, 2023). Measurement of the improvement of the project is vital utilizing both qualitative and quantitative data to determine whether a positive change is occurring. Next, in part two of the IHI model, is quick implementation of interventions

quickly and testing their effectiveness utilizing the PDSA (Plan, Do, Study and Act) cycles (Nelson, Batalden, & Godfrey, 2007).

PDSA Cycles



(hopkinsmedicine.org, 2023).

The use of PDSA cycles assists moving the project forward quickly, learning from the results of the testing phase (positive or negative) to continue forward momentum, and problem solving the issues to meet the end goal of the project.

The IHI model fits this project, as the intention is not to create new evidence-based practice but rather to apply current evidence-based research. The purpose of using the model is to increase the compliance and education of peripheral intravenous standards on Unit B to ultimately improve patient outcomes. The utilization of the PDSA cycles will allow for the implementation of several interventions to assist in the sustainability of the project in the complicated microsystem of healthcare. Due to the complexity of healthcare microsystems, one intervention will not be sufficient to ultimately improve the problems surrounding PIV care in the acute care setting.

Review of the Literature

The Infusion Therapy Standards of Practice 8th edition (2021) provides standards utilizing evidence-based practices for healthcare concerning peripheral intravenous catheter assessment, insertion, documentation, and removal. In addition, it recommends for practice changes to include utilizing quality improvement frameworks to change problem related issues regarding

peripheral intravenous therapy within a micro assessment to improve patient outcomes. The newest edition, 9th, was released in January 2024, which may also provide updated information requiring re-evaluation of standards concerning this quality improvement project.

This review studies the current problems in healthcare surrounding peripheral intravenous practices, implementation of quality improvement processes, evaluation of complications, and patient outcomes. In addition to accurate documentation, compliance from nursing staff of PIV care utilizing clinical practice guidelines is vital to ensure decreased incidences of poor patient outcomes.

Frequency of peripheral catheters relation to patient harm

Significant evidence demonstrated the effect of peripheral intravenous catheters and care on patient outcomes. Poor compliance can lead to complications including phlebitis, infiltration, repeated insertions, occlusion, blood stream infections and extravasation (Bahl et al., 2022; Berger et al., 2021; Blanco et al., 2020; Casanova et al., 2021; Hontoria-Alcoceba et al., 2023; Oh et al., 2020; and Slater et al., 2019). It is noted that upward of 330 million patients annually in the United States have peripheral catheters inserted for patient treatment (Oh, 2020).

Peripheral IVs are used more frequently than central catheters. It is estimated between 75% - 90% of patients within the hospital setting will have at least one peripheral intravenous catheter during their stay (Bahl et al., 2022; Berger et al., 2021 and Casanova et al., 2021). With 330 million patients and 75% - 90% having a PIV placed while hospitalized, highlights the importance of compliance in the maintenance of peripheral intravenous catheters and establishing clinical guidelines to ensure patient safety.

A study completed in Spain, used a decision algorithm and evidence-based PIV catheter care bundle (Blanco et al., 2020). The bundles of care for intravenous catheters often include

interventions of education, hand hygiene, evidence-based clinical guidelines, and continued review of PIV care. The result was a reduction of PIV phlebitis incidents in 100 catheters from 6.2 to 2.6: decreased incidence of catheter leakage from 28 to 14 and decreased PIV insertion time from 3.6 days to 2.6 days for patients (Hontoria-Alcoceba et al., 2023). Bundles of care is defined by the IHI (IHI.org, 2023) as a collection of interventions for a nursing process utilized together (IHI.org, 2023). The Hontoria-Alcoceba (2023) study demonstrated improved patient outcomes when using the bundled approach.

Documentation evidence is conflicting. Berger et al., (2021) observational study of 212 peripheral intravenous catheters had an incidence of 14.4% of phlebitis present of the PIV's visually examined; however this study was completed on a single day in an acute care medical/surgical setting. The study could have been more effective if completed more than once and spanning a longer timeline to discover if the incidence is higher or lower than what was reported. Conversely, it is noted in Oh's (2019) study, there was no significant increased rates of phlebitis, when researching the effects of extending the time frame past the standard of 72 - 96 hours a PIV can be left in place. Several reasons could be attributed to the lack of evidence of phlebitis such as, the location already had a well-established protocol being followed for removal and reinsertion, the study took place pre pandemic and may not have had the nursing shortages currently seen, in practice and the staff were educated on the clinical practice guidelines as part of the intervention in the study (See Appendix B, Table 1).

Handwashing/Aseptic Technique

The importance of hand hygiene is well-known to prevent infections and cross contamination within the healthcare and to prevent harm to the patient population. The Centers for Disease Control and Prevention (CDC) and the *Infusion Therapy Standards of Practice* have

given clear indications when nursing staff should be performing hand hygiene surrounding the practices of peripheral catheters (2021). The CDC (2023) recommendation is to perform hand hygiene “before catheter insertion or maintenance, combined with proper aseptic technique during catheter manipulation”. The Infusion Nurses Society (INS) within their *Infusion Therapy Standards of Practice* (2021) recommends “before, during as required, and after all clinical procedures requiring aseptic non touch technique to include insertion and removal, ongoing management and manipulation, and infusion administration” (p.S53). Hand hygiene has been established as a major contributor in infection prevention in healthcare, including the care of peripheral intravenous catheters.

Ensuring consistent hand hygiene practices is vital in producing positive patient outcomes and prevention of infections. Slater et al. (2019) conducted a study of 108 observations of nursing staff, discovered complete compliance of hand hygiene surrounding medication administration of PIV’s was only at 11% (12 of 108). Therefore, this demonstrated the significance in which hand hygiene is easily forgotten throughout points of care, and the importance of adding the intervention to PIV care bundles (See Appendix B, Table 2).

Location of Insertion

Just as important as hand hygiene in PIV care, is the location of insertion. The location of insertion influences the increased likelihood of phlebitis and other PIV complications. Frequently, PIVs are inserted in the field by EMS/paramedics or within the Emergency Department, often in the antecubital location due to ease of site location and insertion under an emergency or crisis. However, the point of flexion is not a recommended location for PIVs due to increasing contribution to failures and complications. According to the INS (2021), flexion points should be avoided, such as the antecubital and wrist, and veins visible on the chest,

abdomen, or breasts. Additionally, the INS cautioned to not use the lower extremities, for example the foot, unless there is an emergent situation as this location increases the risk of “tissue damage, thrombophlebitis, and ulceration” (p.S81). While insertion site recommendations are widely known, they are not always adhered. Blanco et al (2020) study observed in PIV placements, 31.2% (202) were placed in areas of flexion or the foot, with the antecubital fossa the most common location with 114 incidences. Interestingly, it is notable in this study there were 73 PIV failures identified as clinical manifestations of phlebitis. Not only were insertion site recommendations not followed, but there was also a high number of phlebitis infections. Similarly, Hontoria et al. (2023), followed insertion site guidelines, this article found there was decreased incidence of phlebitis with use of the PIV care bundle intervention. In the Casanova’s et al. (2021) study, 14,622 PIVs were observed and the location of catheters. However, this study also evaluated central lines and parental nutrition lines. Vascular catheters in areas of flexion (wrist and antecubital) were 6,014. It is unknown if the catheters were PIVs versus central catheters or parental nutrition. The implementation of training, information sessions and activities for nursing staff in the care of vascular access improved patient outcomes (7.8% to 37.6%), decreased presence of phlebitis, and improved documentation of insertion site and dressing care over a four-year period. (See Appendix B, Table 3).

Assessment

Proper routine and thorough assessment of the PIV prevents complications and failures. According to the INS (2021) for inpatient and hospital facilities, the recommended practice of assessment of PIVs should be “every four hours; every one to two hours for patients who are critically ill/sedated or have cognitive deficits; hourly for neonatal/pediatric patients; and more often for patients receiving infusions of vesicant medications” (p.S119). In addition, the

transparent dressing should be changed every seven days, when noticeably soiled or the dressing is not secured. The recommendation is not to cover the dressing with gauze, tape or other product hindering the ability to view the site location. The literature revealed, PIV assessment regarding site inspection, dressing change, stabilization, flushing and documentation deviates from the recommended standard (Berger et al., 2021; Blanco et al., 2020; Casanova et al., 2021; Hontoria-Alcoceba et al., 2023).

Similarly, guideline timing of assessments is often not occurring. The acute care study (Woda et al., 2021), in a large 900 bed medical facility, the facility assessment protocol was required to be completed every eight hours. Findings demonstrated staff were 91.2% compliant with assessment per documentation data. However, this was a longer timeline than the current assessment time frame standard recommended by the INS. In support the Blanco et al. (2020) study addressed suboptimal assessment documentation. Only 53% of PIV dressings were in perfect condition, 55.3% had a visible site insertion, and 17.5% had no flushing of the IV in the past 24 hours or more. Surprisingly, there was only a PIV failure rate of 11.3%. Similar findings occurred in the Quasi-experimental study completed by Casanova et al., (2021) site visibility was at 44%. After multiple education points during the study, final insertion visibility increased to 75.3%. This demonstrated the effectiveness of education on routine visibility assessments. Bahl et al. (2022) points out an issue, PIV assessment compliance per the documentation was at 81.9%; however, one of the stated limitations in this area was the possibility that assessments documented were not actually completed. The study was reviewing documentation and not through observation of the PIV sites at the bedside. Another weakness of this study is the small sample size in a single location. Therefore, while routine visual assessment guidelines are clearly published, not all facilities likely following them. (See Appendix B, Table 4).

Documentation

Documentation of PIV care and accuracy of data entered are vital to understanding the magnitude of the issues surrounding PIV compliance. Recommended documentation of PIV's, according to the INS (2021), include the "date and time of insertion, number of attempts, type, length and gauge/size inserted, and identification of the insertion site" (p.S40). Other recommendations to be documented, include patient response to insertion and removal of PIV's, side effects of adverse outcomes, and the documentation of daily assessments. The environment nurses are working within was found to be significant in documentation compliance noted by the Blanco et al. (2020) study, reporting documentation of the PIV insertion and the dressing date was 44.7 % and 12.7%. In argument, Bahl et al., (2022) found there was improved overall documentation compliance of 86%. However, the studies completed (Bahl, et al., 2022; Woda, et al., 2021) evaluating documentation with the electronic health record noted the potential problems and limitations of their studies surrounding PIV documentation. Both studies recognized documentation is only as reliable as the nurses ensuring to complete the documentation accurately and is required in a timely manner. Peripheral intravenous catheter routine assessment literature is conflicting. Several studies confirmed routine visual assessment was not performed. However, some studies support that PIV documentation is being completed in the EHR according to current guidelines. This vast discrepancy in the published literature demonstrates inconsistency and room for limitations to comprehensive PIV documentation accuracy. Therefore, as Bahl et al. (2022) mentioned, accurate documentation of the complications and PIV failures is vital to understanding the root causes of PIV complications and can promote generation of ideas to improve patient outcomes, whereby insisting documentation become a priority. (See Appendix B, Table 5).

Summary

Use of the Improvement model will assist in identifying the main concerns surrounding PIV compliance. Through repeated PDSA cycles, it is possible to identify the required invested parties and the actions required to ensure the continuation of compliance and success of the project. The literature notes the aseptic technique, insertion site location, routine visual assessment and proper documentation are of importance to prevent poor patient outcome, yet are often not followed (Bahl et al., 2022; Berger et al., 2021; Blanco et al., 2020; Casanova et al., 2021; Hontoria-Alcoceba et al., 2023; Oh et al., 2020; and Slater et al., 2019). The concept of catheter bundled care includes the education of staff, not just once but repeatedly; assessment rounding on the unit; review of documentation; and use of evidence-based practices, such as hand hygiene; avoiding points of flexure and barrier of the site to ensure increased compliance surrounding peripheral intravenous catheters. Subsequent chapters will discuss the use of the catheter care bundle intervention to improve the PIV compliance within Unit B and review of the updated standards released by the Infusion Nurses Society in January 2024.

Moving forward with the QI project will require identifying the change leaders on the unit who can assist with buy-in from nursing and updated PIV education presented to staff verbally and written. Additionally, collaboration with the Infection control and IT departments will be vital in the data collection for monitoring of PIV's. Communication with the distribution supply department should be considered for financial impact and potential change of supplies being utilized in PIV care.

CHAPTER 3

Overview

As previously noted throughout the literature review, compliance is needed to ensure positive patient outcomes in the use of peripheral intravenous catheters in acute care systems. This project aims to address the continued concern for patient safety and subsequent documentation surrounding all aspects of maintenance and care of the catheter site. The goal is to reestablish standards of care following the new release of updated evidence-based research in the care of intravenous catheters.

The literature supports the utilization of a catheter care bundle (PIV) to address the problems of care. This chapter discusses the PIV protocol, a timeline, and budget considerations. Additionally, an evaluation of the intervention and data analysis will be presented. The use of the PDSA cycles will assist in ensuring continual reassessment of the plan.

Design

Recent evidence on Unit B indicates decreased patient outcomes and poor monitoring related to the care of PIVs. Unit B is a step-down ICU unit, and the patient population consists of those with multiple comorbidities and chronic health problems. Unit B is the largest acute care unit in a Tier III facility (Facility A), employs 43 registered nurses, can hold up to 33 patients at any given time, and maintains full occupancy. The patients are those of high acuity who require close monitoring and continuous heart telemetry and are often recurrent. The capacity of the unit patient population allows for an expansive pool to collect data on current PIV standards.

As outlined in Chapter One, the stakeholders for the proposed clinical QI project are the patients, and the facility. The target population in the QI project are the nursing staff on Unit B. Pending efficacy and success, the project has the potential for replication in subsequent units within the facility to improve the facility's overall PIV care and practice. The care of the patient's

PIV on the unit depends on registered nurse involvement, compliance in maintaining standards, accountability amongst staff, and adherence to expectations and documentation.

Planning

As discussed in the microassessment, PIVs were of concern due to the high-risk patient population and the lack of compliance standards observed on the unit. The microassessment identified issues contributing to the problem, including existing staff-to-patient ratios, years of experience of nursing staff, time allocations for patient care, poor documentation, and poor compliance tracking and auditing of PIV care on Unit B.

Theoretical Framework

Following the nursing process with the Model of Improvement framework, discussed in Chapter Two, an assessment of the current facility state and care practices was completed. The framework and quick PDSA cycles allow for addressing the multiple points of poor PIV care, the complexity of the Unit, while ensuring maintaining the safety of the high-risk patient population and improve patient outcomes (Appendix C).

Challenges

As identified in the microsystem analysis, the PIV assessment in the previous HER platform was not optimal. The previous platform was fragmented at best, resulting in incomplete assessment of patient PIV. The facility has recently updated their EHR platform allowing for improved and detailed documentation for PIVs compared to the previous platform. The new EHR platform was implemented facility-wide on March 1st and has improved ease to pull data from nursing documentation. The new platform will allow closer monitoring of current PIV standards of care. The new EHR can improve data collection and reporting of the PIV documentation, which is inherently beneficial for future data collection and evaluations.

Planned Training for Staff

Establishing benchmarks for the nursing staff's knowledge of the required PIV care and maintenance standards is vital. This baseline can be accomplished by administering a pre-questionnaire to determine knowledge of catheter and IV care, removal, replacement, and routine documentation. This pre-assessment questionnaire will drive the focus of the education intervention for nursing staff.

Education will provide the updated standards of the Infusion Nurses Society of the PIV standards. This education will allow multiple opportunities for contact and will be presented to staff during unit department meetings and huddles. An alternative self-paced education method will need to be considered to reach individuals, such as registry staff who do not regularly work or attend department meetings and nurses on vacation or medical leave during the education period.

After education and the implementation of the new EHR platform, PIV assessments and patient infection rates can be assessed. After the first PDSA cycle adjustments to training frequency, material delivery, and care standards will be revised base on post-assessment results.

Implementation

To begin the implementation phase of the QI project, goals need to be identified and allow for evident progression in the project's success and ability to evaluate the process effectively. As noted in the literature, catheter care bundles include education, assessment, and reassessment of nursing competency and compliance in the care of the PIVs (Hontoria-Alcoceba et al., 2023 & IHI.org, 2023).

Goals

The project requires several goals to be established throughout the QI project. The overarching goal is to improve patient outcomes by updating staff education. Due to the inability to retrieve previous data in the current EHR system and the lack of current auditing of PIVs in facility A, the current rates of complications related to poor compliance of PIVs are unknown. For this project, the goals will address staff education and improved care through monitoring PIV infections and chart audits. Ideally, with education and compliance with the updated standards, Unit B would demonstrate decreased incidences of PIV complications in the admitted patient population. In the future, the new EHR system will allow baseline data to be acquired and compared in other units. Therefore, the immediate goals for this project are as follows:

1. On Unit B, at least 80% of full-time, part-time, and registry-registered nurses will attend PIV education sessions.
2. Two to five weeks after education sessions, 80% of the nursing staff in Unit B will have a post-test score of 85% or higher.

Intervention

Nursing PIV Knowledge

The identification of the nursing staff's baseline knowledge of current PIV standards is required prior to the intervention. The use of a single-page multiple-choice questionnaire (MCQ) will allow staff to answer questions quickly. A quick format will require little time spent by staff, creating a greater likelihood of participation. The questionnaire (Appendix D) consists of five *Multiple-choice* and two *Select All that Apply* questions. Additional quantitative data on the questionnaire includes if the individual is a registered nurse or nurse intern, years of practice, works day or night shift, and if full-time, part-time or registry. The questionnaire scores are based on the one correct answer for *Multiple Choice* questions and correct selections of the

Select All that Apply questions. Comparison of pre-and post-test scores will occur, with the goal of post-test scores at 85% or higher. Demographics for years of service, position, day/night shift and full-time, part-time, or registry will be compared with test scores to identify the most significant education gap among nursing staff on the unit. Ideally, the goal of completing the survey is 80% of all nursing staff. A limitation to using a multiple-choice questionnaire is that staff guess the correct answer, causing an inaccurate assessment of the nursing staff's knowledge of PIV care and compliance. The benefit of the MCQ is ease of answering questions and analyzing results. The opportunities for nursing staff to complete the questionnaire are at morning and evening shift huddles and in a monthly department meeting before the education presentation. After education completion, the nursing staff will once again complete the questionnaire to compare previous knowledge in the care of PIVs, assessing the educational intervention's success.

Staff Education

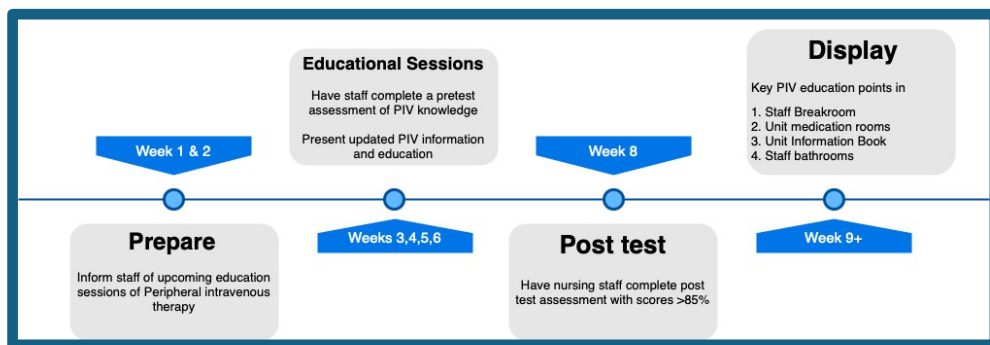
Analyzing the data's results will assist in developing nursing education for PIV care and maintenance after the completion of nursing staff questionnaires and PIV patient care observations. The results will drive the information presented regarding Unit B baseline compliance and goal areas to improve with the additional INS newly released standards of PIV care.

A PowerPoint presentation with handouts will allow for visual and auditory learning during a monthly department meeting, and short verbal presentations will be provided with informational handouts to staff in the morning/evening department shift huddles. In conjunction with these points of educational contact, a feasible opportunity would include creating an informational slideshow with an education quiz for nursing staff absent at previous meetings.

Results can be shared with the target population during the QI project. Flyers and handouts with quick facts about the department baseline data, key PIV care information, and the PIV improvement goals can be posted on the unit in the breakroom, medication rooms, and bathrooms. This information accessibility will create a visual reminder of the project and keep the unit's quality goals at the forefront.

Timeline

Unit B employs 43 registered nurses. The goal of the QI project is to complete education at a minimum of 80% of full-time, part-time staff and registry staff. Additionally, any new nurses or travel nurses on the unit should be included in the training. To ensure education completion and to consider staff rotational schedules, education should be given ample time to clarify standards and practices. A total of four weeks should be sufficient, allowing multiple opportunities to meet with staff through shift huddles and monthly department meetings. A two-to-five-week time frame from initial education sessions to post-test assessment should be considered to determine retention of newly learned PIV education. Additional education opportunities can be identified later during the PDSA cycles.



Budget

The most significant cost of the project will be the wage covered by the nursing staff during the 20-minute education sessions. The starting registered nurse wage at Facility A is

\$31.57 per hour. For nursing, time spent on the pre-and post-questionnaires and going through education is approximately 30- 40 minutes per person. The budget for 43 registered nursing staff participation would start at \$2,036 but increase depending on years of service for nursing staff and their individual base hourly wage. One hundred flyers, handouts, and questionnaires printed in black and white will cost approximately \$25, and color prints will cost \$75 from a local print shop.

Evaluation

The expectations of improved PIV care will be based on the 2024 INS evidence-based standards described above and the facility A guidelines. To determine the success of staff education on the new standards of PIV care, a confidential checklist of staff names and the completion date, with scores, will be tracked. The checklist assists in ensuring contact with a majority of staff employed and identifying individuals still missing the education needed for adherence to the QI project SMART goals. To re-evaluate knowledge of the PIV standards after education sessions, a repeat educational post-test (Appendix D) is planned, and the progress of knowledge will be based on pre-and post-test scores of staff. Successful education will be measured with staff scoring at or above 85% on the post-test. While not an immediate goal, eventually after the completion of the initial PDSA cycle and the use of the new EHR platform, patient PIV infections and complications will be used to measure project outcomes.

Summary

The initial goals of the QI project included 80% education completion of full-time, part-time, and registry staff on Unit B and passing scores of 85% or above on the post-education questionnaire. A minimum of eight weeks is required for providing PIV education and attaining

the SMART goals. The improvement of staff PIV knowledge will be measured by comparing the number of correct answers on the pre-and post-test after the education is presented.

After the initial implementation of the PDSA cycle of peripheral IV education, future PDSA cycles are as follows;

1. Addressing inaccurate documentation on the unit, utilizing the new EHR reporting system at the facility.
2. Complete observed patient PIV sites and dressing spot checks.
3. Complete quarterly documentation audits.
4. Include PIV care in quarterly and yearly unit skills days and continued education.
5. Replicate the project to other units in facility A for improved organization compliance with PIV care and maintenance.
6. Include in organization education for new nursing staff and new graduates during orientation.

CHAPTER 4

This QI project aimed to improve PIV compliance and reduce poor patient outcomes in Unit B following the Infusion Nurses Society's newly released evidence-based guidelines for intravenous therapy. Reestablishing PIV standards is essential to improving patient outcomes and adherence to current guidelines and has a significant impact on the institution.

QI Project Summary

Throughout the research review, multiple points of contact in the care of PIVs can potentially affect poor patient outcomes due to non-compliance. Additionally, the literature noted the importance of nursing staff education in providing safe patient care of PIVs in the acute care setting. Due to the complexity and difficulty of implementing process change in an acute care setting, using the Model of Improvement theoretical framework with PDSA cycles was chosen for continued evaluation and progression of the QI project's success. Multiple quick PDSA cycles are intended for nursing staff to demonstrate increased knowledge of PIV standards, improved documentation of PIVs, and ultimately improved care of patient PIVs. This bundled

approach to PIV care would ultimately reduce PIV complications and potential mortality of the high-risk acute patient population in Unit B.

Discussion

The literature review noted that over 330 million individuals will have a PIV inserted during their care (Oh, 2020). The number of PIV complications is a concern. In Berger et al.'s (2021) study in which, 14.4% of 212 patients with PIV catheters developed phlebitis. If 330 million individuals have a PIV placed and a potential of 14.4% phlebitis complications, the possible number of individuals developing phlebitis is over 47.5 million, which is unacceptable, as PIV complications are preventable.

The Infusion Nurses Society guidelines state that PIVs be left in place no longer than 96 hours. However, Ohs's study in 2019 found no increased rates of phlebitis with extended time past 96 hours of PIV catheters in place. This information is surprising as it conflicts with the standards set forth, and further studies would need to be investigated on catheter insertion time. Throughout the literature review, it was noted that there are several points of PIV care to consider when assessing for improvement areas in Unit B, demonstrating the importance of using a catheter care bundled approach for improved PIV care compliance using education, assessment of care, correct documentation, and chart auditing.

Due to the multiple points of PIV care, it is important to establish an obtainable goal to maintain the focus of the QI project. The use of the Improvement Model aligns by creating focus and purpose for the project while considering several interventions. Using PDSA cycles is required. Each PDSA cycle will need to have goal-specific areas to address in PIV compliance to ensure the momentum of the QI project. The complexity of QI projects in healthcare can hinder progression if the focus is not maintained.

Implications and Recommendations

Many PIVs on the unit were not in compliance with care and documentation per INS or facility standards. The reestablishment of PIV standards on Unit B has the potential of setting into motion improvement in other aspects of patient care and accountability. The QI project may allow staff to reflect on their care practices with an increased focus on maintaining standards. The nursing staff's education and compliance with PIVs can assist in ensuring future nurses on the unit follow standards, ultimately improving patient outcomes and reducing complications surrounding PIV care. If the QI project on Unit B demonstrates improved PIV compliance and patient outcomes, the process change can be rolled out to another acute care setting within Facility A. The initial project expected outcome is for nursing staff to improve PIV education, as demonstrated by attaining 75% or above on the post-test.

There is a lack of retrievable data on PIV-documented care in Unit B. Additionally, the data was not well monitored or tracked for the patient population on Unit B, but observations noted the poor compliance issues on the unit. However, with the implementation of a new EHR system, an improvement and ease of data reports should allow for baseline information to be established moving forward. Therefore, as a future goal, monitoring of PIV compliance should be expected to expand from baseline staff education to EHR documentation compliance as well as PIV infection rates on the unit.

A challenge to the QI project is the timing. Before starting this QI project, time is needed to prevent nursing staff from becoming overwhelmed with new process changes occurring in Unit B. Recently, an entirely new EHR system was implemented, and nursing staff are adjusting to the new EHR platform, changes in their workflow, and new documentation. A second phase of

the QI project after the initial phase could be using the new EHR platform to monitor patient outcomes such as infections and PIV complications.

A peer evaluation and staff post assessment scores of the educational content could determine if the sessions and information provided are effective and beneficial. Based on the evaluation and assessment feedback, the content of PIV education could be altered to meet the needs of the Unit B nursing staff. Future assessment of intravenous therapy could include care associated with central lines, Port-a-Caths, and intravenous supply variations further to strengthen the staff's knowledge of intravenous therapy standards.

CNL Role

Through this project, a Certified Nurse Leader (CNL) allowed for the preparation for practice in the changing and complex healthcare setting established by the AACN competencies. The expectation of a CNL in the acute care setting is to identify and lead in areas of improvement through research, dissemination, and evaluation in the care of the patient population and the community served. A CNL, an expert in their field, recognizes the significance of analyzing the unique aspects of the acute care setting through a macro or micro assessment, utilizing technology and informatics for data analytics and collection, identification of gaps of care, use of current evidence-based practices, education of staff and patients and ensuring to maintain ethical and legal aspects of healthcare to determine the most appropriate plan for improvements. The CNL demonstrates the importance of collaboration, teamwork, and various communication methods, ensuring patient quality and safety measures. It is the responsibility of the CNL role to consider the budget and financial impacts of the patient, staff, unit, or facility in the development and execution of improvement plans. A CNL is essential in

leading the improvement of patient care within the complex and ever-changing healthcare system.

Conclusion

Reducing PIV complications in the acute care population directly impacts a patient's length of stay and health outcomes and can be a cost-saving measure for the facility. Unit B cares for a patient population with comorbidities who are already at risk for healthcare complications. This project will provide the primary education necessary to follow PIV standards of care. Further monitoring and continued PIV assessment outcomes will help guide future interventions. By reducing complications with preventable PIV care and continual focus on improvement measures, the potential to reduce the risk of sepsis and mortality improves the care of the community and region the facility serves.

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Appendix A

Guidelines for Peripheral Intravenous Access

Status **Active** PolicyStat ID **14091429**



Origination
Dustin

10/1997 Owner

Last 10/1997
Approved Quality

Desjardins: Lead
Analyst

Effective
10/1997 Area Nursing (General)

Last Revised 10/1997

Next Review 02/2024

Guidelines for Peripheral Intravenous Access

PURPOSE: AREAS AFFECTED: Hospital, Benefis Senior Services, Benefis Outpatient Clinics, Hospice, Sletten Cancer Institute, Community Care
Benefis Health System strives to minimize the risks of infection and other complications associated with the insertion and maintenance of intravenous catheters by specialty trained personnel following provider orders.

PERIPHERAL INTRAVENOUS (PIV) GUIDELINES:

- I. NICU: Refer to *Intravenous, Intra-Arterial Therapy in the NICU* policy.
- II. Insertion
 - A. See *Manual of Nursing Practice Elsevier Clinical Skills: "Intravenous Therapy: Short Peripheral Catheter Insertion"* for step-by-step instructions on PIV insertion.

- B. Prep site with chlorhexidine gluconate/alcohol applicator for 30 seconds and allow to dry. If the patient is allergic to chlorhexidine, betadine or betadine/alcohol applicator may be used in its place.
- C. Catheter placement in close proximity to a joint should be avoided. If selected as the insertion site of choice, immobilize the joint to limit the motion of the catheter.
- D. Cover the insertion site with highly permeable transparent dressing. If the patient is allergic to the transparent dressing, a gauze dressing may be applied.
- E. Label the site with the date, time, and initials.
- F. Do not place PIV access in affected arm of patient with lymphedema, at risk for lymphedema, or a functioning AV fistula. Place bright pink "Do Not Use This Arm" band on this extremity.

III. Maintenance

A. Assessment

1. PIV sites are assessed every shift and PRN.
2. Standard PIV catheters are to be re-sited every 96 hours unless provider order has been obtained to extend dwell time and the device is functioning appropriately. This includes Ultrasound guided PIVs placed by trained personnel other than vascular access team.
3. Ultrasound guided long PIV catheters placed by the vascular access team may remain in place unless removal/re-siting is clinically indicated:
unresolved complication, discontinuation of infusion therapy, or when no longer necessary for the plan of care.
 - a. To determine if device is a long PIV placed via ultrasound by vascular access team refer to electronic health record documentation or label placed on PIV from vascular access team.
4. A PIV site will be changed within 24 hours of hospital admission for any of the following conditions
 - a. PIV started in the field (ie. Pre-hospital emergency setting) under suspect
 - b. PIV started under emergency conditions where skin asepsis is under suspect
5. IV sites in children from ages 0-18 years may remain in place unless removal/re-siting is clinically indicated: unresolved

complication, discontinuation of infusion therapy, or when no longer necessary for the plan of care.

6. The Infection Prevention Nurse is notified if the catheter is the suspected source of infection.
7. If required to stabilize, or assist in maintaining IV site, use Stockinette sleeve or Kerlix dressing gauze. Limit use of Coban as it can cause constriction to patient and/or IV tubing. All wraps must be removed for assessment each shift and PRN.

B. Flushing and Locking

1. *See Manual of Nursing Practice Elsevier Clinical Skills: "Intravenous Therapy: Maintenance and Dressing Change" for step-by-step instructions.*
2. Disinfect the connection surface and sides of the needleless connector by using vigorous mechanical scrubbing for a minimum of 15 seconds with a flat swab pad containing 70% isopropyl alcohol. Allow to dry for 5 seconds.
3. Flush PIV with single-dose prefilled preservative-free 0.9% sodium chloride every 12 hours and PRN when not in use.
4. Use a pulsatile flushing technique of 10 short boluses of 1-mL solution interrupted by brief pauses (push/pause technique).
5. PIV are flushed and aspirated for blood return prior to each infusion.
6. PIV are flushed prior to and after each infusion or medication administration.
7. Clamp PIV tubing when not in use.

C. Dressing Change

1. *See Manual of Nursing Practice Elsevier Clinical Skills: "Intravenous Therapy: Maintenance and Dressing Change" for step-by-step instructions.*
2. For PIVs that are allowed to dwell longer than standard 96 hours (USGPIV placed by vascular access team or provider order to extend dwell time), transparent dressings must be changed every 7 days and PRN if dressing integrity is disrupted (ie. Lifted/detached on border edge, visibly soiled, presence of moisture, drainage, or blood).

3. Gauze dressing must be changed every 48 hours (for patients with transparent dressing allergy).

4. Cleanse the access site with a single-use sterile applicator containing an alcohol-based chlorhexidine solution for 30 seconds. Allow the solution to completely dry. If there is a contraindication to chlorhexidine, use an iodophor (e.g., povidone-iodine) or 70% alcohol.

D. Tubing Change

1. All lines must be labeled with date, time, and initials when initiated.
2. Replace primary and secondary continuous administration sets (other than lipids or blood products) every 96 hours.
3. Replace intermittent administration sets (disconnected tubing) every 24 hours.
 - a. Utilize male/female luer lock cap on end of PIV tubing when disconnecting from vascular access device.
4. Replace administration sets and filters for Parenteral Nutrition solutions and lipid emulsions every 24 hours.
5. Replace administration sets used to administer Propofol infusions every 12 hours.
6. Tubing that delivers blood and blood products is changed every 4 hours.
7. Change tubing if integrity is compromised.
8. Standard IV solution bags (that do not contain additives) are changed every 96 hours and with tubing changes (whichever occurs first). Refer to expiration date on IV fluids with additives received from pharmacy.
9. *During times of IV tubing or IV fluid shortage the policy will be modified to the following:*
 1. *Primary and secondary tubing that is used in a continuous closed system can be changed every 7*

days. The tubing must maintain integrity or will need to be changed immediately.

2. *Standard IV solution bags (that do not contain additives) can be hung in a continuous system for 7 days from spiking.*
3. *All other tubing and IV bags will follow the standard policy for timing of changes.*

E. Needless Connector (Neutral End Cap)

1. Change needless connectors every 7 days or PRN for:
 - a. Residual blood or debris present
 - b. If removed for any reason
 - c. Upon contamination

IV. Documentation

- A. Document site assessment in the electronic health record every shift and on initiation and discontinuation.
- B. Document flush solution and time in the Medication Administration Record.
- C. Document dressing and needless connector changes.

PHLEBITIS SCALE

0 = No redness or swelling

1 = Localized redness, with or without swelling

2 = Pain and/or redness and/or edema at site

3 = Pain and/or redness and/or edema AND streak formation palpable

4 = Pain and/or redness and/or edema AND streak formation AND palpable cord AND

purulent drainage **Interventions:**

Score 2 - Remove catheter, and notify provider

Score 3 - Remove catheter, apply moist heat, elevate extremity, and notify provider

Score 4 - Remove catheter, apply moist heat, elevate extremity, and notify provider

INFILTRATION SCALE

0 = No Symptoms

1 = Skin blanched, edema < 1 inch, with or without pain, cool to touch

2 = Skin blanched, edema 1-6 inch, with or without pain, cool to touch

3 = Skin translucent, edema > 6 inches, cool to touch, mild to moderate pain, possible numbness
 4 = Skin translucent, tight, leaking, discolored, edema > 6 inches, deep pitting tissue edema, circulatory impairment, moderate to severe pain, infiltration of any amount of blood product, irritant, or vesicant **Interventions:**

Score 2 - Remove catheter

Score 3 - Remove catheter, apply moist heat, elevate extremity, and notify provider

Score 4 - Remove catheter, apply moist heat, elevate extremity, and notify provider

Infiltration of any amount of blood product, irritant, or vesicant, follow extravasation procedure. Refer to the following policies as applicable: 1. Extravasation of Chemo Agents 2. Catecholamine Extravasation –Treatment of Peripheral IV.

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Approval Signatures Standards

Step Description

Approver

Date

No standards are associated with this document

Appendix B

Table B1

Author/Year	Design/Method	Sample/Setting	Findings
Berger, Winchester, Principe and Culverwell, 2022	Observational point prevalence study; convenience sample	N=449 patients in 19 wards; 212 PIV observations	PIVC Prevalence was 47%. PIVCs were inserted in points of flexion 52%. 19% of documented assessment of 8-hourly visual infusion phlebitis (VIP) score. Patients had local signs of phlebitis in 14.4%.
Hontoria-Alcoceba, Lopez-Lopez, Hontoria-Alcoceba, Sanchez-Morgado, 2023	pre/postintervention quasi-experimental design	N= 364 PIV catheters were assessed/ Medical unit	PIV dwell time decreased; phlebitis incidence decreased (6.3 to 2.6) leaks (28-14); Nrsrg adherence (84.3% - 91.8%) from pre to post intervention implementation.
Oh, Shelly, Nersinger, Cai, & Olsan, 2020	observational study	N= 469 pts, N=1033 PIVs; Community hospital, medical unit	PIV phlebitis rates not statistically different pre-posttest; change of contacting physician for PIV time extension; recognition of documentation on worklist for drsg change noted to be missing

Table B2

Author/Year	Design/Method	Sample/Setting	Findings
Slater, Cooke, Scanlan, & Rickard, 2019	Observational study; convenience sampling	2 med/surg units, ER dept= 108 observations; 5 wk. period	4/108 RN's complied with 15 sec dry time of PIV hub; 56/108 dry time of 5 sec or less, majority 80% allowed for 6 sec-14 sec. Hand hygiene total compliance- 11%

Table B3

Author/Year	Design/Method	Sample/Setting	Findings
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Berger, Winchester, Principe and Culverwell, 2022	Observational point prevalence study; convenience sample	N=449 patients in 19 wards; 212 PIV observations	PIVC Prevalence was 47%. PIVCs were inserted in points of flexion 52%. 19% of documented assessment of 8-hourly visual infusion phlebitis (VIP) score. Patients had local signs of phlebitis in 14.4%.
Blanco-Mavillard, Parra-Garcia, Fernandez-Fernandez, Rodriguez-Calero, Personat-Labrador, & Castro-Sanchez, 2020.	Observational study; convenience sampling	N= 624pts, N=646 PIVs; 3 hospitals	5% of PIVC insertion sites were not visible; 34% of transparent dressings were not in optimal conditions; insertion date not recorded =52%; dressing not dated=
Casanova-Vivas, Mico-Esparza, Garcia-Abad, Hevilla-Cucarella, Ballestar-Tarin, Blasco, & Garcia-Molina, 2021.	Quasi-experimental, multicenter study	N= 21,108 pts; 19 hospitals: 54 nurses	average of 22.1% (95% CI: 21.4–22.7) of the intravenous lines were classified as optimal=Improved the quality and safety of vascular accesses, with a VES baseline evolution from 7.8% to 37.6 (nrsg educ)
Hontoria-Alcoceba, Lopez-Lopez, Hontoria-Alcoceba, Sanchez-Morgado, 2023	pre/postintervention quasi-experimental design	N= 364 PIV catheters were assessed/ Medical unit	PIV dwell time decreased, phlebitis incidence decreased (6.3 to 2.6) leaks (28-14); Nrsg adherence (84.3% - 91.8%) from pre to post intervention implementation.

Table B4

Author/Year	Design/Method	Sample/Setting	Findings
Bahl, Mielke and Johnson, 2022	Prospective observational analysis, convenience sample	N=77 patients; N=1201 observations; convenience sample	Documentation 86%; Insertion-related compliance 93.3%; Removal-related compliance was 80.5%, Daily catheter assessments were compliant 81.9%
Berger, Winchester, Principe and Culverwell, 2022	Observational point prevalence study; convenience sample	N=449 patients in 19 wards; 212 PIV observations	PIVC Prevalence was 47%. PIVCs were inserted in points of flexion 52%. 19% of documented assessment of 8-hourly visual infusion phlebitis (VIP) score. Patients had local signs of phlebitis in 14.4%.
Blanco-Mavillard, Parra-Garcia, Fernandez-Fernandez, Rodriguez-Calero, Personat-Labrador, & Castro-Sanchez, 2020.	Observational study; convenience sampling	N= 624pts, N=646 PIVs; 3 hospitals	5% of PIVC insertion sites were not visible; 34% of transparent dressings were not in optimal conditions; insertion date not recorded =52%; dressing not dated=
Casanova-Vivas, Mico-Esparza, Garcia-Abad, Hevilla-Cucarella, Ballestar-Tarin, Blasco, & Garcia-Molina, 2021.	Quasi-experimental, multicenter study	N= 21,108 pts; 19 hospitals: 54 nurses	average of 22.1% (95% CI: 21.4–22.7) of the intravenous lines were classified as optimal=Improved the quality and safety of vascular accesses, with a VES baseline evolution from 7.8% to 37.6 (nrsg educ)

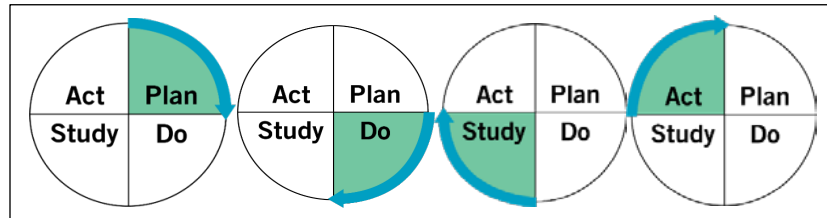
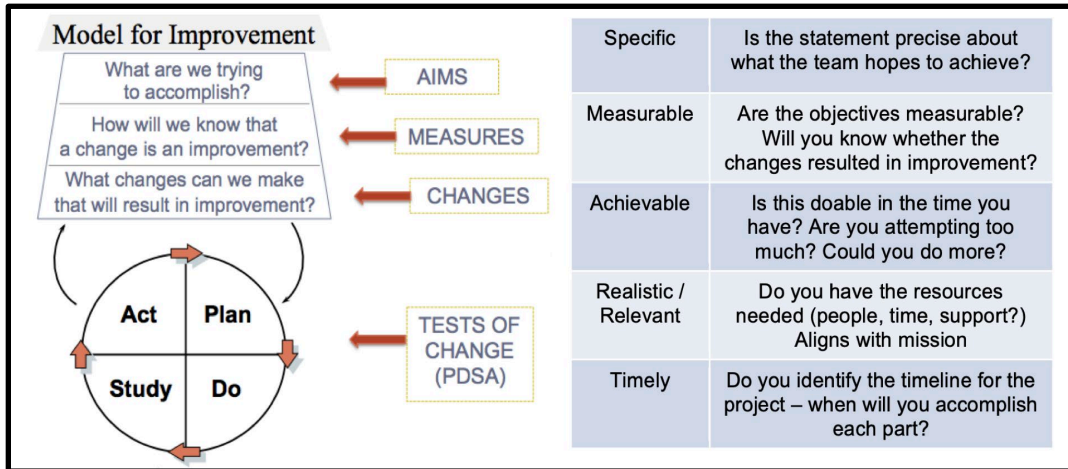
Woda, Ford, Meise, Singh, 2021	A theory-based framework and mixed-method design	29 units-6month, 900-licensed bed, urban,; adult patients (N = 12 031) who had SPC insertions (N = 30 772) quaternary medical center in the Midwest	SPCs removed for infiltration, occlusion, extravasation, patient dislodgement, or suspected infection, 24.2% of the time,- PIV placed in points of flexion- 48% ; No incident reports describing extravasation were filed by study units during the study period. removals for adverse outcomes including infiltration (13.0%), accidental dislodgement (6.3%), and occlusion (4.1%)
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Table B5

Author/Year	Design/Method	Sample/Setting	Findings
Bahl, Mielke and Johnson, 2022	prospective observational analysis, convenience sample	N=77 patients; N=1201 observations; convenience sample	Documentation 86%; Insertion-related compliance 93.3%; Removal-related compliance was 80.5%, Daily catheter assessments were compliant 81.9%
Blanco-Mavillard, Parra-Garcia, Fernandez-Fernandez, Rodriguez-Calero, Personat-Labrador, & Castro-Sanchez, 2020.	Observational study ; convenience sampling	N= 624pts, N=646 PIVs; 3 hospitals	5% of PIVC insertion sites were not visible; 34% of transparent dressings were not in optimal conditions; insertion date not recorded =52%; dressing not dated=
Woda, Ford, Meise, Singh, 2021	A theory-based framework and mixed-method design	29 units-6month, 900-licensed bed, urban,; adult patients (N = 12 031) who had SPC insertions (N = 30 772) quaternary medical center in the Midwest	SPCs removed for infiltration, occlusion, extravasation, patient dislodgement, or suspected infection, 24.2% of the time,- PIV placed in points of flexion- 48% ; No incident reports describing extravasation were filed by study units during the study period. removals for adverse outcomes including infiltration (13.0%),accidental dislodgement (6.3%), and occlusion (4.1%)

Appendix C

Model of Improvement



Appendix D

Questionnaire

NAME: _____ RNs- Years as a nurse _____

Please Circle one: Registered Nurse *or* nurse intern/student , Day Shift *or* Night Shift,
Full-time *or* Part-time *or* Registry

This questionnaire is for MSU-Bozeman graduate student Mandilynn Lee's Safety project and paper.

1. When does a field stick IV need to be removed and replaced? **Choose one**
 - a. Can leave in during patient stay.
 - b. Immediately when admitted to the unit.
 - c. 24 hrs
 - d. 48 hrs
 - e. 72 hrs

2. How long can a Be***** facility PIV be left in before needing to be changed out? **Choose one**
 - a. 24 hrs
 - b. 48 hrs
 - c. 72 hrs
 - d. 96 hrs
 - e. It does not have to be changed out if not needed.

3. How long can an outside facility PIV be left in before needing to be changed out? **Choose one**
 - f. 24 hrs
 - g. 48 hrs
 - h. 72 hrs
 - i. 96 hrs
 - j. It does not have to be changed if it is patent, secure, and clean.

4. How often should the PIV catheter be flushed with normal saline? **Choose one**
 - a. Every 12 hours
 - b. Every 2 hours
 - c. Once every 6 hrs
 - d. Once every 24 hrs
 - e. Only when preparing to administer medications.

5. How often should the PIV sites be assessed? **Select All that Apply.**
 - a. Every shift
 - b. Once daily
 - c. Only when needed.

- d. Before giving medication
 - e. As needed (PRN)
6. When should the transparent dressing be changed? **Select All that Apply.**
- a. When visibly soiled
 - b. When coming apart
 - c. Every four (4) days
 - d. Every 7 days
 - e. Once per day
 - f. Moisture is present in dressing.
 - g. Only when a patient is discharged.
7. What documentation should be present on the dressing? **Choose one**
- a. Date dressing changed.
 - b. Date IV placed.
 - c. Initials of individual placing PIV
 - d. Unit or facility that placed a PIV.
 - e. The date dressing needs to be changed.

Please turn in the completed questionnaire to Mandy Lee or Nikki Walsh. Thank you for your participation.