Implementing a Vascular Access Management Program to Achieve Positive Clinical Outcomes

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June 23, 2021

PART I: QUALITY IMPROVEMENT PROJECT PROPOSAL

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Abstract

Background: An independent review of current hospital practices related to vascular access device (VAD) insertion, maintenance, access, and removal in a 400-bed community medical center identified widespread practice variability and significant policy discrepancies compared to current evidence-based best practices and standards of care. Development of a vascular access management program in alignment with standards of care will take place to effect positive clinical and financial outcomes.

Methods: The project design is a quality improvement project including practice and educational interventions. Quantitative methods will be utilized to measure nursing practice compliance with policy changes reflecting evidence-based practice standards of care.

Results: It is anticipated that the implementation of a vascular access management program based on s evidence-based practice standards of care and maintenance of all VADs will increase compliance with hand hygiene compliance on entry to patient room, maintenance of aseptic technique in manipulating devices, performing proper hub and site maintenance, and performing correct sequence and processes for flushing and clamping practices as observed in post intervention observations.

Discussion: Successful implementation of this study will have a positive impact on patient care outcomes to include CLABSI incidence rates, patient satisfaction with vascular access as well as a positive economic impact by improving PIV dwell time, and decreased CVL utilization.

Keywords: vascular access management; vascular access device care; vascular access program

Implementing a Vascular Access Management Program for Achieving Positive Clinical Outcomes

Vascular access devices (VAD) are one of the most frequently performed invasive procedures in hospitals with 90% of patients receiving at least one form of VAD during their hospitalization (Platt & Osenkarski, 2018). Although vascular access is common practice amongst clinicians, there is significant variation in vascular access practices from catheter insertion to daily maintenance across hospitals and organizations worldwide (Morrell, 2020). According to the process improvement principles of the Six Sigma methodology, having variability in processes results in gaps in care and puts patients and health care workers at risk with significant economic burdens placed on hospitals (Variance Reduction International, 2021). An independent review of current hospital practices related to VAD insertion, maintenance, access, and removal in a 400-bed community medical center identified variability and significant policy and practice gaps between current practice and evidence-based best practice standards of care. Current policies governing VAD practice were not in alignment with current standards of care and nursing practice was found to be inconsistent from unit to unit with all segments of the VAD access and care. According to Jarding & Makic 2020, a single central line associated bloodstream infection (CLABSI) can add an average of seven additional days and $45,000 USD to a patient's stay. With 170,000 CLABSIs occurring annually in non-intensive care units and 80,000 in intensive care settings, the problem begs to be addressed.

Background

VADs, including peripheral and central access, are routine experiences for most patients receiving hospital care. Peripherally inserted intravenous (PIV) catheters have an estimated failure rate between 35%-50% (Helm et al., 2019; Nickel, 2019). Central venous lines (CVL) resulting in central line associated bloodstream infections (CLABSI) have an estimated 25%

mortality rate (Harnage, 2012). The lack of standardized education and practice bundles encompassing all VADs is an issue that is demanding to be addressed (Harnage, 2012; Helm et al., 2019). Even though placement of peripheral VADs is one of the most frequently performed invasive interventions for hospitalized patients, there is a lack of evidence supporting best practice standards and research investigating the associated risks regarding PIV (Platt & Osenkarski, 2018). Evidence-based best practice guidelines in the form of care bundles have been shown to decrease CLABSI rates and the risks associated with CVL. Given the commonality of PIV and the extreme variability in care practices associated with the insertion and maintenance of these lines in hospitals illustrates the identified gap in the literature and need for evidence-based care bundles for PIV.

VAD failure and complications have various etiologies, some of which are specific to the type of access, but most concepts overlap. Proper site and catheter selection based on the patient and specific therapy to be delivered, insertion technique, and maintenance practices all need to be reviewed when addressing policy and practice. As Coram, 2015 noted, practice and product standardization have a direct correlation with safety, when safety is the goal of any patient therapy that is delivered. It is imperative that the entire process of vascular access is evaluated and addressed to implement and maintain safe patient care on a continuous basis and consider that all vascular access devices be treated similarly since they all carry a risk for complication and infection for the patient. According to Helm et al (2015) and Hallam et al (2016), insertion of PIVs is an invasive procedure with risks and should be given the respect it deserves considering individuals who are currently inserting PIVs may not fully realize the potential complications associated with all types of vascular access.

Vascular access, via any route, is a routine experience for patients in the hospital setting

and it is essential that clinicians ensure safe vascular access and focus on preventing the inherent risks of patient harm associated with access (Hugill, 2017). As seen in recent years with preventing other hospital acquired infections (HAIs), such as catheter associated urinary tract infections (CAUTIs) and CLABSIs, good infection control and prevention strategies using standards precautions and care bundles, has proven beneficial to preventing patient harm (Hugill, 2017).

Developing a vascular access management program establishing standards of best practice in the community medical center clinical setting will provide the framework for consistent clinical practice and improve clinical outcomes. Recommendations for best practice from the Infusion Nurses Society (INS) and Centers for Disease Control and Prevention (CDC) Healthcare Infection Control Practices Advisory Committee (HICPAC) advocate for comprehensive vascular access care bundle that includes all forms of vascular access. The INS and CDC-HICPAC guideline documents were developed for all persons who insert intravascular catheters and advocate for development of prevention programs to eliminate incidence of catheter-related bloodstream infection (CRBSI) from all patient care areas (Gorski et al, 2021; O'Grady, 2017).

The INS and CDC-HICPAC guideline documents were developed for all persons who insert intravascular catheters and advocate for development of prevention programs to eliminate incidence of CRBSI from all patient care areas (Gorski et al, 2021; O'Grady, 2017). According to O'Grady et al (2017), 80,000 central line associated bloodstream infections (CLABSIs) occur in ICUs each year and an estimated 250,000 bloodstream infections (BSIs) occur annually when assessing entire hospitals. It is important to note the differences in definitions of BSIs as they are used interchangeably and can be confusing. Catheter-related bloodstream infection (CRBSI) or

catheter associated bloodstream infection (CABSI) and CLABSI are different terms. According to National Healthcare Safety Network (NHSN) (2021), CLABSI is defined as a primary BSI in a patient who had a central venous catheter in the previous 48-hours before developing the BSI and the BSI cannot be attributed to another site or source and is the only defined infection that is reported for surveillance. Whereas CABSI or CRBSI are terms related to primary bloodstream infections that are attributed to an intravenous catheter. While CRBSI and CABSI are clinical definitions used for diagnosing and treating patients, they are not typically used for surveillance purposes (O'Grady et al, 2017).

Problem Statement

Vascular access management in the primary care setting is a difficult, complex, and involved process effecting 90% of the patient population (Helm et al., 2019). Many studies have proven the value of implementing vascular access bundles with current standards of care to achieve positive clinical outcomes solely focusing on CVLs (Harnage, 2012; Hugill, 2017; Jarding & Flynn, 2020). There is identified variability in clinical practice and policy regarding vascular access regarding hand hygiene, hub, site maintenance, and flushing and clamping sequences with positive displacement needless connectors that do not align with current evidence-based best practice standards of care. The purpose of this quality improvement project is to establish evidence-based best practice standards as noted by the INS and CDC HICPAC for the management of vascular access related to these areas. A vascular access management program will focus on the elimination of variation in the processes related to vascular access and decrease incidence of CRBSIs.

Organizational Needs Assessment of Project Site

To evaluate organizational readiness for change, a SWOT analysis was performed with

results noted in Appendix A, Figure 1. Strengths of the clinical setting were identified as the culture of safety, a three-time Magnet distinguished facility, leadership support for program implementation, prior experience successfully implementing similar programs for other quality improvement initiatives, such as CAUTI reduction and prevention. Weaknesses of the clinical setting were identified as lack of urgency as there have been low standardized infection ratios (SIR) compared to the rest of the hospital system for the last two years, outdated policy, inconsistent practice standards, and various levels of readiness to change across nursing units. Opportunities that promote successful implementation were noted in nursing leadership's ability to be proactive in broadening the clinical focus shifting from not only CLABSI but to a focus on all CRBSI incidence in anticipation of INS definitional changes anticipated to influence NHSN definition changes in the next few years, and the ability to standardize practice across the facility and decrease variability. Threats identified that may hinder implementation include current competing priorities with other initiatives and the magnitude and complexity of implementing a vascular access management program.

Prior to the PI initiating this project, the clinical setting facility participated with a third-party vendor to conduct a comprehensive needs assessment focused on policies related to vascular access, clinical practice, vascular access products, workflow related to vascular access, rates and incidence of complications, and the economic impact of current practices on the patient and the facility. This was a multi-faceted, comprehensive assessment that included staff interviews, de-identified patient chart reviews, staged observations, policy review and direct vascular site assessments. At the time of the assessment the facility had had five CLABSI events in the past twelve months, a current average daily census of 360 patients, and an annual PIV utilization of 145,968 catheters.

The gap analysis of current policy related to intravenous therapy identified poor alignment with current Infusion Therapy Standards of Practice. The Infusion Therapy Standards of Practice are considered to be the gold standard of care in vascular access management. Revised and published every five years by the Infusion Nurses Society the Standards are a comprehensive approach to managing vascular access across sixty-six standards including infection prevention and control, equipment, device selection and placement, device management, complications, patient and clinician safety, and therapies (Gorski et al 2021). According to the gap analysis, current policy was lacking in standards and in several points were out of date. Staff observations and interviews had similar findings during the assessment as inconsistent practices were observed across the facility.

Staff interviews and staged observations had significant findings. Overall aseptic technique was correctly observed in the central line dressing changes 33% of the time, hand hygiene upon entry into the room was correctly observed 67% of the time, and proper donning of sterile gloves was observed 50% of the time. Hub maintenance assessments found that overall aseptic technique was never achieved. Seventeen percent of the staff scrubbed the catheter hub for the recommended 10-15 seconds with appropriate dwell time. Thirty-three percent of the staff attached new needle-free connectors while maintaining aseptic technique. Assessments of PIV insertion found that overall aseptic procedure and room entry hand hygiene was similar to central line assessments and the insertion site was retouched after prep with nonsterile gloves 83% of the time. IV push medication assessments achieved overall aseptic technique in 17% of observations and clinician reported proper skin prep and dry time 60% of the time. Vascular site assessments and chart reviews revealed that 52% of PIVs were left unclamped, 100% of sites were not labeled with insertion date, 37% of sites were not visible due to added products, such as Coban

wrapped around site for various reasons, and 43% of catheters removed did not have a documented reason for removal.

Relevant statistical findings from the gap analysis have been selected to illustrate significant areas for improvement. See Appendix B. Although the cost of vascular access complications such as CLABSI, blood clean up, extravasations, and PIV costs based on current dwell time, are estimated, the vendor projected a total current cost per year of $2,054,112.40 at this facility alone. At the conclusion of the gap analysis, the vendor provided a comprehensive review of the findings to nursing leadership. This sparked an in-depth conversation of reflection that resulted in purposeful conversations targeting the need for change and raising policy and practice standards to meet and exceed minimum standards of care. Findings from the needs assessment will inform the development and implementation of a comprehensive vascular access management program to systematically address identified deficiencies.

Review of the Literature

The review of the literature was conducted utilizing CINAHL and PubMed databases with search terms including vascular access device care; vascular access care bundle; and vascular access management program. Literature from 2011-2021 was included in the search due to the low number of high-level research available on this topic. CINAHL database returned an initial yield of 856 articles, which was filtered by full text and academic journals to return a filtered yield of 636. Upon individual review for inclusion based on relatedness to the specific topic at hand, 9 articles were identified and 6 ultimately included. PubMed database returned an initial yield of 2,283 articles, which was filtered by full text and academic journals to return a filtered yield of 546. Upon individual review for inclusion, 3 articles were included in this review. In total, 9 articles were included in the review of literature and evidence was appraised

using the Johns Hopkins Research Evidence Appraisal Tool. The summary can be found in Appendix C.

Care Bundles

A randomized study by Sun et al (2020) found that care bundles are essential for preventing CRBSI. The study not only looked at CRBSI incidence, but also the patient's psychological state and satisfaction with their hospitalization. All patients received conventional nursing care and the case group received the additional care bundle, to include a surveillance team, maximal barrier precautions for insertion, hand hygiene standards, daily evaluation, and strict aseptic technique. After implementing the care bundle, it was found that hospitalizations and CRBSI rates were lower in both case and control groups, but significantly lower in the case group ($P<0.05$). The same was found with higher hospitalization satisfaction and lower patient self-rated depression and anxiety scores.

Perin et al (2016) found in their systematic review of 34 studies that care bundles coupled with education and institution commitment can lead to decreases in CRBSIs. One care bundle implemented following the Institute for Healthcare (IHI) checklist was able to decrease average infection rates from 6.83 to 1.83 and was assigned a 2.d. evidence level. A second bundle implemented use of ultrasound guided insertions showed marked decreases in infection rates and received an evidence level of 2.d.

Lastly Duffy et al (2015) implemented a daily CVC maintenance care bundle to include procedural guidelines for hand hygiene, dressing changes, and access in a busy pediatric oncology unit. The quality improvement project was able to achieve dramatic improvement in compliance with documented daily baths, post-intervention care bundle, and CLABSI rates during the six-month post intervention period when compared to the six months pre intervention.

Vascular Access Management Program

In an INS White Paper position statement, Meyer et al (2020) asserted that organizations implement a comprehensive approach to vascular access and management in ensure safe patient care. A task force was formed by INS to review the current literature and provide guidance on the frequent queries that are submitted to INS requesting guidance on VAD care and management. Meyer et al (2020) recognized that care bundles have demonstrated improvement in lowering infection rates, yet complications and lack of standardization still exist in practice. The task force held that each organization should develop policies and procedures in alignment with current standards of care; develop a framework for gathering and analyzing related clinical data; utilize quality outcome data to facilitate evidence-based best practice; and evaluate organization education and clinician competency pertaining to VADs.

Perin et al (2016)'s systematic review also analyzed evidence pertaining to management programs in combination with care bundles. Nine of the thirty-four studies evaluated addressed care bundles in conjunction with staff education, safety culture, or organizational strategies such as surveillance and staff feedback and received an evidence rating of 2.d. A randomized control trial receiving an evidence level rating of 1.c. evaluated a multipronged approach including evidence-based practices, communication, safety, and interdisciplinary team. Lastly, three studies included in the review evaluated the implementation the International Nosocomial Infection Control Consortium (INICC) bundle which includes education, surveillance, and feedback, receiving a rating of level 2.d evidence.

McGuire et al (2019) performed a follow-up audit from four years prior where practice was found to be in poor compliance with evidence-based guidelines. A comprehensive program including initial training, continued education, and organization standardization for VADs which

was successful a statistically significant changes in compliance relating to dressing status, ongoing care, and policy compliance. As Loveday et al (2014) found, implementation of a comprehensive vascular access management program focusing on all facets of care provided is necessary to improving patient outcomes and reduce healthcare costs.

Guidelines, Standards, and Evidence-based Best Practices

Currently there are two governing bodies that provide standards of care specific to vascular access: The Infusion Therapy Standards of Practice (Gorski et al 2021) and The Guidelines for the Prevention of Intravascular Catheter-Related Infections (O'Grady et al, 2017). The Infusion Therapy Standards of Practice sponsored by the INS are published every five years and are considered to be the gold standard of care in vascular access management and provide standards on policies, process, maintenance and care for all VADs, both peripheral and vascular. The Guidelines for the Prevention of Intravascular Catheter-Related Infections from the CDC HICPAC provide guidance for all healthcare personnel who insert intravascular catheters and for those who are responsible for the surveillance and control of infections. This quality improvement project will be built on the standards of care provided in the INS clinical practice guidelines, as they are considered the gold standard for vascular access management.

Deficiencies in Vascular Practice

In a systematic review of 140 articles on disinfection of needless connectors from Moureau & Flynn (2015), it was found that the greatest risk for contamination after insertion was with the needless connector, partly due to disinfection compliance being as low at 10%. Although a high-level evidence proven technique of disinfection time or technique has not been identified, it is currently recommended to scrub the connector with chlorhexidine or 70% alcohol for 5-60 seconds and allow for dry time. Moreau & Flynn (2015) go on to discuss the difficulties

of compliance beyond writing the policy stating the standard expectation of disinfection practices. Validation of competency and actual practice must be integrated into the facility culture and include a focus on aseptic technique, hand hygiene, and other aspects on care bundles previously discussed.

Raynak et al (2020) took one step further and performed a scoping review regarding nurse's knowledge on routine care and maintenance of VADs. Thirty-six articles were included in the review, and it was found that significant gaps in knowledge on the care and maintenance of VADs exist. The review focused on knowledge specific to CVL and PIV knowledge and several of the gaps found were quite alarming. 73.7% of nurses were not familiar with the CDC recommendations for hand washing before PIV insertion and only 50.4% could correctly identify the antiseptic agent for skin prep (Raynak et al, 2020). It was also noted the concern regarding the fact that such a low amount of scientific literature is available on a practice that is utilized worldwide in almost every hospitalized patient interaction. Not only is standardization and improvement needed in nursing knowledge, but additions to the literature is needed as well.

Evidence-based Practice: Verification of Chosen Option

This quality improvement project will implement a vascular access management program to systematically address deficiencies noted in the needs assessment based on the current evidence-based best practices as described in the literature. The goal of the quality improvement project will be to answer the PICOT question: In a tertiary community medical center (P), how does the implementation of an evidence-based practice vascular access management program (I), compared to current practice (C), affect nursing practice compliance with new policy standards in alignment with current standards of care (O), within a two-month period (T)?

Theoretical Framework

The Ottawa Model of Research Use (OMRU) is a practical theoretical framework that promotes an evidence-based approach to use of research findings in clinical practice (Logan & Graham, 1998). This model was chosen for this evidence-based project due to its relevance to the goals of establishing a vascular access management program to facilitate increasing the use of established research and practice standards into daily clinician practice and positive patient outcomes.

The OMRU model will provide a framework that will be used to assess, monitor, and evaluate the various elements necessary to translate current research and practice standards into daily clinician practice, as shown in Appendix D. The model will be used to assess: the practice environment, potential adopters, and evidence-based innovations; monitor: transfer strategies; and evaluate: adoption and outcomes. According to Logan & Graham (1998), the model elements are derived from research utilization, diffusion of innovations, behavior change, and developing and implementing practice guidelines.

Practice Environment

The practice environment for the quality improvement project will take place in thirteen nursing units in a large tertiary community medical center. Policy analysis and development along with interdisciplinary nursing staff committee will take place within the administrative and shared governance structure of nursing services. Staff education and practice implementation will occur in all nursing units across the facility and ultimately changes will take effect at the bedside with patient care with all VADs.

Potential Adopters

Potential adopters to consider for project implementation consist of knowledge, attitudes,

and skill. Knowledge will be assessed through the needs assessment and baseline data collection. Attitudes of potential changes will be evaluated during leadership meetings where needs assessment results and policy approvals will take place and during education sessions for staff regarding changes. Skill will be assessed during post intervention data collection and through ongoing education delivery as performed by the interdisciplinary team.

Evidence Based Innovation

The evidence-based innovation to be deployed is the current evidence-based standards of practice and practice guidelines set forth by INS, CDC HICPAC, and other relevant research currently available regarding vascular access management and care. The translation process will be the work completed by the interdisciplinary staff nurse committee and nursing leadership around the updated policy and educational content and methods for delivery.

Transfer Strategies

Transfer strategies include dissemination, diffusion, and implementation of the innovation. For the purposes of this project this will include initial nursing education for every nurse in the facility in a skills fair style setting. Diffusion of information will also take place with the committee staff members on each unit who will serve as champions for the change and be able to provide additional ongoing education monthly.

Adoption

Adoption of the innovation practice will be evaluated through post intervention direct observations of nursing practice and care with VADs. Post intervention data collection will take place two months post education intervention on various nursing units in similar fashion as baseline data.

Outcomes

The project will evaluate the adoption of evidence-based practice standards for vascular access management and care, which according to research has shown to impact positive clinical outcome for patients with VADs. Expected outcomes from this quality improvement project include increased compliance with hand hygiene compliance on entry to patient room, maintenance of aseptic technique in manipulating devices, performing proper hub and site maintenance, and performing correct sequence and process for flushing and clamping practices. Plan Do Study Act (PDSA) processes will be utilized to institute and measure practices educated and implemented on through the program and ongoing monthly education.

Goals & Objectives & Expected Outcomes

According to Morrell (2020), there is significant variation in current vascular access practice accentuating the importance of implementing quality improvement programs tailored to individual facilities and respective staff. The primary objective of this quality improvement project is implementation of a vascular access management program that incorporates evidence-based practice standards of care and maintenance of all VADs within two months. Goals for measuring project success include increasing compliance for each bundle component from baseline data by a minimum of 20% within the two-month period post education intervention. Current bundle components include hand hygiene compliance on entry to patient room, maintenance of aseptic technique in manipulating devices, performing proper hub and site maintenance, and performing correct sequence and process for flushing and clamping practices Baseline data from needs assessment for the bundle compliance was hand hygiene on room entry at 66%, maintenance for aseptic technique between 0-33%; proper hub and site maintenance at 15-30%; and correct flushing and clamping sequence at 15-50%.

Methods

The quality improvement project will use the OMRU model as a framework to implement a vascular access management program in a 400-bed community medical center. The project will include education for all nurses on campus with a focus in thirteen adult inpatient nursing units of various levels of care. The program will include implementation of a nursing leader process owner to facilitate the program and processes and implementation of an interdisciplinary nursing committee with staff representation from each unit to ultimately drive the changes needed to implement the vascular access management program. The initial multifaceted program will include the establishment of a nursing leader process owner for the facility who will serve as the executive sponsor and help drive changes and help eliminate barriers for the newly established interdisciplinary team to successfully achieve policy revamp to meet established standards of evidenced-based best practice, and an initial education plan to disseminate changes specifically with 'scrubbing the hub', hand hygiene, and flushing and clamping practices. Subsequent monthly ongoing education will be disseminated by interdisciplinary team members to ensure that ongoing education is achieved. Findings from this project will be used to expand the scope and breadth of the vascular access management program across the facility.

As the CDC HICPAC (2017) states, it is not only important to implement comprehensive prevention programs, but sustained elimination of CRBSI requires continued effort. According to Nickel (2019), standards such as INS and CDC HICPAC must be fully integrated into education, competencies, and daily workflows to positively influence patient outcomes. For the purposes of this quality improvement project, the focus of the vascular access management program will be to establish evidence-based best practice standards as noted by the INS for the management of

vascular access and focus on the elimination of variation in the processes related to vascular access management.

Project Design

The project design is a quality improvement project that will include practice and educational interventions. Quantitative methods will be utilized to measure nursing practice compliance with policy changes reflective of evidence-based practice standards of care. First a nursing leader process owner to serve as executive sponsor for the interdisciplinary team will be identified. The process owner will be able to provide support for the vascular access management program and facilitate implementation of processes. Second an interdisciplinary nursing team will be developed, with representation from each nursing unit. This team will meet at a minimum of once a month. The nursing leader process owner will serve as executive sponsor for the team and assist in eliminating barriers and moving the team and processes forward. The team will review the gap analysis information, INS standards, and work to come to a consensus on recommended policy changes needed to reflect evidence-based best practice standards for vascular access management. Once the policy has been approved for publication at the facility, the team will develop the education content to be delivered to all nurses, regardless of practice area or specialty. The policy will be updated in its entirety for publication, but the focus of the study will be on developing and implementing the specific EBP care bundle of hand hygiene, maintenance of aseptic technique, proper site and hub maintenance, and correct flushing and clamping sequences on the identified thirteen nursing units. The education will consist of a skills station at the hospital annual skills fair with educational brochure enumerating policy changes and hands on skills with return demonstration for site maintenance, hand hygiene, and flushing and clamping sequences. Each nurse will spend fifteen minutes at the skills station which will be

taught by members of the interdisciplinary team. This education will be mandatory for all nurses in the facility and will be documented in their annual education competencies. The education will be provided to all nurses since the policy changes will be effective for the facility. The quality improvement project will continue to focus on the thirteen inpatient units and expand to the facility upon successful completion of the project . Once nursing staff have received education on the new policy changes, post intervention observations will be performed to measure compliance with newly adopted hand hygiene, site maintenance, and flushing and clamping policies and procedures. Post intervention observations will take place utilizing the BD© VAM Assessment methods that were utilized for performing the needs assessment to obtain baseline data which include direct observation, staged assessments, and chart reviews two months after the education session has taken place. Observed instances of noncompliance will be addressed at the time of observation with the intent to identify and understand barriers to compliance followed by ongoing education and remediation.

Project Site and Population

The quality improvement project will take place in a 400-bed, tertiary community medical center, forty miles north of Houston, Texas. The facility currently operates as a three-time Magnet™, Level II Trauma and Comprehensive Stroke Center, as well as serving as one of the busiest surgical centers in the Houston area. Participants in the project will included nursing services and leadership, advanced practice providers, medical staff, professional development, and patients with a VAD. Key stakeholders include nursing leadership and nursing committee unit representatives.

The PI currently serves as a Director of Patient Care at the project site and will serve in the role of nursing leader process owner for the program and advisor for the nursing committee

with unit staff representatives. In completing the quality improvement project, the student will interact with nursing staff through the committee, educational intervention, and during the pre/post intervention direct practice observations of VAD care. During the direct observations, the PI will also encounter patient interaction in various nursing units throughout the facility. See Appendix E for facility letter of support furnished by the site Chief Nursing Officer.

The SWOT analysis, facilitators, and resources to note include leadership support of the initiative, current CLABSI rate is lower than national benchmark, and facility staff are familiar with similar quality improvement initiatives that were implemented in previous years to prevent catheter associated urinary tract infections. Barriers to the project include competing priorities such as staffing deficiencies, educational programs currently in progress, and of course the long-term effects of the COVID-19 pandemic. To overcome these barriers, it is imperative to have leadership and staff champion support amongst the key stakeholders. Aside from the fact that there are competing priorities in the facility and the need to plan accordingly, the project implementation is also part of a proactive intervention not being driven by typical quality or financial metrics in a reactive manner.

Measurement Instruments

To measure the goals and objectives for this project, the assessment methods used for performing the needs assessment utilizing the BD© VAM Assessment will be completed two months post education intervention. The assessment methods consist of direct observations and randomized staged assessments in various participating units and concurrent chart reviews for ten percent of average daily census with vascular access on the thirteen in-patient nursing units.

Data Collection Procedures

The ORMU theoretical framework used for this project is overlayed with the Assess-

Monitor-Evaluate-Outcomes model, as seen in Appendix D which can be used to describe the data collection procedures for the project. Refer to the quality improvement project timeline in Appendix F for specific information regarding each portion of the project.

Assess

Assessment was performed at the project site with a needs assessment of the current vascular access management program and baseline data collection of nursing practice and care of VADs. Performing these assessments are vital to collect information specific to the project site to be able to provide tailored education to staff. The was performed on multiple units over a three-day period. The baseline data collection will be completed while the policy revamp occurs and prior to educational intervention deployment. Since the project is a quality improvement project based on evidence-based best practice standards, University of Texas Health Science Center Institutional Review Board (UT-IRB) submission will be completed for quality improvement approval, see Appendix G for UT-IRB guidelines. If approved as is, the project design will be geared toward the entire facility and will not require participant recruitment for the educational intervention. The PI will obtain consent from nurses during direct observations of VAD access and care post education intervention. Nurses will have the opportunity to opt out of having their information included in the study.

Monitor

Monitoring of the project intervention will consist of feedback from nursing leadership, continued education, and nursing staff. The educational intervention will be structured by the nursing staff committee representatives armed with information from the needs assessment to help garner buy in from bedside staff.

Evaluate

Evaluation of practice adoption will be completed through post-intervention assessment similar to the baseline needs assessment of direct observations, staged assessments, and chart reviews by the PI. Subsequent education will be targeted towards continued deficiencies noted in practice.

Outcomes

Implementation of a vascular access management program that incorporates evidence-based practice standards of care and maintenance of all VADs within 2 months will be measured through goal attainment of increased compliance with hand hygiene compliance on entry to patient room, maintenance of aseptic technique in manipulating devices, performing proper hub and site maintenance, and performing correct sequence and process for flushing and clamping practices as observed in post intervention observations.

Data Analysis, Maintenance & Security

The quality improvement project will employ a paired sample design measuring pre and post intervention data that will be quantitative in nature. Descriptive statistics will be collected and analyzed while quantitative data will be analyzed using an unpaired sample t test and p value. Graphical representations of data collected will be provided.

Data maintenance and security will be controlled and secured by the PI. All data will be de-identified and stored in a secure server (UABox). Individual participants will not be identified, and no Patient Health Information (PHI) will be included. A limited number of research team members will have access to the data during data collection. No personally identifying information will be collected or recorded. Each observation will be assigned a unique code for which corresponding contact information will be stored on a master key that will be stored in a HIPAA compliant server (UA Box). All observations will be given a unique code for analysis. The master list of unique code will be destroyed three years following the end of the

study. De-identified survey data will be stored indefinitely.

Cost-Benefit Analysis/Budget

There will be no significant resources needed to implement the project. The educational intervention will take place during the project site's annual skill's day for all staff. The Chief Nursing Officer is in full support for establishing the shared governance committee with nursing staff to help implement and effect ongoing change at the site. Since there are no costs associated with the project, no budget has been created. Although there is not cost for project implementation there is a potential for economic benefit if the project clinical outcomes are achieved. Decreasing CVL and PIV catheter utilization will decrease supply cost and staff time spent on the insertion task. As Helm et al (2019) noted, each CLABSI event can add up to $56,000 in additional patient care costs and 7 to 20 days in additional hospital days. If the project site can decrease CLABSI incidence even by one, there will be a positive financial impact.

Timeline

The timeline for the quality improvement project will be divided into two phases, pre work and project work. The pre work phase consists of the project site needs assessment, proposal writing, and IRB submission processes for both UT and Alabama. The pre work phase has a planned duration of two months with the ability to be completed ahead of planned schedule. The project work phase will include gathering baseline data, policy analysis and revamp with required nursing committee approvals, educational intervention development and delivery, and post intervention observations after two months. Refer to the project Gantt chart in Appendix F for further detailed information on each project task and associated timeline. Once the post intervention data collection is complete, analysis and dissemination of findings will be expected within the next six months, 6 months total time.

Ethical Considerations/Protection of Human Subjects

The University of Alabama (UA) IRB and UT-IRB approval will be obtained prior to initiating this project. Participants will be protected by the Health Insurance Portability and Accountability Act of 1996 (HIPAA), which is in place to protect the patient's privacy and associated health information. Evidence-based practice standards of care as set forth by the INS and CDC HICPAC for vascular access management will be carefully followed and drive all portions of the project. Information collected during direct observations of VAD care will not include any potential patient identifiers or PHI.

Minimal risks to participants are anticipated. However, this is expected job performance and nurses may experience scrutiny related to performance with effect to their performance evaluation. This would be true with or without participation in the study, so participation does not elevate their risk. All information collected will be stored on the HIPPA secure UA box and hard copies will be destroyed in a HIPPA compliant shred receptacle.

Conclusion

As nurses we have a responsibility and commitment to our patients and our profession to continually improve our care delivery and ensure that we are compliant with the most current evidence-based best practices available. Many studies have proved the value of implementing vascular access bundles with current standards of care to achieve positive clinical outcomes solely focusing on CVLs. By implementing this quality improvement project, the project site has the potential to achieve cost savings, improved patient safety and satisfaction, decrease CLABSI rates, and improve overall vascular access processes through implementation of a vascular access management program in alignment with evidence-based best practices.

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Appendix A

Figure 1:

SWOT Analysis

STRENGTHS

- Culture of safety organization
- Three time Magnet facility
- Facility currently has low CLABSI SIR
- Leadership support to pursue initiative
- Familiarity with implementing standard-ized practice to decrease CAUTI events

WEAKNESSES

- Currently no focus on CABSI due to low CLABSI SIR
- Gaps in policy and practice with respect to the most current standards of care
- Various levels of readiness to change across facility

OPPORTUNITIES

- Ability to be proactive in focusing and monitoring all vascular access devices in preparation for CMS definition change from CLABSI to CABSI
- Ability to standardize practice across facility and decrease variability

THREATS

- Competing priorities with other facility initiatives
- Complex process implementation for facility wide practice change

Appendix B

Figure 2:

Vascular Access Site Risks for Central Lines

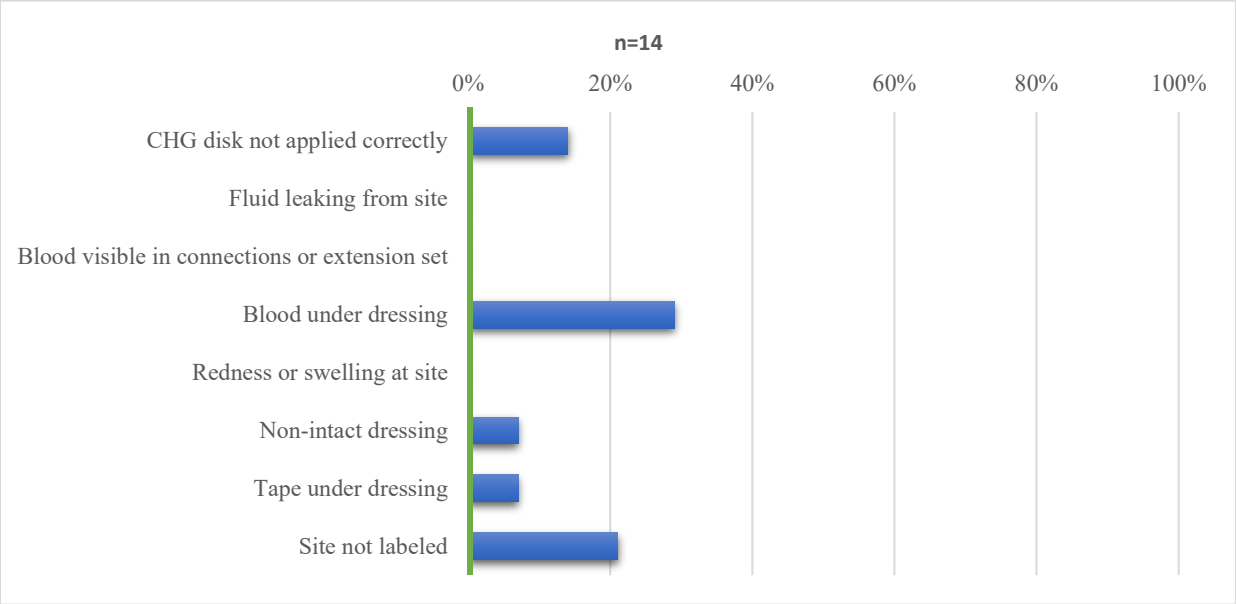


Figure 3:

Central Line Dressing Change Staged Assessments

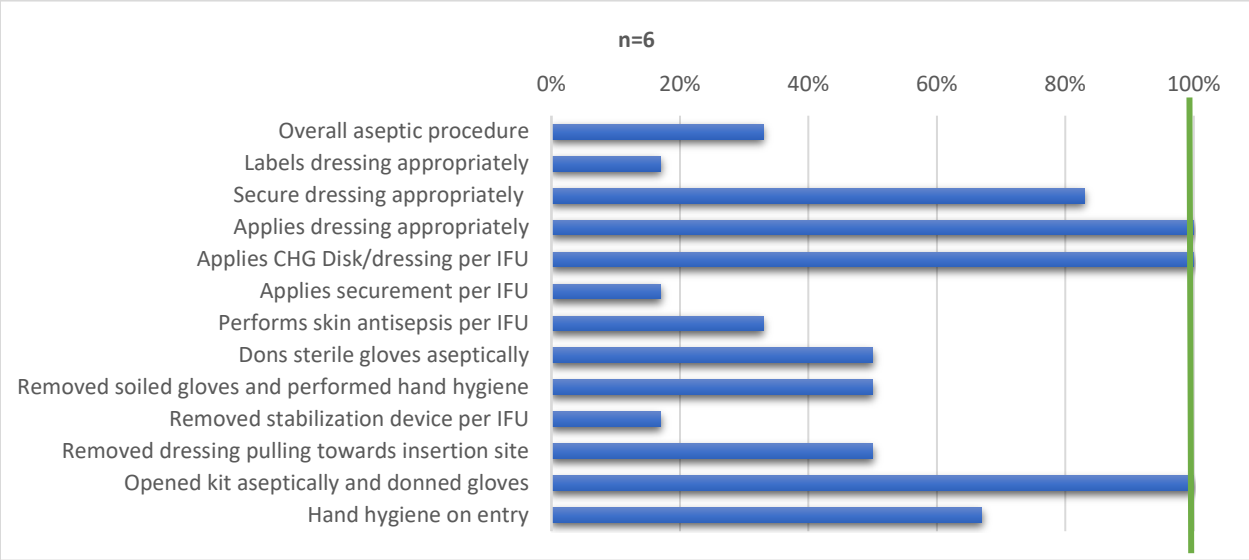


Figure 4:

Hub Maintenance Staged Assessments

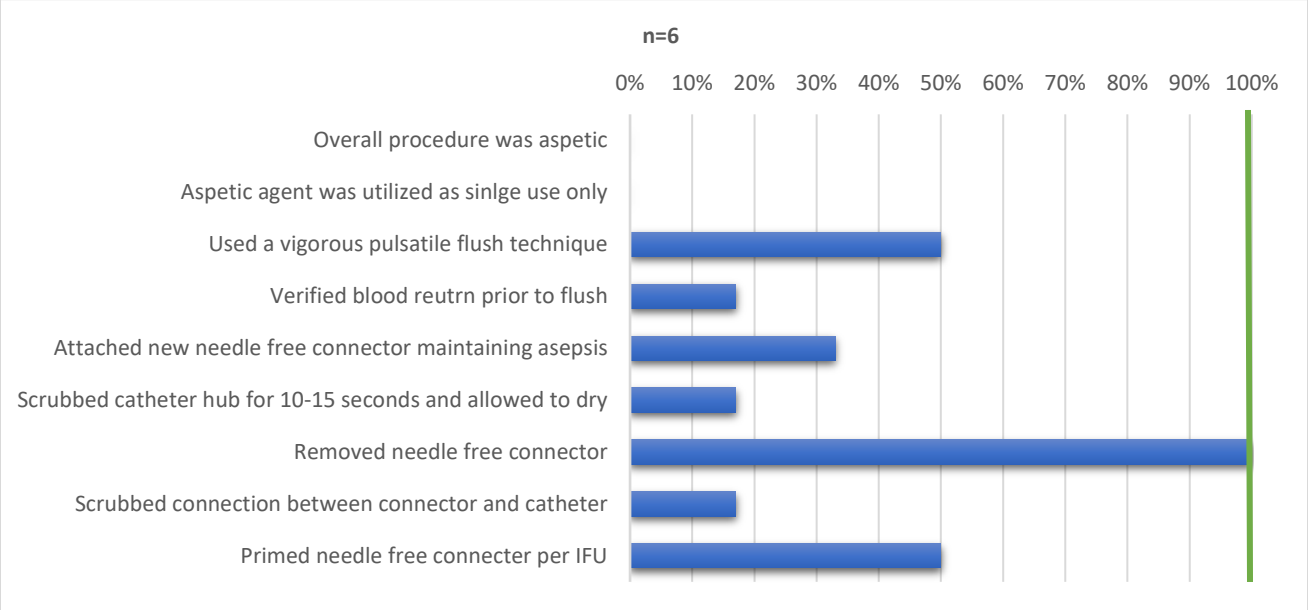


Figure 5:

PIV Insertion Staged Assessments

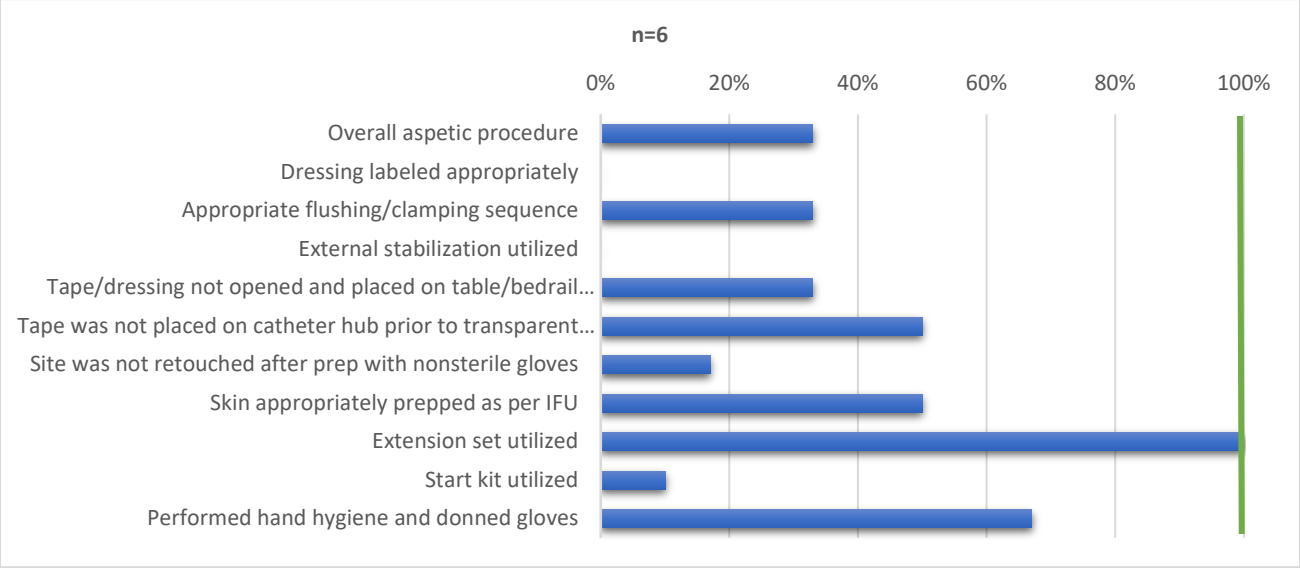


Figure 6:

IV Push Medication Administration Staged Assessment

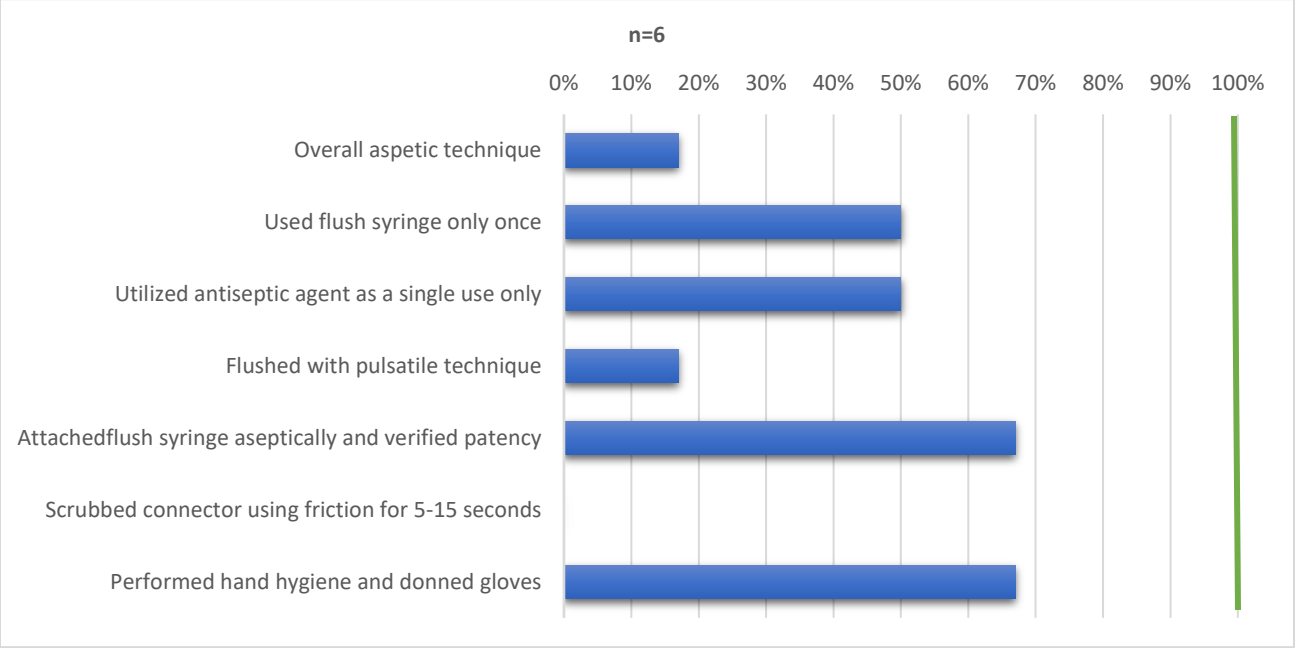


Figure 7:

Vascular Access Site Risks for PIVs

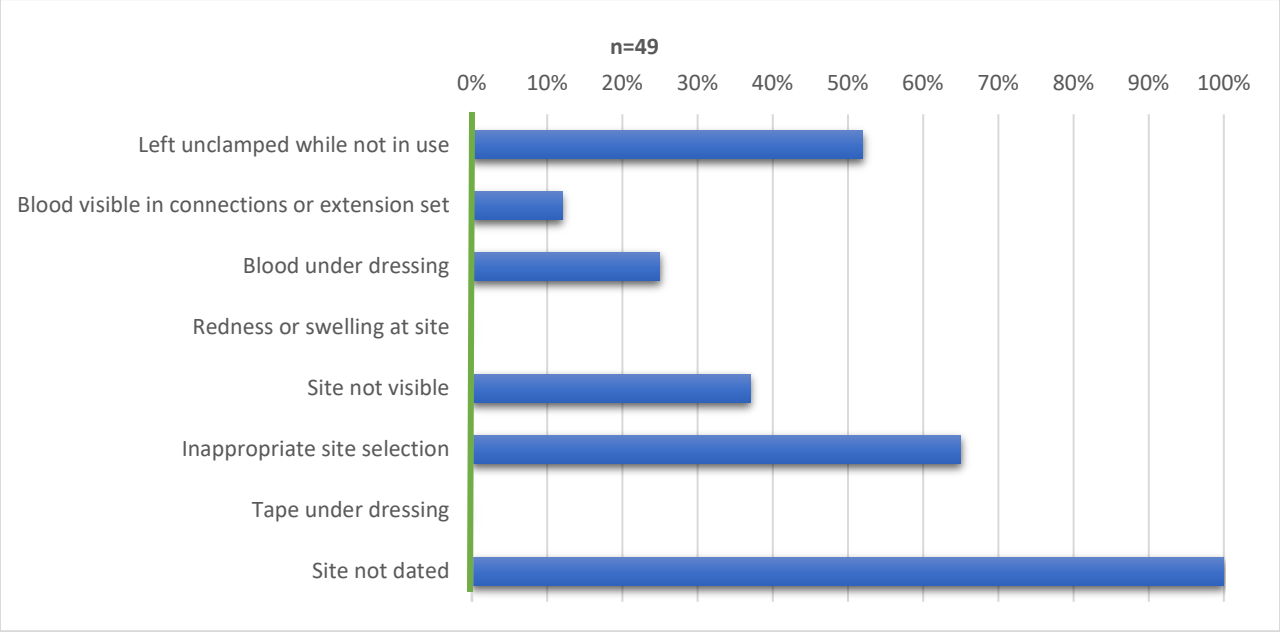


Figure 8:

Clinician Reported Skin Prep and Dry Times for PIVs

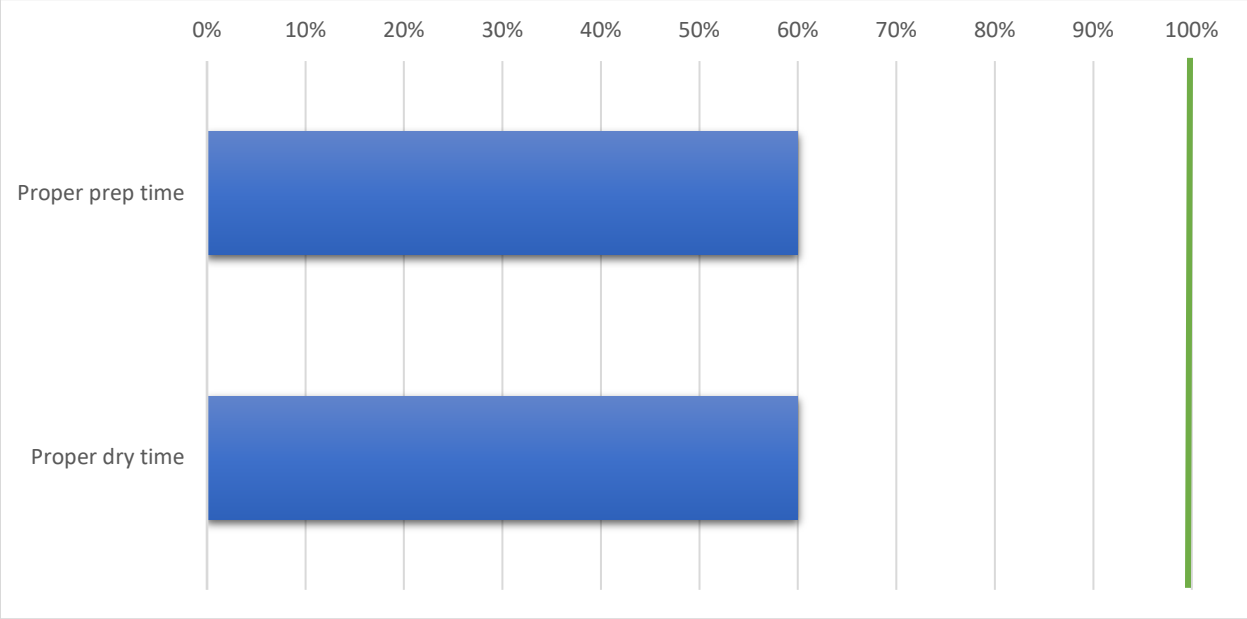
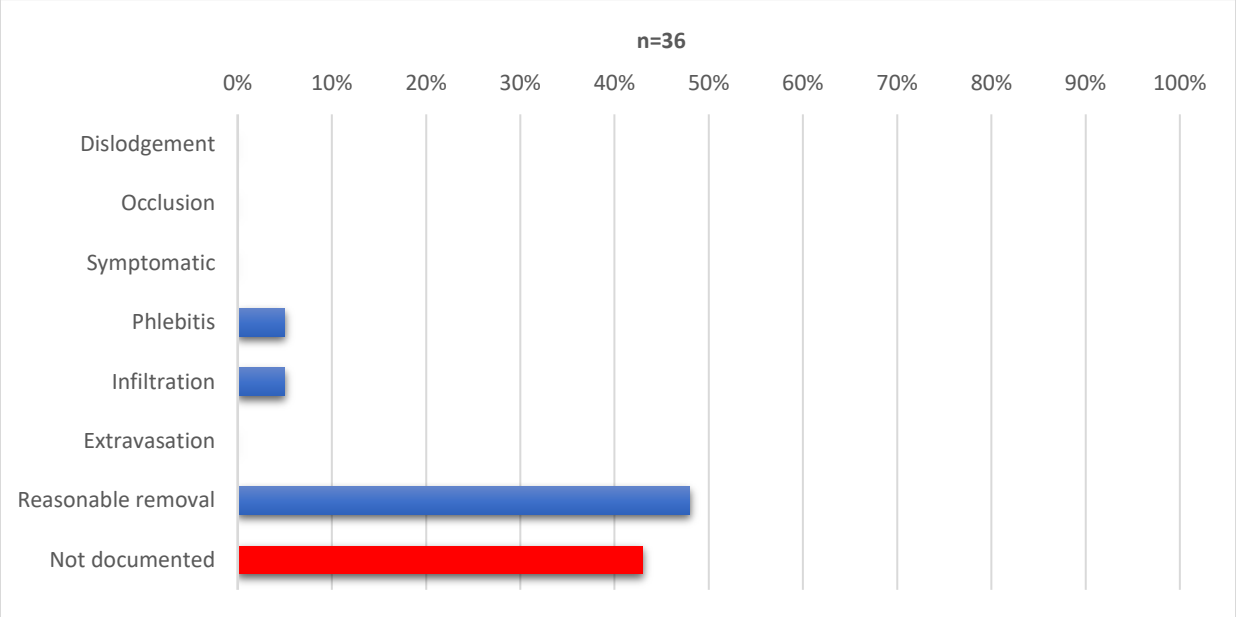


Figure 9:

Documented Reasons for PIV Removal



Appendix C

Evidence Table

Article	Title	First author & date	Evidence Type	Sample/ setting	Findings that answer the EBP question	Observable Measures	Limitations	Level of Evidence
1	Positive effect of care bundles on patients with central venous catheter insertions at a tertiary hospital in Beijing, China	**Sun, Y. (2020)**	Single center, randomized control study	• Patients with CVC insertion from ICU, general surgery ward, and emergency ward. • 212 patients total Randomly divided into 106 in each group	• Article of interest due implementation and evaluation of care bundle on the prevention of CRBSI and improving patient's experience in case group compared to control group with conventional nursing care Case group given conventional care in addition to care bundle (nurse education, hand hygiene, maximal sterile barrier, bedside	• Study suggest care bundles can improve patient's psychological state and hospitalization satisfaction and reduce number of days, and significant reduction in CRBSI • After care bundle intervention, hospitalization days and CRBSI rate were significantly lower in case group than in control group ($P<0.05$ for both)	• Single center study • Only implemented a specific portion of bundle	**Level I-B**

					observation, and evaluation)	• Hospitalization satisfaction score was significantly higher in case group (*P<0.05*		
2	Disinfection of needleless connector hubs: clinical evidence systematic review	**Moureau, N.L. (2015)**	Systematic review using Pubmed, Medline, Scopus, Ovid, jStor, CINAHL, Cochrane, Athens, and ScienceDirect	• initial yield- 433 • 259 excluded 67 of the 140 included studies were considered after grading strength of study	• Developed table of recommendations for disinfections practices with associated levels of evidence. Range from A-C. Aseptic technique is foundation of delivery of intravenous medications	Greatest risk for contamination of catheter after insertion is the NC and compliance with disinfection	• Highlights lack of available high quality research in subject area Studies to date have a risk of unintentional bias due to lack of randomization and control group/strategies	**Level II-A**
3	Evidence based measures to prevent central line-associated bloodstream infections: a systematic	**Perin, D.C. (2016).**	Systematic review using Pubmed, Socpus, CINAHL, Web of Science, Lilacs, Bdenf, and Cochrane	• 1,611 initial yield • 126 duplicate • 1333 excluded. 152 reviewed	• Level 2 evidence finding: variety of educational approaches could be cost effective and decrease facility's costs	26 of 34 studies presented significant results in decreasing CLABSI	Lack of evidence addressing different types of catheters and more abundant systematic	**Level III-A**

	review		studies	full text, 118 excluded. 34 studies included in review	Level 2c evidence finding: bundle cleansing hub with CHG for 15 secs, daily bath with CHG cloth, daily nursing rounds showed progressive decrease in CLABSI		reviews with higher levels of evidence	
4	Nurse's knowledge on routine care and maintenance of adult vascular access devices: A scoping review	**Raynak, A. (2020)**	Scoping Review: Medline-Ovid; Embase-Ovid; Ebsco CINAHL Plus; ProQuest Nursing & Allied Health Database PRISMA-ScR checklist	• 4,099 abstracts identified • 3,789 articles excluded based on criteria set • 310 full text reviewed-276 excluded • 36 full text articles included	Variability in nurse's knowledge around CVAD and PIV- room for improvement in educational preparation of nurses and a need for workplace training	• Review raises awareness to poor state of nursing knowledge of VAD routine care and maintenance and importance of addressing the knowledge gap • Calls for early nursing education regard VAD care to narrow the gap	• Given sheer volume of VADs used in healthcare-surprising only 36 studies were found • Studies suggest that VAD care globally is a healthcare concern • Identified main themes:	**Level III-A**

							nurses' specific knowledge regarding VADs; knowledge about VAD complications occlusion management; extravasation; a need for better workplace training	
5	Infusion Therapy Standards of Practice	**Gorski et al (2021)**	Clinical Practice Guideline		synthesizes specialty knowledge and provides a global focus on the shared standards of vascular access			**Level IV-A**
6	Guidelines for the Prevention of Intravascular Catheter-Related Infections	**O'Grady et al (2017)**	Clinical Practice Guideline		Guidelines for healthcare personnel who insert intravascular catheters and for persons responsible for			**Level IV-A**

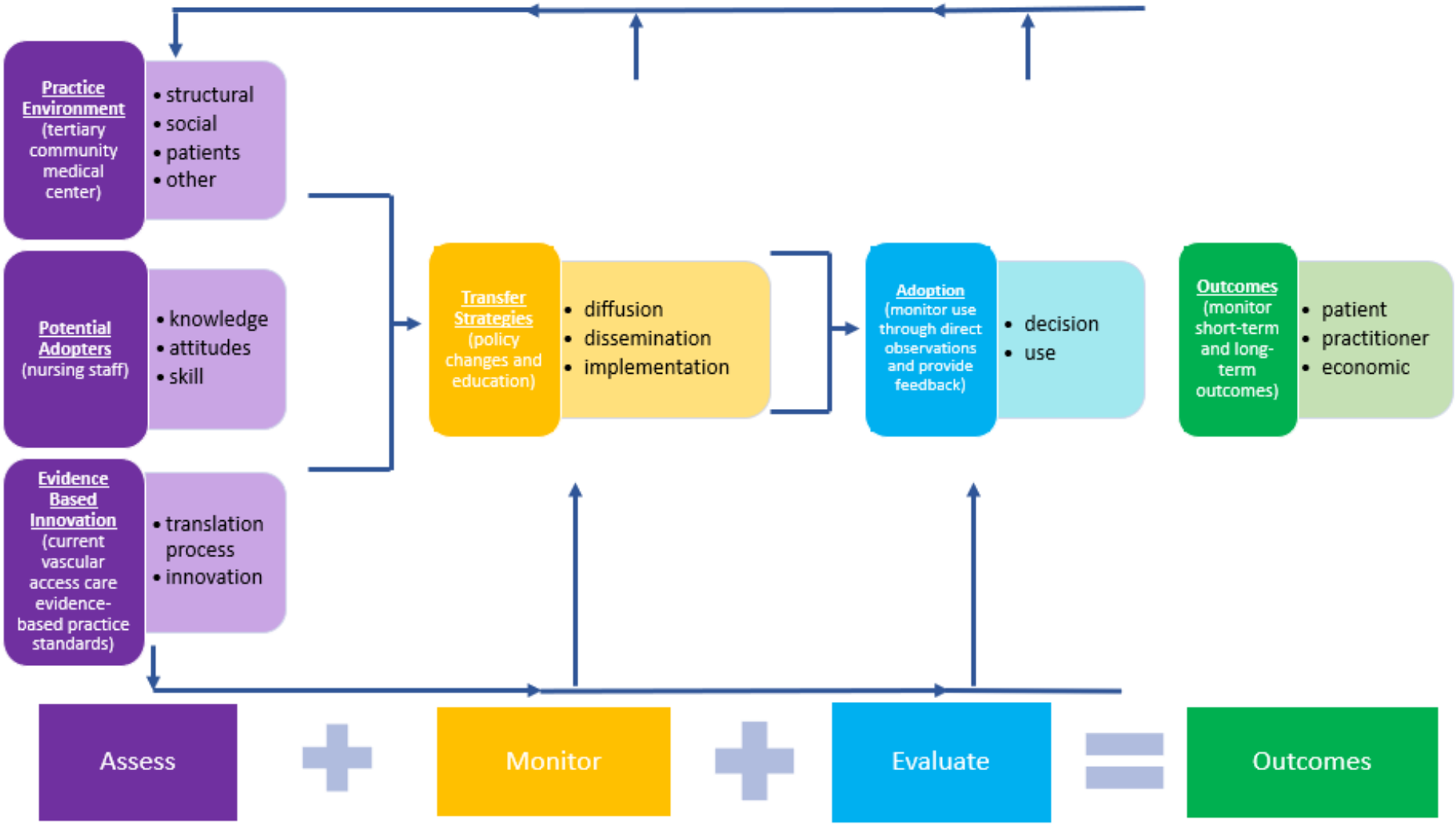
					surveillance and control of infections			
7	Vascular access device care and management: A comprehensive organizational approach	**Meyer, B.M. (2020)**	Infusion Nurses Society (INS) position statement- INS White Paper		• comprehensive organizational approach to VAD care and management is imperative	Significant findings include: • Infection prevention • Hand hygiene • Disinfect NCs • chlorhexidine • VAD necessity • Daily necessity • Remove immediately • VAD care and management • Administration sets change at established intervals/ loss of integrity • VAD dressing and securement device assessed daily and changed when damp, loose, or soiled		**Level IV-A**

						• Assess patency with every infusion Evaluate risks/benefits for blood sampling from VAD		
8	Implementing a daily maintenance care bundle to prevent central line-associated bloodstream infections in pediatric oncology patients	**Duffy, E.A. (2015)**	• Quality improvement project • Pre-post program design comparing rate of CLABSI over six months after implementation	• 32 bed pediatric hematology, oncology, and bone marrow transplant unit • Large tertiary medical institution • 600 annual admission to unit 68 nurses on staff	• Project confirms use of daily maintenance care bundle to decrease CLABSI • First implementation of project did not consider impact of nurse champions. Found that this practice is vital	• CLABSI rate • Documentation of daily maintenance bundle (hand hygiene, dressing changed appropriately, IV tubing changed appropriately, daily bath or shower performed, and central lines entered appropriately)	• Chart audit did not measure compliance with all component of daily care bundle; due to lack of charting (ie. Hand washing) • Compliance with CHG bathing was not measured	**Level IV-A**
9	Reassessing standards of vascular access device care: a follow-up audits	**McGuire, R. (2019).**	Convenience sampling audit. Utilized same audit tool from 2013 study	• 500 bed general hospital • 158 devices audited (156	Introducing a bundle strategy of staff training, education, and standardized guidelines proved effective	• Bundle elements evaluated on audit: • Dressing dry, clean & intact	Success cannot be attributed to one single initiative	**Level V-A**

				PIVs; 2 PICCs)		• Dressing dated • Inserted site visible • Insertion documented • Ongoing observation • Clinical indication • Dwell time		

Appendix D

OMRU Theoretical Framework for Program Implementation



Appendix E

Project Site Letter of Support

MEMORIAL HERMANN
The Woodlands Medical Center

June 15, 2021

To: University of Alabama Capstone College of Nursing

RE: DNP Project: Implementing a Comprehensive Vascular Access Management Program for Achieving Positive Clinical Outcomes by Rebecca Davis

To Whom It May Concern,

This is a letter of support for the project titles: Implementing a Comprehensive Vascular Access Management Program for Achieving Positive Clinical Outcomes that will be conducted by Rebecca Davis for her DNP project at the University of Alabama Capstone College of Nursing. She will have the support and needed resources to complete her project in accordance Memorial Hermann policies and procedures.

Sincerely,

Catherine A. Giegerich

Catherine A. Giegerich, DNP, MS, RN, FACHE
Vice President – Nursing; Chief Nursing Officer
Memorial Hermann The Woodlands Medical Center

Appendix F

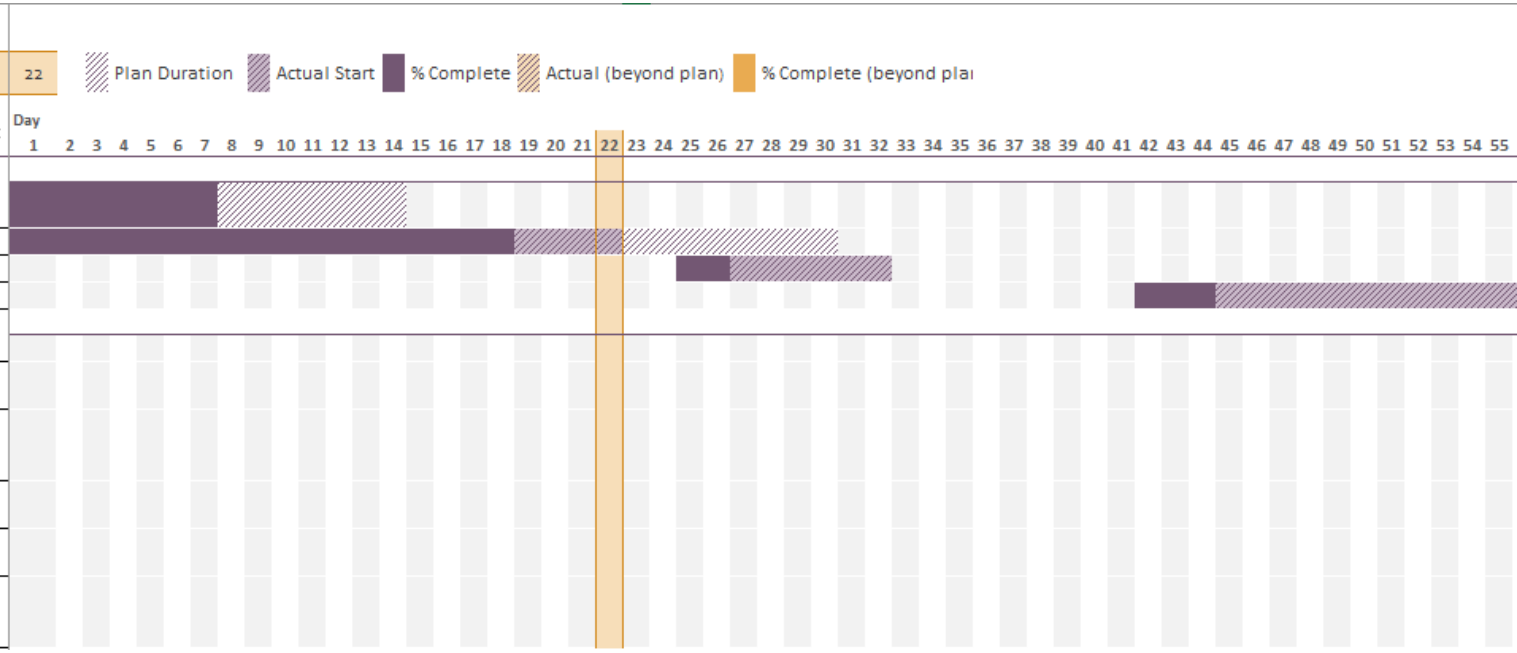
Project Timeline

Davis DNP Project Timeline

Day Highlight: 22

Plan Duration | Actual Start | % Complete | Actual (beyond plan) | % Complete (beyond plan)

ACTIVITY	PLAN START	PLAN DURATION	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
PreWork					
Needs Assessment	1	14	1	7	100%
Proposal Writing	1	30	1	22	85%
UT IRB	25	8	25	8	25%
Alabama IRB	42	15	42	15	25%
Project Work					
Baseline data	61	30	61	30	0%
Policy Analysis & Revamp	61	30	61	30	0%
Nursing Committee Implementation	61	14	61	14	0%
Education development	61	7	61	7	0%
Educational intervention	91	4	91	4	0%
Post intervention observations	100	56	100	56	0%



Appendix G

UT IRB Guidelines

University of Texas Health Science Center at Houston

QI Project Charter Template
Adapted from Advanced Standards for Quality Improvement Reporting Excellence – SQUIRE 2.0

Project Title:

Project Leader:

Key Personnel: List all collaborators

Performance Sites: List all the sites where the project will be conducted.

Project Duration: State duration of project

General Information
- A brief description of the project.

Background
- Problem description – nature and significance of the problem.
- Available knowledge – summary of what is currently known about the problem, including relevant previous studies.
- Rationale – Informal or formal frameworks, models, concepts, and/or theories used to explain the problem, any reasons or assumptions that were used to develop the intervention(s), and reasons why the intervention(s) was expected to work.

Objectives or Goals
- Primary and secondary objectives.
- Include statement of aim e.g., to assess, to determine, to compare, to evaluate and method of assessing how the objective is met, i.e., the project outcome measure.

Project Design
- A description of the design of the project to be conducted.
- Description of the intervention in sufficient detail.
- Expected duration of project.
- A specific statement of the primary and secondary outcomes to be measured during the project (must be consistent with Project Objectives).

Population
- The population and inclusion/exclusion criteria should be clearly defined in this section of the protocol.
- This section should include a discussion of selection of the project population and inclusion/exclusion criteria.
- Describe the recruitment strategy (if applicable).

University of Texas Health Science Center at Houston

Procedures

- Specify the type of information that will be gathered, along with the means for collecting and recording it.
- If data is going to be stored, describe the plans for storage, duration of storage and procedure to maintain confidentiality.

Risks and Benefits

- Describe and assess any risks and asses the likelihood and seriousness of such risks.
- Consider any potential benefits including potential benefits for individual participants.
- Consider potential harms particularly associated with efforts to improve the quality, safety, and value of healthcare services include opportunity costs, invasion of privacy, and staff distress resulting from disclosure of poor performance.
- Describe plans for identifying, managing and reporting any unanticipated problems

Data Confidentiality

- If the project includes protected health information, describe the plan to protect data confidentiality.

Statistics

- Qualitative and quantitative methods used to draw inferences from the data.
- Methods for understanding variation within the data, including effects of time as a variable.

Ethics

- Ethical aspects of implementing and studying the intervention(s) and how they were addressed including, but not limited to, formal ethics review and potential conflict(s) of interest.
- Describe the consent process, if any.

Post Project Plan

- Describe plans for publication and/or dissemination of the results of the project.
- Describe plans for implementation of recommendation from the QI project at this institution.

References

- List references relevant to the project

ATTACHMENTS (when applicable)

1. Schematic of Project Design
2. Consent Document
3. Data Collection Forms
4. Surveys and Questionnaires