

Regis University

ePublications at Regis University

Regis University Student Publications
(comprehensive collection)

Regis University Student Publications

Fall 2020

Peripheral Intravenous Education for Nurses

Sara M. Gibbons
Regis University

Follow this and additional works at: <https://epublications.regis.edu/theses>

Recommended Citation

Gibbons, Sara M., "Peripheral Intravenous Education for Nurses" (2020). *Regis University Student Publications (comprehensive collection)*. 978.
<https://epublications.regis.edu/theses/978>

This Thesis - Open Access is brought to you for free and open access by the Regis University Student Publications at ePublications at Regis University. It has been accepted for inclusion in Regis University Student Publications (comprehensive collection) by an authorized administrator of ePublications at Regis University. For more information, please contact epublications@regis.edu.

Peripheral Intravenous Education for Nurses

Sara M. Gibbons

Submitted to Patricia Cullen, PhD, CPNP-C in partial fulfillment of

NR 706C

Regis University

August 24, 2019

Peripheral Intravenous Education for Nurses

Executive Summary

Title: Peripheral Intravenous Education for Nurses

Problem: Nurses enter the profession with little to no experience with peripheral intravenous (PIV) insertions and lack the requisite confidence and skill level needed to insert and maintain PIV lines. This greatly impacts patient satisfaction and the ability to provide care in a timely manner. The vascular access team (VAT) is also inundated with calls for PIV insertions and this prevents the team from being able to focus on central line insertions, care, and maintenance.

Purpose: The purpose of this project was to provide education and mentoring to new nurses with 0-5 years of experience that focused on insertion techniques as well as care and maintenance of peripheral intravenous lines.

Goal: The success of this project demonstrated that education and mentoring can help improve nursing confidence and skill level with PIV insertion, increase first attempt success rate, and ultimately affect patient satisfaction. Although patient satisfaction was not a data point that was tracked in this study, it was a dependent variable that can be affected downstream.

Objective: Improve nurse-reported self-efficacy and skill level with PIV placement and care and to reduce the number of calls to the VAT for PIV access by 10%.

Plan: The project provided a one-hour educational offering to all nurses, on an acute care inpatient unit, with 0-5 years nursing experience. A pre-intervention survey was completed by all participants prior to the class and a post intervention survey was completed immediately following the class and again at one-month post intervention. VAT calls data were also evaluated for one-month pre-intervention, the month during the intervention, and one month post intervention.

Outcomes/Results: There was a statistically significant change in the mean scores from the pre-aggregate data to the first post-aggregate survey data. With a p-value of 0.003 and a positive shift in the mean scores, the intervention was effective, and the nurse-reported self-efficacy improved. There was also a statistically significant change from the post-aggregate 1 survey data to the post-aggregate 2 survey data. With a p-value of 0.012 and a negative shift in the mean scores, although the intervention was successful, the knowledge was not retained. There was also a 10.5% decrease in calls to the VAT in the one-month post-intervention.

“Healthcare professionals often perform peripheral intravenous catheterization (PIVC) on adult inpatients and emergency department patients. PIVC prevalence rates of 85% are expected to rise with increased intravenous therapeutics use” (Parker, et al., 2016, p.15). Success rates with first attempt are as low as 50% in the literature and first attempt success ensures that patients receive the medications and therapies that they need in a timely manner. It also leads to less painful procedures for patients and a decrease in catheter related infections and phlebitis (Parker, et al., 2016). With an increase in the need for peripheral access and the increase in acuity of hospitalized patients, it is imperative that nurses are comfortable and successful with starting peripheral intravenous (PIV) access. Many new nurses complain that they get little to no education in school and very few attempts at initiating PIV lines during schooling and enter the workforce with minimal experience which results in low levels of confidence and skill level. “Nursing is a practice-based profession and learning quality depends on the quality of clinical experience, through which, students manage to integrate theory and practice and also gain the values and characteristics of professionals” (Bitsika, et al., 2013, p.15). Since many skills are now learned after the graduate is hired as a newly licensed registered nurse, training must be integrated into their onboarding process to increase their skill level, and in turn, increase their confidence in starting peripheral intravenous lines. The purpose of this paper is to present the final report for this investigator’s Doctor of Nursing Practice (DNP) project.

Problem Recognition/Definition

Problem Statement

At Littleton Adventist Hospital (LAH) in Littleton, Colorado, the vascular access team (VAT) starts approximately 200 PIVs on a monthly basis. Many of these calls are for patients

with difficult access, but the team often hears from newer nurses who report they are afraid to attempt such access for their patient, they don't want to miss, or they just don't have the experience and confidence level to even attempt to start the PIV. Therefore, the VAT starts many PIVs daily that could be started by the floor nurse if he/she had the requisite confidence and skill level. The hospital also receives multiple negative comments monthly in their patient satisfaction survey responses related to this issue. The comments indicate that patients are leaving the hospital bruised on both arms, that they underwent access attempts multiple times before someone was able to gain access, and they doubt the confidence and skill level of the nurse starting their PIV. These experiences greatly impact patient satisfaction, and something must be done to improve this nursing skill throughout the facility to ensure our patients are receiving the best care and having optimal outcomes.

Project Purpose/PICO Question

The purpose of this quality improvement project was to provide education to nurses with 0-5 years nursing experience that focuses on insertion, care, and maintenance of peripheral intravenous lines. There was no new knowledge developed through this project outside of LAH. The Problem/Population-Intervention-Comparison-Outcome (PICO) question used for this project was: Will an educational program that teaches newer nurses (0-5 years' experience) how to insert and maintain peripheral intravenous access increase the nurse's confidence and skill level with peripheral IV insertions and result in decreased calls to the vascular access team? The population identified was LAH nurses with 0-5 years nursing experience. The intervention was an educational offering that focused on insertion techniques, care, and maintenance guidelines for peripheral intravenous lines. The comparison was the pre- and post-intervention self-reported

nurse self-efficacy, skill level, and number of calls to the VAT. And finally, the outcome was to show increased self-reported nurse self-efficacy, improved skill level, and decreased calls to the VAT.

Project Significance/Scope

This quality improvement project took place on an inpatient acute care unit at Littleton Adventist Hospital, a 231-bed community hospital. A convenience sample was used which was the entire population of nurses on the unit with 0-5 years nursing experience. The significance of this project is that newer nurses will have more confidence and skill level with PIV insertions, care, and maintenance as a result of project participation. It is imperative that nurses are given the tools and knowledge they need to insert and maintain peripheral access with success. When a nurse is unable to start an intravenous line, the patient may be stuck several times resulting in emotional and physical discomfort as well as delays in administration of medications, blood products, and other necessary therapies for the patient's condition. The VAT cannot focus on central line insertions and care and truly difficult access patients if the nurses on the unit cannot start their own peripheral lines. The success of this project would result in less attempts for peripheral access and discomfort for patients, less delays in care, increased patient satisfaction, and the VAT would be able to focus more productive time on central line insertion, central line care and maintenance, and difficult to access patients because the volume of calls for PIV insertions would decrease.

Foundational Theory

Two theories were chosen to support this quality improvement project and those include Betty Neuman's systems model and John Kotter's eight step change theory. The Neuman Systems model was developed in 1970 and the model looks at the client and the possible or actual reactions to stress. This model is considered a grand nursing theory and the purpose of the theory is to help guide nursing practice and research while considering the client as a system and creating systemic stability for the client. The client is viewed holistically and considers five variables – physiological, psychological, sociocultural, developmental, and spiritual (Neuman, 1990). The model is composed of several concepts which include the client or client system, the environment, and health or wellness. Clients can be considered one person or a group of people which can include a family, a community, or a society (Ume-Nwagbo, DeWan, & Lowry, 2006). The theory also addresses nursing interaction with the client. The nurse evaluates the client's response to a stressor, which can be external or internal, and assists the client back to a state of stability through intervention which consists of three levels, primary, secondary, and tertiary (Neuman, 1990).

The Neuman Systems Model is one of the most highly utilized grand nursing theories which is demonstrated through many articles applying its use to current research and practice. Betty Neuman has updated this theory several times since she originally developed the model. "The Neuman systems model provides a comprehensive, flexible, wholistic, and system-based perspective for nursing (Neuman, 1996, p.67)." Because this theory can be applied to individuals, families, communities, and even societies, it is relevant both socially and cross-culturally. It remains congruent with nursing standards and current nursing interventions because it can be applied to clinical practice as well as research. The model "provides an opportunity to

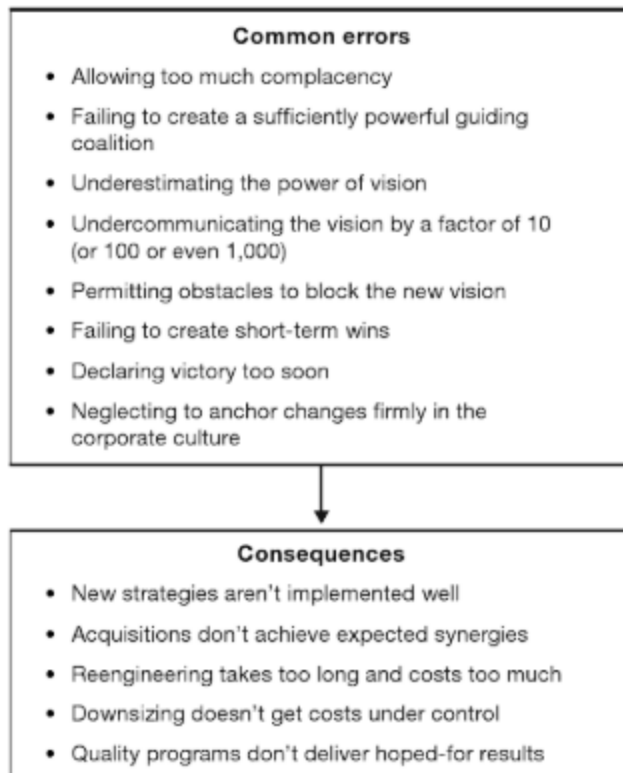
increase the scope of nursing practice because of its breadth and flexibility, and its focus which is congruent with emerging health care needs (Neuman, 1996, p.69).” The model has also been useful to create nursing assessments, diagnostic tools, nursing care plans, and many other useful tools in the nursing community (Neuman, 1996). The theory is also supported by research and according to Neuman, there are six rules that can help guide research using the Neuman systems model (Neuman, 1996). This theory relates to the problem statement since it evaluates how stressors affect the patient and their outcomes and how nursing can have an impact in preventing these stressors or intervening to help the patient through the situation when the stressor is presented. Pain, infiltration of the line, emotional distress, and multiple attempts for placement of the line are just a few examples of stressors that can be presented to the patient and alter their stability.

John Kotter’s eight steps of change process is a non-nursing theory that is applicable to the problem statement. The purpose of this theory is to help guide organizations through change and avoid the pitfalls that create failure in change. According to Kotter (2012), There are eight common errors that result in failure of change. Refer to figure 1. Based on these eight mistakes, Kotter developed the eight steps of change which include the following: 1) establish a sense of urgency 2) creating the guiding coalition 3) developing a vision and strategy 4) communicating the change vision 5) empowering broad-based action 6) generating short term wins 7) consolidating gains and producing more change 8) anchoring new approaches in the culture (Kotter, 2012, p.23). These steps are categorized into three phases. Stage 1 being “creating a climate for change,” stage 2 is “engaging and enabling the whole organization,” and stage 3 is implementing and sustaining the change (Campbell, 2008). Kotter notes that the first several steps are used to soften the “hardened status quo” and that change takes a lot of effort in the

beginning (Kotter, 2012, p. 24). The last few steps are used to help create new practices and ensure that the change is engrained in the culture (Kotter, 2012). This model can also be used in any context as it can be applied to any organization or profession including healthcare.

John Kotter developed a model that walks the user through the eight steps of change management and the three stages help link the steps together in phases. Once one phase has been completed, it is easy to move onto the next. In his book, Kotter defines the eight mistakes and the impending consequences as you can see in the diagram below.

Figure 1



(Kotter, 2012, p.16)

Kotter (2012), explains that early on, many organizations did not see the need to implement change and as time has gone on, there are many driving forces that have required organizations and professions to implement change to be able to compete in the market they exist in (Kotter,

2012). Therefore, it is imperative that change models like this exist to help overcome the barriers of change which can include lack of trust, poor leadership, pessimistic attitudes, prior negative experiences with change, and many others.

Although John Kotter's change model was not developed for nursing, it can easily be applied to the nursing world and the changes that are implemented in nursing. One example of using Kotter's change model in healthcare is described in an article by Mbamalu and Whiteman (2014), where they discuss the implementation of vascular access teams to decrease the amount of use of long term central venous catheters for hemodialysis and replace with long term access and this change will help improve patient outcomes (Mbamalu & Whiteman, 2014). A nurse manager can utilize the steps in the change model and apply it to any nursing problem or change that may need to be made. The theory has been tested in many different organizations and professions and is congruent with nursing standards. There are a multitude of other studies in healthcare that have used Kotter's model to implement change.

The investigator for this project chose this theory because the goal was to create a change in practice. It can be difficult in the beginning to gain buy-in from key stake holders. According to Campbell (2008), a manager in health care must be aware of the emotions that come with change and that these emotions can deter change from happening and being successful. He also discusses providing evidence and data to the individuals involved in the change and giving them the "why" of the change (Campbell, 2008). This eight-step process helps managers walk through all the pitfalls of change and what to do to move past those obstacles.

Review of Evidence

Systematic Literature Review

A thorough and vigorous literature review was conducted to identify published evidence that existed to support the goals of this project. Databases searched included CINAHL, PubMed, EBSCOhost, MEDLINE, and Academic Search Premiere. Initially, the search term used was “peripheral intravenous access.” This initial search term resulted in 2,088 articles. There were multiple studies and articles that focused on the care and maintenance of PIV devices as well as many articles that focused on placing PIVs in difficult access patients using ultrasound guidance or a vein light. The initial intent of this project was to focus on location of PIV placement and to show an increase in catheter related complications based on the placement of the PIV catheter.

Additional search terms included power injection, peripheral IV catheters, peripheral cannulation, complications, intravenous catheters, nursing students, nurse confidence, and skill level. The final number of articles reviewed for this project was 36. Major themes identified in the literature search included: 1) peripheral intravenous access is more prevalent and required for inpatient hospital admissions; 2) insertion, care, and maintenance can negatively impact complication rates, and patient experience; 3) training is inadequate and confidence and skill level affect first attempt success rates and complication rates; 4) simulation and best practice guidelines are available to enhance educational offerings. The seven-tiered levels of evidence adapted from Melnyk and Fineout-Overhold, (2005) were used when evaluating the evidence reviewed (Houser & Oman, 2011). Most of the articles reviewed were level II and VI.

As the focus of this project shifted to confidence and skill level of the practitioner placing the PIV, an additional literature search was performed, and additional literature was found to support this focus. This investigator also discovered, it was important to include care and

maintenance of PIVs in the education as this also impacts the confidence and skill level of the nurse inserting the PIV. Therefore, the literature retrieved that applies to care and maintenance of the PIV was beneficial to this study. One example of this literature is an article written by Ann Marie Aziz (2009), which speaks to the importance of standards and clinical guidelines that help improve practice around the care and maintenance of PIVs (Aziz, 2009). Over two hundred million peripheral catheters are inserted yearly in the United States and most patients (60-90%) have at least one PIV during their hospital stay (Fowler, et al., 2018). With this many PIVs being placed in our hospitals, it is imperative that insertion is done correctly, and care and maintenance guidelines are followed. According to Aziz (2009), at any time, 8% of patients in the hospital have a hospital acquired infection (HAI). HAI can add 3-10 days to a hospital stay and many of these HAIs can be directly causative of blood stream infections from a PIV. There are high impact interventions that are evidence based that can reduce the risk of HAIs (Aziz, 2009). It is important to teach nurses, not just about the insertion of the PIV, but also the care and maintenance evidence-based guidelines to decrease the risk of complications to the patient which includes infection.

When evaluating nursing confidence and skill level with PIV insertion, education and experience need to be taken into consideration. “Even though it is a prevalent, technically difficult, and invasive procedure, most health care practitioners, who have not been trained as vascular access experts, receive little substantive peripheral vascular access education, training, or opportunities to practice skills until competent” (Keleekai, 2016, p.376). Nurses who do not have adequate education or time to improve on this skill, therefore often do not try or shy away from the opportunity to start a PIV. The deficits in skill level and confidence also lead to catheter failure and premature removal (Keleekai, 2016). This article speaks specifically to the problem

of the project and suggests that giving nurses the education and tools they need to be successful with PIV insertion will in turn increase their confidence and skill level. A higher rate of complications has also been associated with less extensively trained healthcare professionals. These complications include phlebitis, infiltration, catheter leakage, and premature removal (Schuster, Stahl, Murray, Keleekai, & Glover, 2016). There is also evidence that healthcare professionals with less training are also less likely to adhere to best practice guidelines and standard precautions which pose greater risk of exposure to the practitioner (Schuster, et al., 2016).

The literature retrieved included themes around best practice guidelines for care and maintenance, insertion and removal, insertion using different visual devices, and included studies that evaluate the confidence and skill level of the practitioner. All the literature collected helped support the problem and outcomes of this DNP project. One very useful article, written by Schuster, et al., (2016) validates an assessment tool using a Likert scale that assesses nurses' perceptions of their confidence level and skill level with PIV insertion. One limitation of the study was that the sample enrolled nurses with 8-21 years of experience, so the initial confidence level of the nurses was already relatively high. The author states that the tool and study should be conducted using a group of nurses with less nursing experience (Schuster, 2016). The proposal for this project was to use nurses with 0-5 years nursing experience. This project was able to assess an increase in self-perceived confidence and skill level in a group of nurses with less experience and evaluate if the education had a greater impact on nurses with less experience. An example of how this systematic review of the literature was conducted can be found in Appendix B.

Project Plan and Evaluation

Market/Risk Analysis

A Strengths-Weaknesses-Opportunities-Threats (SWOT) analysis was completed for this project. Strengths included the engaged nursing workforce and culture at LAH, the support of leadership, and the financial resources available to support the pilot. The initial cost of the pilot was minimal and the budget and financial resources required for the project are discussed later in this paper. Weaknesses included the financial cost of the project if it is rolled out to the entire hospital after the pilot, the time needed for training and the impact this would have on productivity, poor IV skills present in existing staff, nurse turnover, and nurses being resistant to change. Although LAH has a very engaged nursing workforce, there are still nurses who are engrained in their own practices and are resistant to learn new things or adapt to change. The opportunities that were identified included the improvement in reported patient satisfaction, the opportunity to maximize the VAT productivity and allow them to focus on central line care and insertions, and the literature that supported improved care and maintenance of PIV lines and better insertion practices. Threats included a new competitor hospital that recently opened a few miles away from the hospital. This can affect nursing turnover as well as patient volumes. Another threat is the existing culture of nursing where nurses are uncomfortable starting their own PIV and rely on the availability of the VAT to start their peripheral lines instead of having to learn these skills and rely on themselves.

Driving and Restraining Forces

There were multiple driving forces for this project. Inconsistent PIV care and maintenance throughout the hospital was one of the major driving forces which can result in

many negative patient outcomes. Negative comments from the patient satisfaction surveys and nursing feedback regarding their lack of skill and confidence with PIV insertion were also driving forces. Lastly, the large volume of calls to the VAT each month for PIV placements which approaches 200 calls a month, was an important driving force since this limits the time the VAT can focus on central line care and insertion and difficult access patients.

Restraining forces included nursing engagement in their desire to learn and improve and nursing workflow. Nurses want to do what is best for their patients and provide good care, but often have so many competing demands that they often do not have the time to learn and fine tune a skill like inserting a PIV. This leads to another restraining force which is the current culture in nursing at the hospital where they rely on the VAT rather than improving their own skill and the ability to rely on themselves for most peripheral vascular access needs. Finally, the financial limitations for education are a restraining force. The productivity budgets that are imposed on the acute care inpatient units often do not include budgeted time for education and trainings. The nurse manager is forced to find creative ways to plan for education, trainings, and even staff meetings in order to provide education that is needed but still meet productivity standards.

Sustainability

In order to sustain this project after the pilot, as well as spread it throughout the facility it will be imperative to have leadership support, which includes all nursing managers and directors as well as the executive team of the hospital. Physician support is also very important since physicians play a key role in the care of the patient and help make decisions about what line is appropriate for the patient based on their care needs. The educational class will need to be

offered on a regular basis to continue to train everyone in the hospital as well as included in new nurse onboarding. The model used to mentor each nurse during the pilot project may not be sustainable if the project is spread. There may be a need to transition to a train the trainer model or deploy super users for mentoring on the units. The VAT can also continue to mentor at the bedside. The post intervention survey that was conducted at one month was used to give information about the sustained results and whether the confidence and skill level increase persisted at one month after the educational offering.

Budget and Required Resources

Required Resources include the following:

- Teaching materials printed and bound- $\$4.00$ per manual x 20 manuals = $\$80.00$
 - Expansion cost- 320 manuals x $\$4.00$ = $\$1,280.00$
- Conference room space- free for pilot and this facility. May be a cost incurred if project replicated at another facility.
- Nurse time to attend- Average pay for a nurse with 0-5 years' experience is $\$31.00/\text{hr}$. Class time is one hour with a total of 20 participants. $\$31.00$ x 20 hours = $\$620.00$.
 - This number would greatly increase if the project was expanded to the entire facility and all employed nurses would attend. The average hourly rate would increase to $\$36.00/\text{hour}$ to account for nurses with more experience. Each session is one hour a piece, and a total of 320 nurses currently employed in the facility. 320 hours x $\$36.00$ = $\$11,520.00$

- Cost for educator- initial cost was free as the DNP student taught all classes and the VAT at the facility helped to mentor nurses at the bedside during the pilot. There will be a cost associated with the expansion of the project and the educator needed to continue the classes for onboarding. There may also be a cost for the educator if this project is replicated in another facility.
 - Experienced VAT educator salary is approximately \$42.00/hour.
Anticipate 10 sessions offered initially to get all nurses trained then monthly offerings to reach all newly hired nurses. Anticipated prep time for the class is four hours. 4 hours (prep time) + 10 hours (initial classes) + 12 hours (monthly offerings) = 26 hours x \$42.00 = \$1,092.00 annually
- Simulation equipment
 - needles- \$25/box
 - tourniquets- \$10 for 50
 - dressing kits- \$2.48 each- 30 needed for the class=\$74.40
 - Simulation equipment needed for expansion = \$2,406 annually
 - Simulation arm- \$500/piece- arms are already owned by the facility but to replicate training a facility would need to purchase these simulation arms.

The total for the pilot cost the facility \$809.40. The total cost for the facility to expand the project would initially be \$16,298.00 but would decrease significantly in consecutive years as training would only be needed for onboarding newly hired nurses. This amount would also be slightly higher for replication in a facility that may have to pay for conference room space and purchase the simulation arm.

Stakeholders and Project Team

A stakeholder can be described as “one who is involved in or affected by a course of action” (Merriam-Webster, 2019). Key stakeholders for this project were nursing, first and foremost, as they were involved in and impacted by this DNP project. Other stakeholders included the hospital leadership team, patients, and the VAT. The project team included the DNP student which was the investigator of this study, the clinical mentor of the DNP student who is also the quality director at the facility, the Chief Nursing Officer (CNO), the director of acute care, the nursing manager of the pilot unit, the VAT educator, the VAT, and the patient safety manager. There are multiple people in the facility that helped with this project as it moved forward, and other key people were consulted or added as the project took place.

Cost-Benefit Analysis

As previously discussed, the initial cost of the pilot of this project required minimal financial resources. The financial impact would be much greater if the project is sustained and implemented throughout the facility and used as an ongoing educational offering for onboarding of all newly hired nurses. The budget will be discussed later in the budget section of this paper. There are multiple benefits of the project which includes decreased access attempts for patients, which results in decreased discomfort and fewer potential complications. Nurses will have the knowledge and tools to be successful with PIV insertion which results in timely administration of medications and therapies; the nurses can provide appropriate care for their patients in a timely manner, eliminate wait times for response of the VAT, and the patient will have more confidence in their nursing care. Although patient satisfaction was not a data point that was tracked with this project, it is a dependent variable and will potentially be impacted. Currently, PIV complications

such as infiltrations and extravasations, blood stream infections, blood clots, and phlebitis can impact cost and reimbursement for the hospital if a patient experiences one of these complications during their stay. A benefit of this project was to increase skill level and thus decrease complication rates which will have a positive financial impact for the hospital. The benefits of the project clearly outweigh the cost in many ways.

Project Objectives

The mission statement for this project was: Provide nurses with the tools and education needed to confidently and successfully perform PIV insertions. The main goals and desired outcomes of this project were to improve nurse-reported self-efficacy and skill level with PIV placement and decrease calls to the vascular access team by 10% or more. The nurses will feel empowered to attempt to start their own PIVs before calling for reinforcements. It was also important to see if there would be a downstream effect on patient satisfaction scores and a decrease in negative comments received because patients will see the increase in confidence and skill level of their nurse, and they will be traumatized less. The outcomes are both nurse sensitive and patient sensitive outcomes as nurses will benefit from the intervention and become more confident with their skill of PIV insertion. Patients will also benefit since they will receive less needle sticks and receive their infusions in a timely manner.

The DNP role is based on using evidence to improve practice. According to Houser and Oman (2011), "Evidence based practice is the use of the best scientific evidence integrated with clinical experience and incorporating patient values and preferences, in the practice of professional patient care" (Houser & Oman, 2011, p.1). As the profession of nursing and its respective scope of practice grows, it is imperative that evidence and literature drive practice and

practice change so that patients thrive and receive the best care possible which will result in positive patient outcomes. This project related to the DNP role because the goal of the project was to improve nursing skill and nursing practice, both of which have a direct effect on patient experience and patient outcomes.

Population/Sampling

The initial step in the project was to identify the nurses on the pilot unit with 0-5 years of nursing experience. Once the nurses with 0-5 years' experience were identified, they were notified that they would comprise the Quality Improvement (QI) project sample. No recruitment was necessary and informed consent was not required. There were no vulnerable populations involved in this study. The investigator completed education relevant to the identification of vulnerable populations. Evidence of this training is provided in Appendix H. The pilot unit chosen was an inpatient acuity adaptable telemetry unit. This is a 24-bed unit with an average daily census of 21. The unit has a large amount of influx every day since the unit has many patients under observation status, so they have many admissions and discharges daily. The unit has approximately 40 nurses with close to half of the nurses having less than 5 years of nursing experience. The sample size was initially 21 nurses with 21 responses to the pre-intervention survey. This number fluctuated throughout the pilot due to turnover and change of skill-mix on the unit at the time of the project implementation.

Using paper surveys with a number assigned to each participant, the investigator delivered each participant nurse a survey that included a combination of open-ended questions and questions with a numerical rating using a Likert scale. Once all nurses completed the survey, they participated in a one-hour educational offering in a classroom setting. The offering included

theory, anatomy and physiology, PIV insertion tips and tricks, and simulation related to placement and care of PIVs. The class was offered multiple times to allow for scheduling needs of the unit and to give the nurses a variety of dates and times they could fit into their schedule. The investigator also met with one nurse individually to review the content who could not attend one of the offered class times. After the educational offering, every nurse completed the first post-intervention survey. Each nurse received the survey that corresponded to their participant identification number to ensure proper comparison of results from the pre-intervention data to the post-intervention data. During the one-month timeframe between the educational offerings and the second post-intervention survey, nurses received mentoring at the bedside with PIV attempts on patients. This mentoring was provided by the VAT. Once the mentoring period was over, the nurses completed a one-month post intervention survey, again using the paper surveys with the correct participant identification number. Data were also collected on the number of calls to the VAT for one month prior to the intervention, the month during the intervention period, and one month after the intervention. The project did not have any identifiable information and no vulnerable populations were involved. In this project, the independent variable was the education offered to the nurses. The dependent variables and desired outcomes were the increased nurse confidence and skill level and decreased calls to the VAT. There were some additional secondary outcomes that were considered, for example, patient satisfaction as measured on the patient satisfaction surveys.

Logic Model

Figure 2

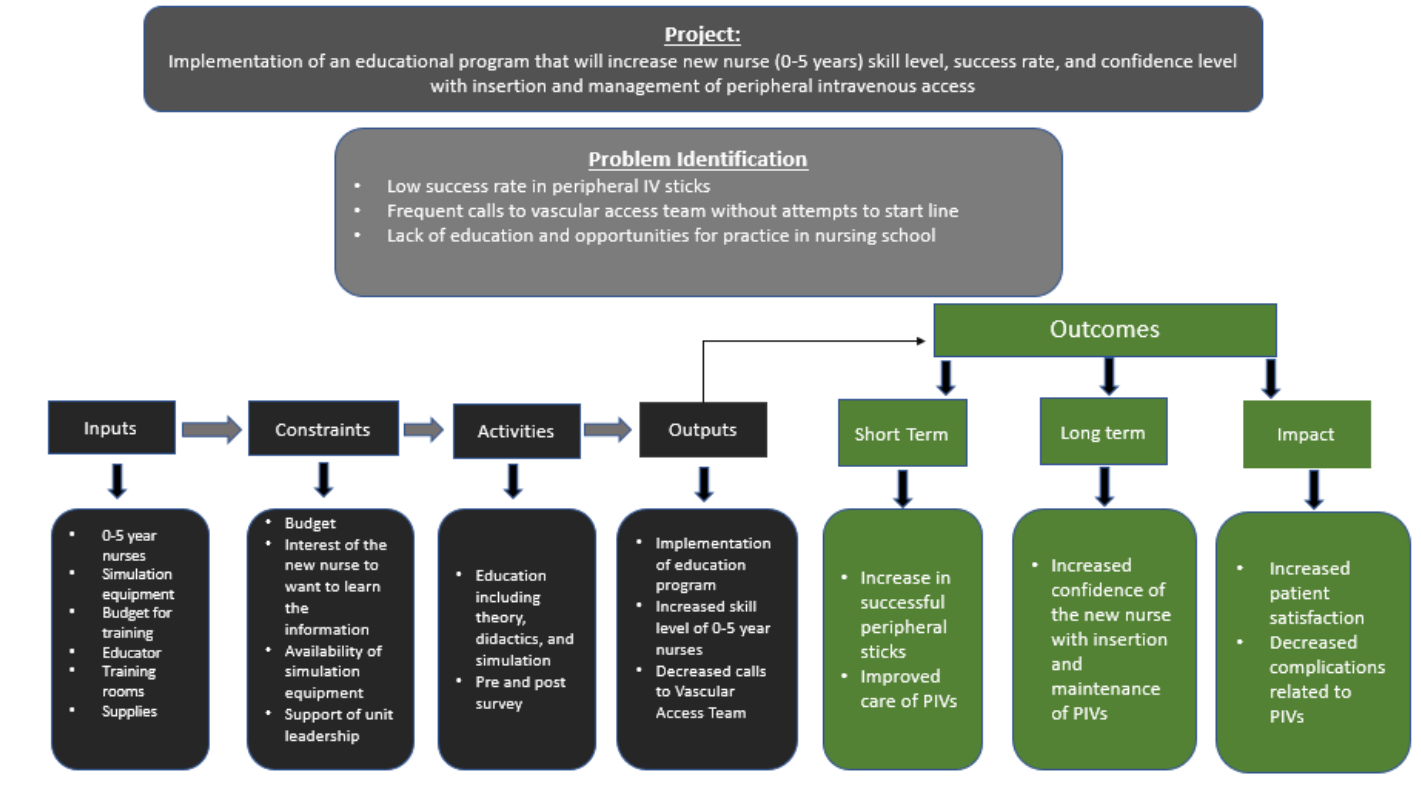


Figure 2 shows the Logic Model© created and used for this quality improvement project. The W.K. Kellogg foundation created the development of a Logic Model© to help facilitate planning, implementation and evaluation of different programs (W.K. Kellogg Foundation, 2004). The logic model was used to guide the implementation of the project and help evaluate the proposed outcomes. The Logic Model© shows the project, how the problem was identified, inputs, which included anything that was necessary for implementation of the project, constraints, activities that would take place, and outputs which lead to short term and long-term goals, and the impact this has on the problem identified.

In addition to some of the factors already discussed in the problem statement and proposed methodology, the conceptual model also identifies other factors that are important to consider. It is important to focus on constraints that could affect the design, specifically, the nurses' interest in learning and engagement in the education and process. The availability of funds and simulation equipment was also a potential barrier. It was imperative to have leadership support in order to conduct the educational offerings as this would affect the individual unit's budget and productivity.

Benchmarks

There are currently not any national nursing benchmarks around PIV insertions, nursing confidence, and skill level. It is also difficult to set benchmarks on calls to VAT for PIV insertions. Vascular access teams have very different roles in varying hospitals so there is no available benchmark on how many PIVs they should be placing a month. Some VATs place all PIVs in a facility while others only place central lines and do central line care and others only assist with very difficult access. The VAT at this facility places PIVs on difficult access patients, performs all the central line care, and places central lines, but they also place PIV's that could have been started by the floor RN if they had the necessary confidence and skill level.

Design Methodology

For this DNP project, the focus was on improved confidence and skill level in nurses with 0-5 years' experience after an educational intervention was offered. The project also sought to demonstrate a decrease in calls to the vascular access team for PIV insertions. As previously discussed, one inpatient acute care unit in the facility was used for the pilot. A pre- intervention

and two post-intervention surveys were given to all participants. The survey included numerical rating questions with a Likert scale and open-ended questions. Because of the different types of questions, a mixed method design was employed to obtain both qualitative and quantitative data relevant to the project. According to Polit (2010), qualitative data uses verbal or narrative information and quantitative data uses information in numerical form (Polit, 2010).

This was a quality improvement (QI) project that was internal to the organization. It did not meet the federal definition of research since there were no vulnerable populations involved and it did not intend to add knowledge to the discipline of nursing. The project received approval from the Regis University Institutional Review Board (IRB) as well as the Centura Health IRB. Both IRB's agreed this project was a QI project and did not require any further review. Approval letters for the project and evidence of the completion of human subjects' protection training are found in Appendices G, H, and I

Validity and Reliability

Validity speaks to whether an instrument measures what it is supposed to or not (Polit, 2010). Reliability is the dependability or accuracy of the instrument measuring what it is intended to measure (Polit, 2010). The survey was developed by this investigator and the questions used were developed based on the focus of the project and what information this investigator was seeking. The survey was reviewed by the DNP project chair and an additional professor from Regis University. There were no reliability testes run in SPSS on the survey instrument used. Demographic data was also collected on the nurses involved in the study including their gender, age, years of experience, highest degree completed, and the shift they work. This information is displayed in the data dictionary. See Appendix A.

A context-specific database includes all the variables that are out of the investigator's control that could negatively affect the outcomes of the study. Since this study will take place on a busy telemetry unit, there were many variables that could affect the outcomes. Those include the following:

- Admissions
- Discharges
- Phone calls to the nurse
- Call lights
- Family and visitors
- Physicians
- Therapies

These were just a few of the factors that could affect the nurse amid trying to start a PIV. Many nurses stated they were too busy and did not have time to learn this skill or practice this skill. All the distractions and interruptions could negatively affect how and when the nurses have time to practice the skill as well as receive the mentoring at the bedside. These factors could also increase the anxiety of the nurse and cause the nurse to feel rushed and not able to focus on the skill. Any of these variables could cause negative outcomes for this study and affect the nurse's self-perception of confidence and inhibit an increase in their skill level.

Project Findings and Results

After all post-intervention surveys were collected, the demographic data and survey responses were compiled into a spreadsheet and were coded appropriately prior to entering the data into the statistical software. Refer to Appendix A for coding definitions. Statistical Package

for the Social Sciences (SPSS), version 26 was used for the data analysis. Several different statistical tests were run on the quantitative data including paired samples t-tests, Pearson correlation, descriptive statistics, and other correlation tests. Each of these will be discussed in detail throughout this section. It is important to note that all tests were run using aggregate data. Pre-aggregate data will be referred to as pre-data, the post-aggregate data for the first post-intervention survey will be referred to as post 1 data and the post-aggregate data for the second post-intervention survey will be referred to as post 2 data. Qualitative data will be discussed later in this paper. All quantitative response data on the Likert-scaled instrument were considered interval level a priori.

Paired Samples T-test

The first and most important test conducted was the paired samples t-test, which was run three different times to include the pre data to the post 1 data, the pre data to the post 2 data, and the post 1 data to the post 2 data. The paired samples t-test for the pre data and post data 1 resulted a p-value of 0.003 which demonstrated a statistically significant change and lends support to the hypothesis that the intervention was effective. In addition, there was a positive shift in the mean scores from the pre data to the post data 1 scores. Refer to Figure 3 and 4 for the p-value and the mean scores for the pre and post 1 data results.

Figure 3

Paired Samples Test

		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	PreAggData - Post1AggData	-.250	.738	.082	-.414	-.086	-3.031	79	.003

Figure 4

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PreAggData	3.59	80	1.052	.118
	Post1AggData	3.84	80	.754	.084

There was also a statistically significant change from the post 1 data to the post 2 data with a p-value of 0.012 and a negative shift in the mean scores. This demonstrated that although the intervention was effective, the participants did not retain the knowledge in the timeframe between the first post survey and the second post survey. Refer to Figure 5 and 6 for the p-value and the mean scores for the post 1 data and post 2 data results.

Figure 5

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Post1AggData - Post2AggData	.438	1.525	.170	.098	.777	2.566	79	.012

Figure 6

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Post1AggData	3.84	80	.754	.084
	Post2AggData	3.40	80	1.572	.176

Pearson Correlation

The next test that was run was the Pearson Correlation, and again, this was run on the aggregate data for the pre data to the post 1 data, the pre data to the post 2 data, and the post 1 data to the post 2 data. The most significant correlation identified was between the pre data and the post 1 data. There was a high positive correlation with the correlation being 0.713 and the p-value being 0.000. There was a low positive correlation between the post 1 data and post 2 data. Even though the correlation was positive, the scores still went down. The investigator would have anticipated that if they did well on the post 1 survey, they would have done well on the post 2 survey and even though the scores went down, SPSS analysis still demonstrated that there was

a low positive correlation between them. This indicates that some scores could have had slight improvement or stayed the same and even though the scores declined overall, there was not enough of a decline to reduce the Pearson correlation to no correlation. Refer to Figure 7 for the Pearson correlation table.

Figure 7

Correlations

		PreAggData	Post1AggData	Post2AggData
PreAggData	Pearson Correlation	1	.713**	.162
	Sig. (2-tailed)		.000	.150
	N	80	80	80
Post1AggData	Pearson Correlation	.713**	1	.301**
	Sig. (2-tailed)	.000		.007
	N	80	80	80
Post2AggData	Pearson Correlation	.162	.301**	1
	Sig. (2-tailed)	.150	.007	
	N	80	80	80

** . Correlation is significant at the 0.01 level (2-tailed).

Descriptive Statistics

The investigator then ran descriptive statistics and frequencies on all the data including the pre, post 1, post 2, and demographic data. Descriptive statistics are run on all lower level data that can be reported out as a percent. Demographic data is considered lower-level data and the different scores in the table in Figure 8 do not have meaningful results since the scores are based on the coding that was entered in SPSS. The frequencies for these data will be presented in bar

graphs in Figures 12-16. These data are reported in percentages, please refer to Appendix A for the coding definitions for the values in the bar graphs.

The other scores of importance in the table are for the pre, post 1, and post 2 data. Likert scale data is usually considered ordinal, but it was considered interval a priori for this project and thus allowed a more robust statistical analysis. Standard deviation refers to how dispersed the scores are from the mean score and is displayed in Figure 8, the standard deviation is higher for the pre data and is lower for the post 1 data, indicating that more of the scores for the post 1 data were closer to the mean. Refer to Figures 9, 10, and 11 for the bar graphs for the aggregate data. It is important to note, in the post 2 data, zero was not an option on the Likert scale, and this value was used as a dummy value or placeholder for the post 2 surveys that were not returned.

Figure 8

		Statistics							
		PreAggData	Post1AggDat a	Post2AggDat a	Gender	YrsOfExp	Age	HDC	Shift
N	Valid	80	80	80	80	80	80	80	80
	Missing	0	0	0	0	0	0	0	0
Mean		3.59	3.84	3.40	1.80	1.80	1.65	1.85	1.45
Median		4.00	4.00	4.00	2.00	1.00	1.00	2.00	1.00
Mode		4	4	4	2	0	1	2	1
Std. Deviation		1.052	.754	1.572	.403	1.731	.915	.480	.501
Percentiles 100		5.00	5.00	5.00	2.00	5.00	4.00	3.00	2.00

Figure 9

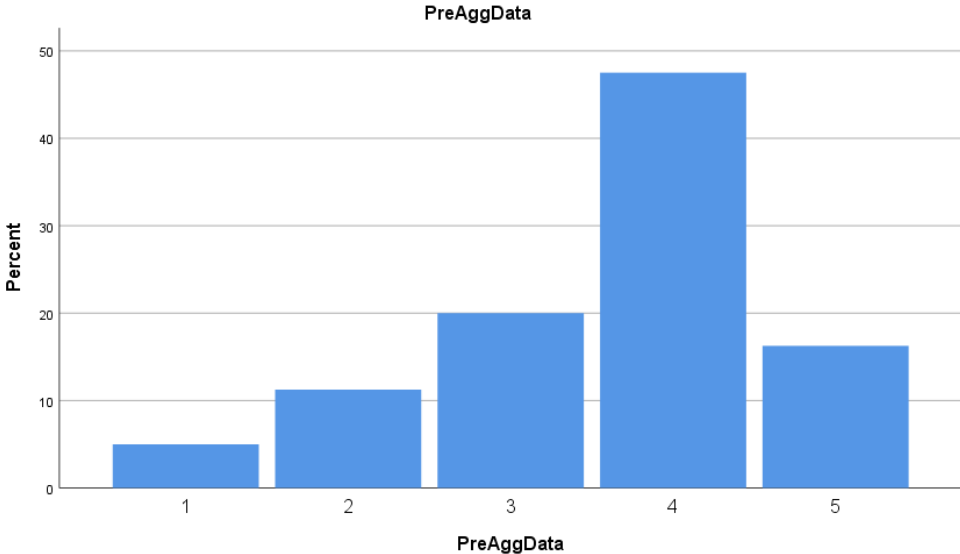


Figure 10

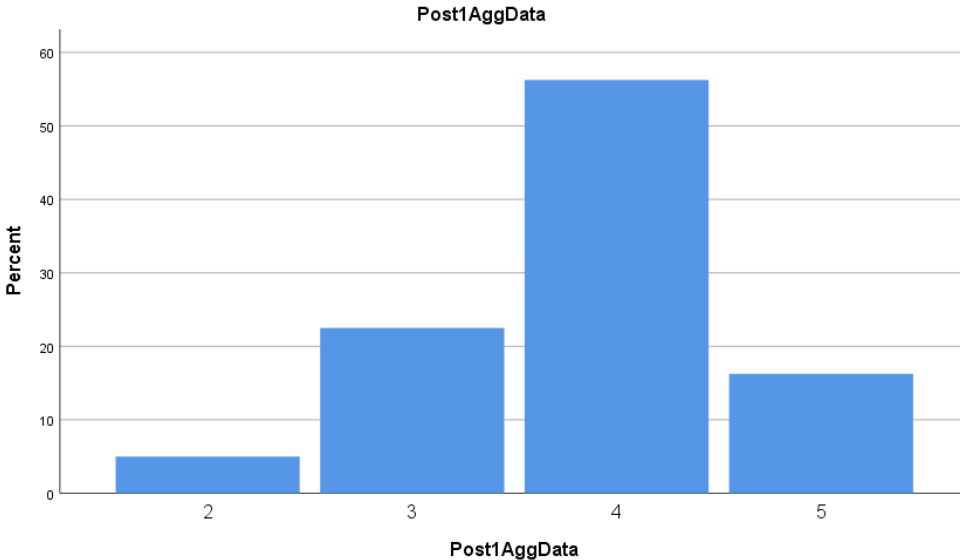


Figure 11

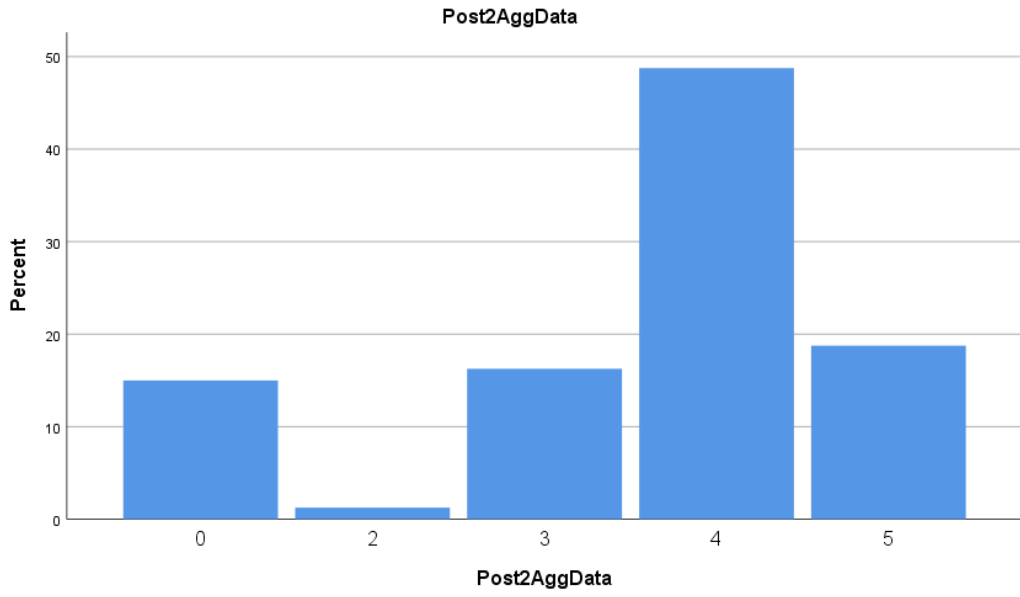


Figure 12

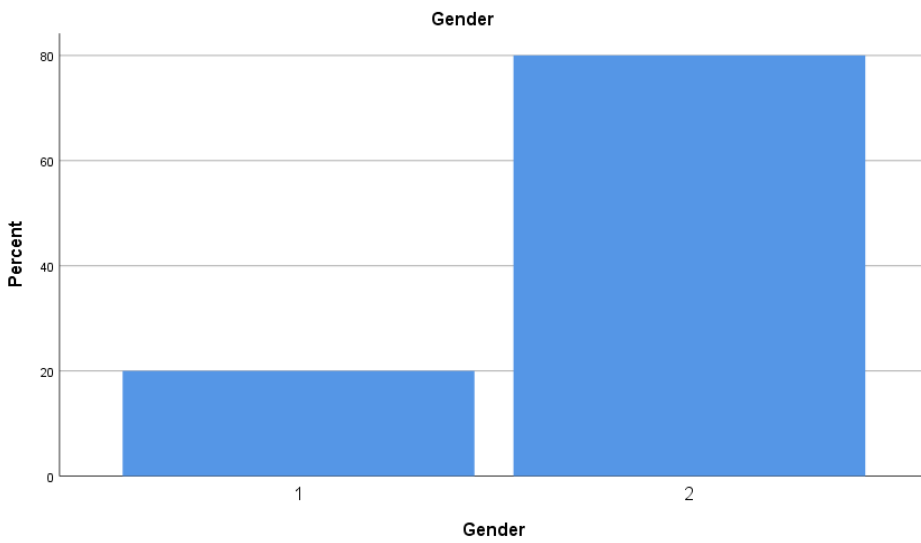


Figure 13

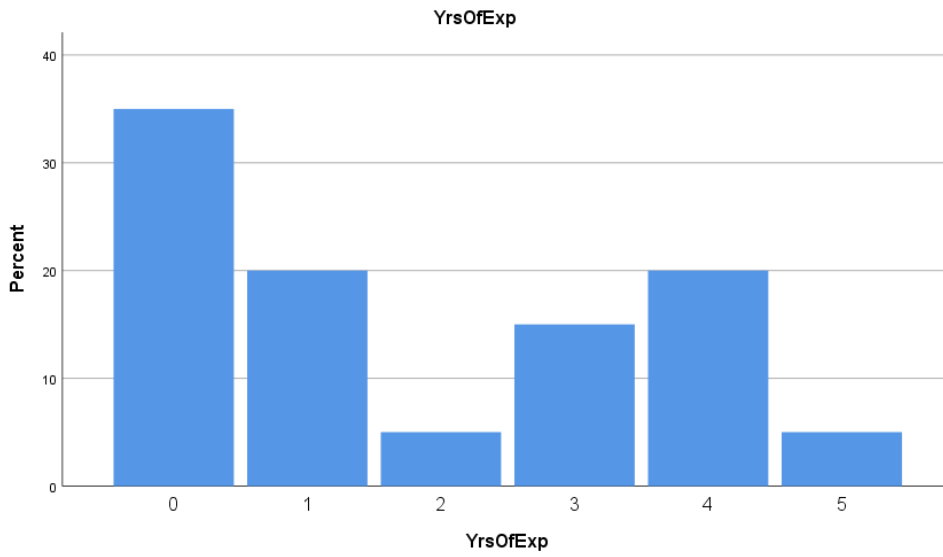


Figure 14

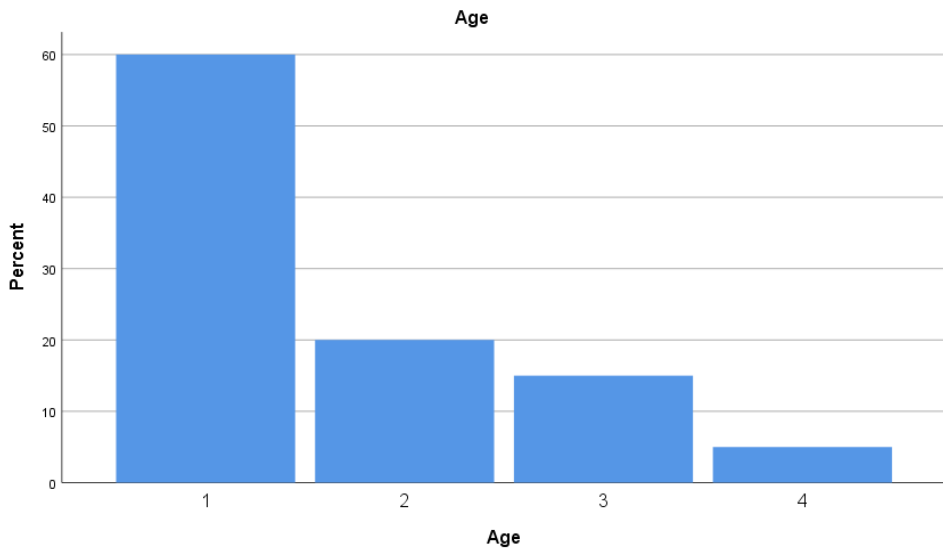


Figure 15

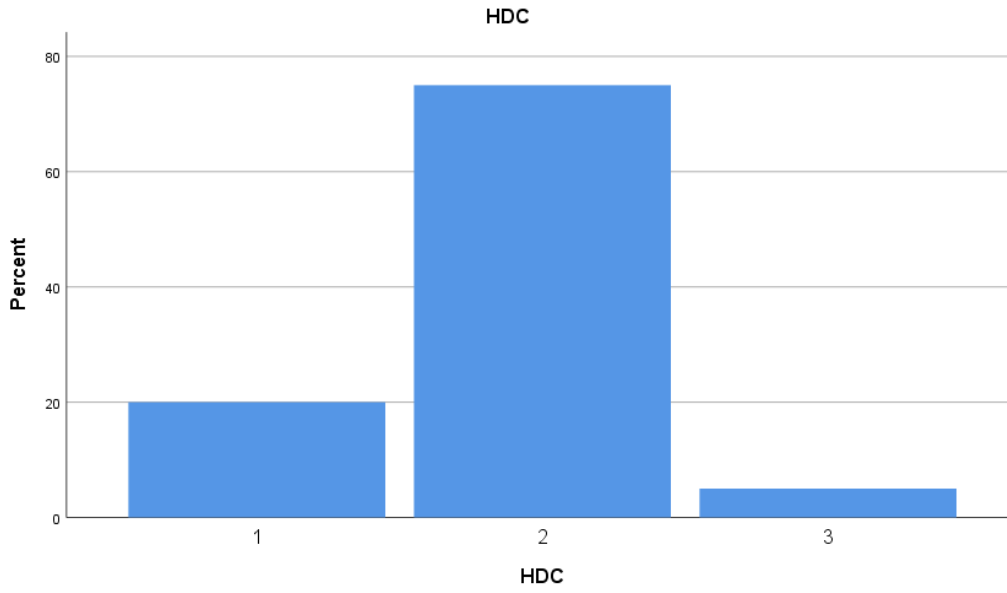
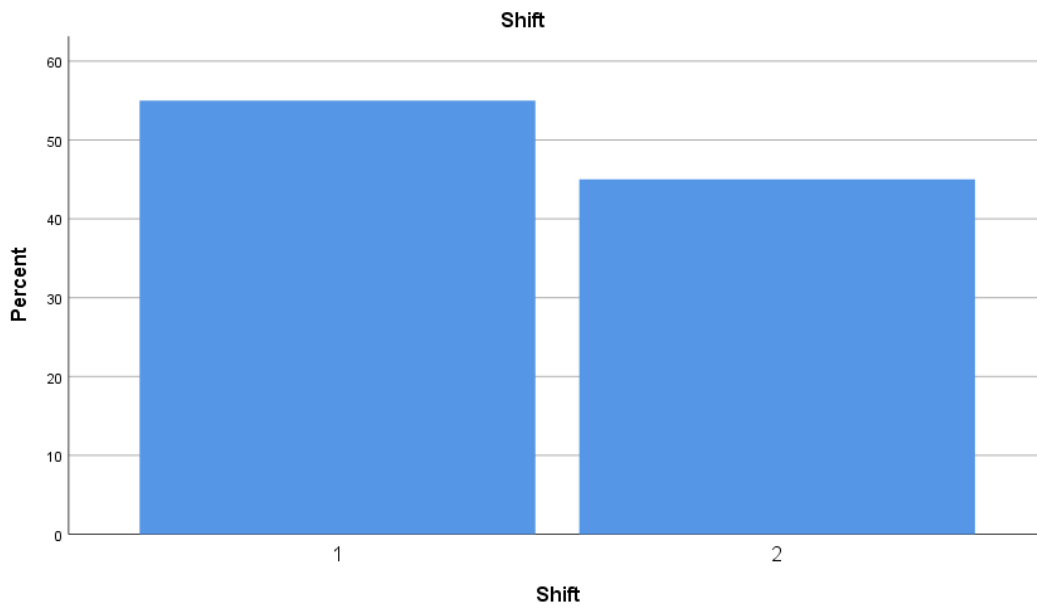


Figure 16



Additional Tests

An additional test run was the paired samples t-test with a split file on each question for the pre data to the post 1 data, the pre data to the post 2 data, and the post 1 data to the post 2 data. The most significant change was the mean score for question 3 when comparing the pre data to the post 1 data. The mean score increased from 3.15 to 3.80. This question focused on the participants satisfaction with their own PIV insertion skill level. This can be interpreted as a measurement of improvement in their self-efficacy. This is a very meaningful statistical outcome because one of the main goals of this project was to show that education would have an impact on the nurse-reported self-efficacy with PIV insertion. Figures 17, 18, and 19 show the results of the paired samples t-test with a split file for all three comparisons.

Figure 17

Paired Samples Statistics

Question			Mean	N	Std. Deviation	Std. Error Mean
1	Pair 1	PreAggData	3.10	20	1.165	.261
		Post1AggData	3.35	20	.988	.221
2	Pair 1	PreAggData	3.95	20	.826	.185
		Post1AggData	4.05	20	.510	.114
3	Pair 1	PreAggData	3.15	20	1.137	.254
		Post1AggData	3.80	20	.616	.138
4	Pair 1	PreAggData	4.15	20	.587	.131
		Post1AggData	4.15	20	.587	.131

Figure 18

Paired Samples Statistics

Question			Mean	N	Std. Deviation	Std. Error Mean
1	Pair 1	PreAggData	3.10	20	1.165	.261
		Post2AggData	3.10	20	1.518	.340
2	Pair 1	PreAggData	3.95	20	.826	.185
		Post2AggData	3.50	20	1.606	.359
3	Pair 1	PreAggData	3.15	20	1.137	.254
		Post2AggData	3.35	20	1.565	.350
4	Pair 1	PreAggData	4.15	20	.587	.131
		Post2AggData	3.65	20	1.663	.372

Figure 19

Paired Samples Statistics

Question			Mean	N	Std. Deviation	Std. Error Mean
1	Pair 1	Post1AggData	3.35	20	.988	.221
		Post2AggData	3.10	20	1.518	.340
2	Pair 1	Post1AggData	4.05	20	.510	.114
		Post2AggData	3.50	20	1.606	.359
3	Pair 1	Post1AggData	3.80	20	.616	.138
		Post2AggData	3.35	20	1.565	.350
4	Pair 1	Post1AggData	4.15	20	.587	.131
		Post2AggData	3.65	20	1.663	.372

Lastly, the Kendall’s tau b test was run on the demographic data because the bulk of the data being compared for this correlation were nominal or ordinal, therefore this was an appropriate test to run for these data. There was a correlation noted between years of experience, highest degree completed, and the shift worked. Anecdotally, the night shift participants may have more experience starting their own PIVs because they do not have access to the VAT at night and are forced to rely on their own skill. Refer to Figure 20.

Figure 20

Correlations

			PreAggDat a	Gender	YrsOfEx p	Age	HDC	Shift
Kendall's tau_b	PreAggDat a	Correlation Coefficient	1.000	-.025	.513**	.092	.377**	-.234*
		Sig. (2-tailed)	.	.807	.000	.347	.000	.024
		N	80	80	80	80	80	80
	Gender	Correlation Coefficient	-.025	1.000	-.071	.058	-.169	-.302**
		Sig. (2-tailed)	.807	.	.487	.584	.126	.007
		N	80	80	80	80	80	80
	YrsOfExp	Correlation Coefficient	.513**	-.071	1.000	.308**	.462**	-.089
		Sig. (2-tailed)	.000	.487	.	.001	.000	.379
		N	80	80	80	80	80	80
	Age	Correlation Coefficient	.092	.058	.308**	1.000	-.115	.094
		Sig. (2-tailed)	.347	.584	.001	.	.269	.379
		N	80	80	80	80	80	80

HDC	Correlation Coefficient	.377**	-.169	.462**	-.115	1.000	-.124
	Sig. (2-tailed)	.000	.126	.000	.269	.	.260
	N	80	80	80	80	80	80
Shift	Correlation Coefficient	-.234*	-.302**	-.089	.094	-.124	1.000
	Sig. (2-tailed)	.024	.007	.379	.379	.260	.
	N	80	80	80	80	80	80

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Vascular Access Team Calls Data

One of the main objectives of this project was to see a decrease of 10% in calls to the VAT for PIV insertions for the pilot unit. February was considered pre-intervention data and there were 16 calls made to the team for PIV insertions. March was considered the intervention period and was the month when all the classes were taught Although this data point was not included, it is important to not there were 17 calls to the VAT in March. April was considered the post-intervention month and there were 11 call to the VAT, which shows a decrease of 10.5% for the month of April. The project did yield the desired outcome based on one month of data.

Qualitative Data

In addition to the quantitative data reviewed in the previous sections, qualitative data were also collected using open ended questions on the pre and post surveys. Some of the questions changed from the pre to post intervention surveys, therefore the themes for the qualitative data were evaluated as pre-intervention themes and post intervention themes. The

investigator was able to use information from the pre-intervention surveys to help guide the education provided in the classes and address any specific educational needs identified.

The first question on the pre-intervention survey asked: **What do you struggle with most when it comes to PIV insertion?** The major theme identified was difficult to access veins which included veins that roll, accessing veins in the obese patient population, and fragile veins in the elderly population. The second question asked: **What do you struggle with the most when it comes to PIV care and maintenance?** The major themes identified were dressing integrity, specifically changing the dressing without accidentally dislodging the catheter, troubleshooting a non-functioning PIV, and the use of PIVO, a needleless blood draw device that uses the existing PIV for blood sampling. The third question asked: **How many opportunities to start PIVs do you have per month?** The most common answer was five to 10 opportunities. The fourth question asked: **What education/training would be most helpful to you in improving your IV skills?** The major themes identified were tips and tricks for difficult access patients and more opportunities for practice.

The first and second post intervention survey questions were the same and the answers for both were evaluated together for themes. The first question on the post intervention survey asked: **How will you use the information presented in this class to increase your confidence and skill level with PIV insertion?** The major themes identified were to use the tips and tricks provided in class, specifically using the cephalic vein, application of moist heat, using traction, using the vein finder, and utilizing a small gauge catheter. Additionally, using the VAT for mentoring and advice on an ongoing basis and to be confident and always try before reaching out for help were noted. The second question asked: **How will you use the information presented in the class to increase your confidence and skill level with PIV care and maintenance?** The

major themes included how to identify malfunctioning PIVs and removing them promptly, reviewing medication properties and appropriate line selection, and dressing changes using the “pull-up” method which refers to removing the dressing in the direction of the catheter to avoid accidentally dislodging it. The third question asked: **Based on your answers in the pre-intervention survey, how will this education help you with the things you struggled with the most when it comes to PIV care and maintenance?** The major themes included how to maintain dressing integrity and the do’s and don’ts of PIV care. The fourth question asked: **How was the educational offering helpful to you in improving your PIV skills?** The major themes included more knowledge leads to more confidence, always try, and the participants learned new tips and tricks for better insertion.

Limitations, Recommendations, Implications for Change

Limitations

There were a few limitations that were identified from this project. Most of the limitations were related to staffing and staff participation. One nurse refused to participate in the study, one staff member resigned prior to the second post intervention survey, and several staff did not return their second post intervention survey. Another limitation was the engagement of the staff during the simulation portion of the class. None of the participants wanted to participate in simulation and did not find this part of the class helpful. The implementation of this project took place during the initial month of the pandemic with COVID-19 and stress levels were very high in the hospital during this time. The investigator had to ensure all class sizes only allowed a limited number of people and limit the amount of people coming in and out of the facility. Many of the staff attended during their scheduled shift and had to return to the unit to care for their

patients. This may have contributed to staff engagement with simulation as well as mentoring at the bedside during the month after the educational offering.

There was also a time limitation with the VAT calls data. This investigator was able to collect data for one month prior to the intervention, the month during the intervention and one month post intervention. If time was not a limitation, it would have been ideal to collect at least three months of call volume data prior to and three months post intervention. If the calls to the VAT remained low for multiple months after the intervention, this would have been a very meaningful outcome.

Recommendations/Implications for Change

From the statistical analysis, it was determined that the participants did not retain the knowledge between the first and second post-survey, which ultimately affected the participants self-efficacy and skill level with PIV placement and care. One recommendation is to offer a review of the content after the initial intervention and prior to any other follow-up surveys. It is also recommended that the project be extended to the other acute care units in the facility and include nurses with more than 0-5 years nursing experience. There are many nurses on the pilot unit, as well as other units in the facility, with more nursing experience, that reported being unable to start PIVs or were not confident in their skills. This is also reflected in the large call volume for the VAT. Lastly, the education should be included in all nurse onboarding for the facility. This will ensure that all nurses receive the training and information upon hire and are better equipped with the tools and skills needed to insert and care for PIVs.

Conclusion

Peripheral IV access is a common and invasive procedure performed every day in hospitals. The purpose of PIVs is very important as it allows healthcare professionals to deliver lifesaving medications and treatments to our patients. This invasive procedure also comes with disadvantages and these are amplified when the practitioner is not confident or skilled in this procedure, which can in turn result in complications and negative patient outcomes. This paper has reviewed the problem identified for this project, the evidence used to support the quality improvement project, the project plan and evaluation, the project findings and results, the limitations of the project and the recommendations and implications for change. The results showed that an educational offering positively impacts nurse-reported self-efficacy with PIV insertion, care and maintenance and a decrease in call volume to the VAT.

References

- Aziz A. (2009). Improving peripheral IV cannula care with high-impact interventions. *British Journal of Nursing*, 18, 6–13. Retrieved from <http://dml.regis.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=cmm&AN=105300038&site=ehost-live&scope=site>
- Bitsika, E., Karlis, G., Iacovidou, N., Georgiou, M., Kontodima, P., Vardaki, Z., & Xanthos, T. (2014). Comparative analysis of two venipuncture learning methods on nursing students. *Nurse Education Today* 34(1), 15-18. <https://doi-org.dml.regis.edu/10.1016/j.nedt.2013.03.016>
- Campbell, R. (2008). Change management in health care. *Health Care Manager*, 27(1), 23-39.
- Fowler, S. B., Penoyer, D. A., & Bourgault, A. M. (2018). Insertion and removal of PIVCs: Exploring best practices. *Nursing*, 48(7), 65–67. <https://doi-org.dml.regis.edu/10.1097/01.NURSE.0000534108.88895.e2>
- Houser, J. & Oman, K. (2011). *Evidence Based Practice: An Implementation Guide for Healthcare Organizations*. Sudbury, MA. Jones and Bartlett Learning, LLC.
- Keleekai, N. L., Schuster, C. A., Murray, C. L., King, M. A., Stahl, B. R., Labrozzi, L. J., ... Glover, K. R. (2016). Improving Nurses' Peripheral Intravenous Catheter Insertion Knowledge, Confidence, and Skills Using a Simulation-Based Blended Learning Program: A Randomized Trial. *Simulation In Healthcare: Journal Of The Society For Simulation In Healthcare*, 11(6), 376–384. Retrieved from <http://dml.regis.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=cmedm&AN=27504890&site=ehost-live&scope=site>
- Kotter, J. P. (2012). *Leading change*. Boston, Mass: Harvard Business Review Press.

- Mbamalu, G., & Whiteman, K. (2014). Vascular Access Team Collaboration To Decrease Catheter Rates in Patients On Hemodialysis: Utilization of Kotter's Change Process. *Nephrology Nursing Journal*, 41(3), 283-288.
- Merriam-Webster (2019) Definition of stakeholder. Retrieved from <https://www.merriam-webster.com/dictionary/stakeholder>
- Neuman, B.M. (1990). The Neuman systems model: A theory for practice. In M.E. Parker (ED.), *Nursing theories in practice* (p. 241-261. New York National League for Nursing Press
- Neuman, B. (1996). The Neuman systems model in research and practice. *Nursing Science Quarterly*, 9(2), 67-70.
- Parker, S. I. A., Benzies, K. M., Hayden, K. A., & Lang, E. S. (2017). Effectiveness of interventions for adult peripheral intravenous catheterization: A systematic review and meta-analysis of randomized controlled trials. *International Emergency Nursing*, 31, 15–21. <https://doi-org.dml.regis.edu/10.1016/j.ienj.2016.05.004>
- Polit, D. (2010). *Statistics and Data Analysis for Nursing Research* (2nd ed.). Upper Saddle River, New Jersey: Pearson Education Inc.
- Schuster, C., Stahl, B., Murray, C., Keleekai, N. L., & Glover, K. (2016). Development and Testing of a Short Peripheral Intravenous Catheter Insertion Skills Checklist. *Journal of the Association for Vascular Access*, 21(4), 196–204. <https://doi-org.dml.regis.edu/10.1016/j.java.2016.08.003>
- Ume-Nwagbo, P., DeWan, S., & Lowry, L. (2006). Using the Neuman systems model for best practices. *Nursing Science Quarterly*, 19(1), 31-35.
- W.K. Kellogg Foundation (2004). Logic model development guide. Retrieved from <https://www.aacu.org/sites/default/files/LogicModel.pdf>

Appendix A

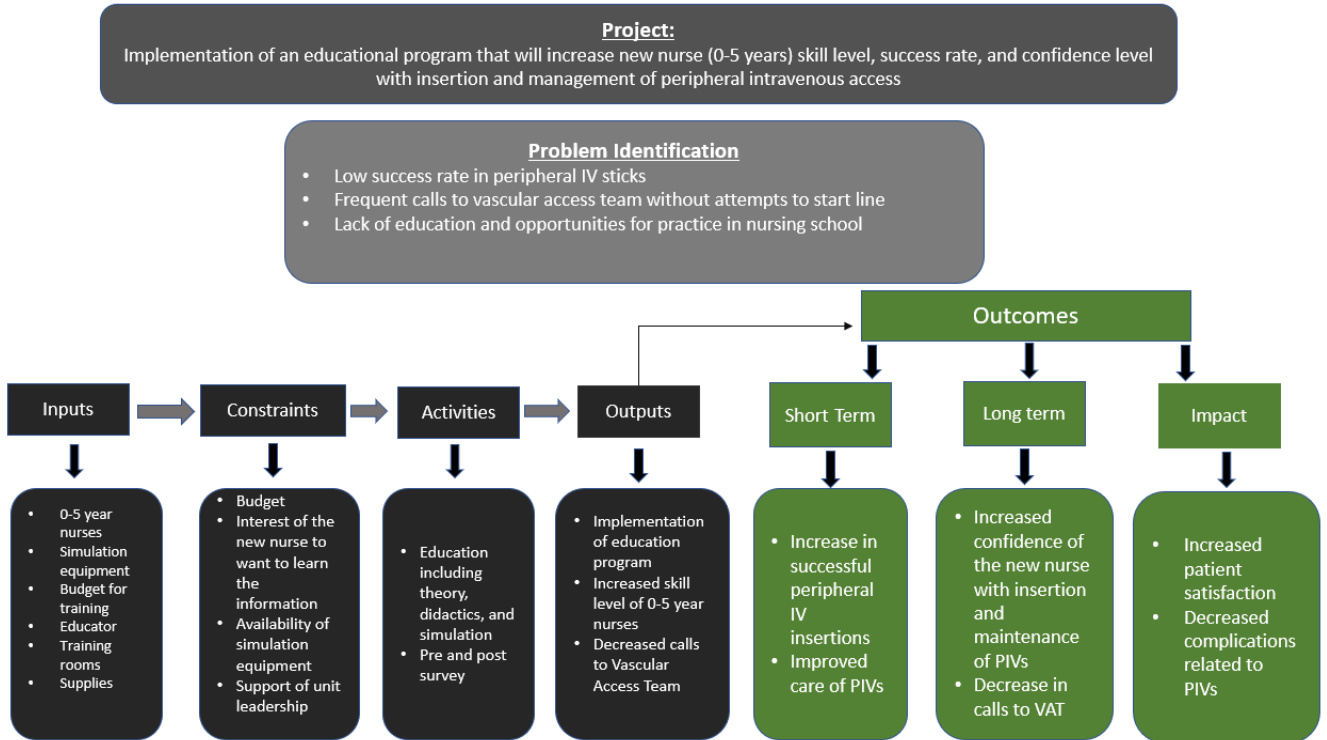
Variable Names	Descriptions	Data Format	Data Source	Response Values	Labels	Response Distributions/Marginal Frequencies	Location of Data Repository
Sex	Gender			1- Male 2- Female			
Shift	Shift worked			1- Days 2- Nights			
Age	Age at time of study			1- 20-30 yrs 2- 31-40 yrs 3- 41-50 yrs 4- 51-60 yrs			
Degree	Nursing Degree			1- Associate 2- Bachelor's 3- Master's			
Years	Years of Experience			0- new grad 1- 1 year 2- 2 years 3- 3 years 4- 4 years 5- 5 years			

Appendix B

Article/Journal	1) Witting, M. D., Moayedi, S., Dunning, K., Babin, L. S., & Cogan, B. M. (2017). Power Injection Through Ultrasound-Guided Intravenous Lines: Safety and Efficacy Under an Institutional Protocol. <i>The Journal Of Emergency Medicine</i> , 52(1), 16-22. https://doi.org.dml.regis.edu/10.1016/j.jemermed.2016.09.017	2) Larsen, E., Keogh, S., Marsh, N., & Rickard, C. (2017). Experiences of peripheral IV insertion in hospital: a qualitative study. <i>British Journal of Nursing</i> , 26(19), S18-S25. https://doi.org.dml.regis.edu/10.12968/bjon.2017.26.19.S18
Author/Year	Witting, M. D., Moayedi, S., Dunning, K., Babin, L. S., & Cogan, B. M. (2017)	Larsen, E., Keogh, S., Marsh, N., & Rickard, C. (2017)
Database/Keywords	Academic search premier, CINAHL, Medline Power injection, peripheral IV catheters, complications	Academic Search Premiere, CINAHL, Medline Peripheral IV
Research Design	Ambispective study which included prospective data and retrospective review of previous patient populations	Qualitative study
Level of Evidence	Level 2	Level 2
Study Aim/Purpose	Estimate the safety and efficacy of peripheral IV's used for power injection of contrast media placed with ultrasound guidance in the forearm. Incidence of compartment syndrome related to the injection of contrast through IV lines placed using ultrasound guidance	Gain an understanding of patients experiences with peripheral venous catheter (PVC) insertion
Population/Sample size Criteria/Power	Retrospective data- 32 referrals Prospective data- 42 referrals Required a minimum of 77 patients received power injection through ultrasound guided PIVs	10 participants from medical and surgical wards Adult patients who had undergone a PVC placement were included Exclusions included patients who were non-English speaking, confused or undergoing palliative treatment Equal amount of men and women and ages 24-79 years of age
Methods/Study Appraisal Synthesis Methods	Journals/logs kept by CT techs and ED physicians-counted referrals and refusals as well as complications Medical records reviewed for retrospective data	Semi-structured interviews using a phenomenological-hermeneutic approach Interviews were conducted at the bedside Interview durations were 5-26 minutes
Study tool/instrument validity/reliability	No study tool identified	Everyone was asked the same initial question, then follow up questions were asked based on the participants answers Following each interview the researcher reviewed the recording and identified themes.

<p>Primary Outcome Measures/Results</p>	<p>18% higher success rate with injection for CT angiography for lines placed with inspection and palpation versus lines placed with ultrasound guidance. Proximal injection is safe when combined with pre-injection IV testing</p>	<p>Four main themes identified: Communication between the inserter and the patient Technique of device insertion Competence of the inserter Location of the device Patients identified links between the four main themes- one could affect another</p>
<p>Conclusions/Implications</p>	<p>The institutional policy permits high speed contrast injections through proximal arm IV lines inserted using ultrasound guidance but in the study 22% of patients were refused for CT angiography No reports of compartment syndrome although there were reports of extravasation in the data</p>	<p>There is a clear need for improved communication with the patient, insertion technique and device location choice while placing a PIV. Practitioners must practice in a way that minimizes pain and discomfort for patients.</p>
<p>Strengths/Limitations</p>	<p>Underestimated the amount of referrals for CT angiography Prospective data collection was incomplete Retrospective data was limited due to physician documentation Based measurement of incidence on compartment syndrome on medical records documentation which was not generally documented No strengths identified in the study</p>	<p>Qualitative methodology helps develop understanding rather than knowledge The sample was small and may not include other possible themes Strength- sheds light on key issues with PVC placement Can help practitioners better their own practice</p>
<p>Funding Source</p>	<p>Grant from the Maryland Emergency Medicine Network</p>	<p>Not identified</p>
<p>Comments</p>	<p>This article is helpful when looking at extravasation rates for site placed proximal to the AC as well as the use of ultrasound guidance and whether it is truly helpful or not in avoiding complications.</p>	<p>This article is very helpful in supporting the patient's experience with a PVC placed in the AC and can help show practitioners the impact their decisions around PVC placement make on their patients.</p>

Appendix C



Appendix D

Peripheral IV Insertion/Care and Maintenance Survey

Now that you have taken this educational offering, how confident are you with your IV insertion skills?

- 1- not at all confident
- 2- somewhat confident
- 3- moderately confident
- 4- very confident
- 5- extremely confident

Now that you have taken this educational offering, how confident are you with IV care and maintenance?

- 1- not at all confident
- 2- somewhat confident
- 3- moderately confident
- 4- very confident
- 5- extremely confident

Now that you have taken this educational offering, how satisfied are you with your own PIV insertion skill level?

- 1- very unsatisfied
- 2- unsatisfied
- 3- neutral
- 4- satisfied
- 5- very satisfied

Now that you have taken this educational offering, how satisfied are you with your own PIV care and maintenance?

- 1- very unsatisfied
- 2- unsatisfied
- 3- neutral

4- satisfied

5- very satisfied

How will you use the information presented in this class to increase your confidence and skill level with IV insertion? List as many items as you would like.

How will you use the information presented in this class to increase your confidence and skill level with IV care and maintenance? List as many items as you would like.

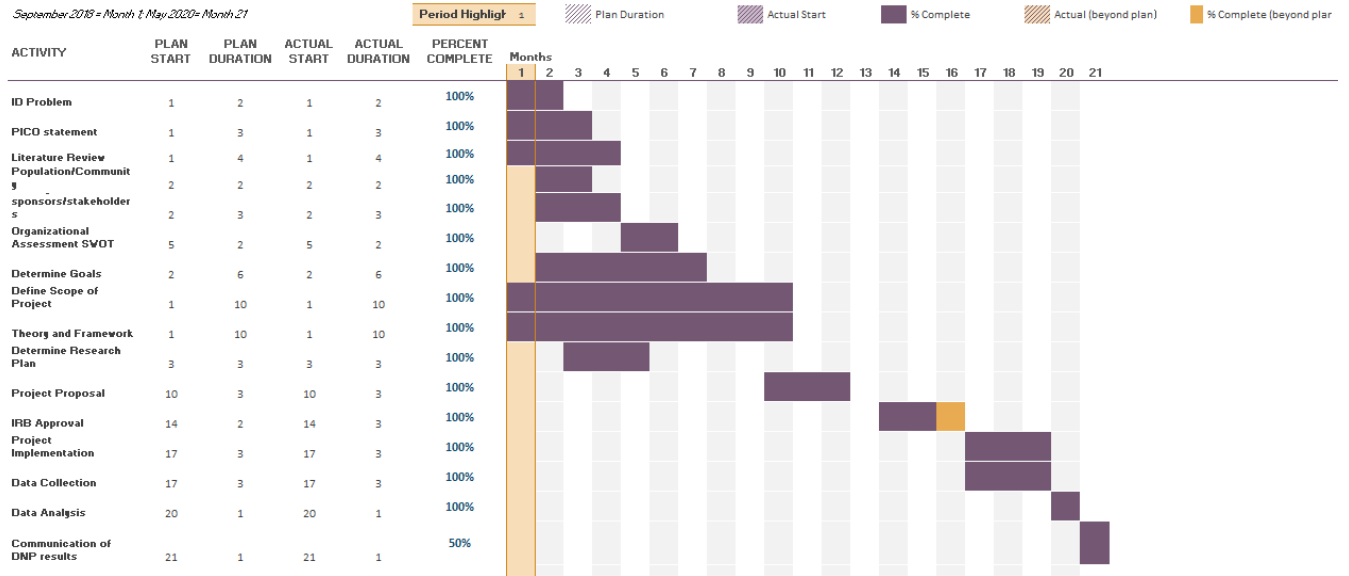
Based on your answers to the pre intervention survey, how will this education help you with the things you struggle with the most when it comes to PIV care and maintenance? List as many items as you would like.

How was this educational offering helpful to you in improving your IV skills?

Appendix E

DNP Project Timeline

September 2018 = Month 1, May 2020 = Month 21



Appendix F

Budget Item			Total Cost
Teaching Materials	\$4.00 per manual	20 manuals	\$80.00
Conference room space	Free		Free
Nurse time to attend class	\$31.00/hour	20 attendees	\$620.00
Educator to teach class	\$42.00	12 hours	\$504.00
Simulation Equipment	\$609.40		\$609.40
Total Cost			\$1813.40

Appendix G

REGIS.EDU

Institutional Review Board

DATE: September 20, 2019

TO: Sara Gibbons, MS,RN,OCN

FROM: Regis University Human Subjects IRB

PROJECT TITLE: [1494214-1] Peripheral Intravenous Education for Nurses

SUBMISSION TYPE: New Project

ACTION: DETERMINATION OF NOT RESEARCH

DECISION DATE: September 20, 2019

Thank you for your submission of New Project materials for this project. The Regis University Human Subjects IRB has determined this project does not meet the definition of human subject research under the purview of the IRB according to federal regulations.

We will retain a copy of this correspondence within our records.

If you have any questions, please contact the Institutional Review Board at irb@regis.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Regis University Human Subjects IRB's records.

1



FWA Number: FWA 00019514
OHRP IRB Number: IRB00009715

DATE: November 1, 2019

TO: Sara Gibbons

PROJECT TITLE: [1499190-1] Peripheral Intravenous Education for Nurses
SUBMISSION TYPE: New Project

ACTION: DETERMINATION OF NOT HUMAN SUBJECT RESEARCH
DECISION DATE: November 1, 2019
REVIEW TYPE: Administrative Review

Thank you for your submission to the Catholic Health Initiatives Institute for Research and Innovation Institutional Review Board (CHIRB). An individual designated by the CHIRB has reviewed your submission and is in agreement with the determination made by the Regis University IRB that this project does not meet the criteria for human subject research under the purview of the IRB according to federal regulations.

As defined by federal regulations, research is systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge. 45 CFR 46.102(l)

A human subject, as defined by federal regulations, means a living individual about whom an investigator (whether professional or student) conducting research obtains (1) Information or biospecimens through intervention or interaction with the individual and uses, studies, or analyzes the information or biospecimens; or (2) Obtains, uses, studies, analyzes, or generates identifiable private information or identifiable biospecimens. 45 CFR 46.102(e)

If you do not believe this determination is accurate, or should you wish to amend this project in any way that might impact this determination, please contact the CHIRB.

Please note that any publications regarding this project should not describe this body of work as "research" or as a "study" involving human subjects.

Please note that it is your responsibility to obtain any additional local institutional or departmental required approvals prior to initiating your project.

The following documents have been reviewed in making this determination:

- Abstract/Summary - Gibbons.Sara_Project Summary_IRB submission.docx (UPLOADED: 09/20/2019)
- CHI - Research Application - CHI - Research Application (UPLOADED: 09/20/2019)
- CV/Resume - SARA Gibbons RESUME 2019 updated.doc (UPLOADED: 09/20/2019)
- Letter - NR706B_GibbonsSa_Letter of intent.pdf (UPLOADED: 09/20/2019)
- Letter - IRBNetDocument.pdf (UPLOADED: 09/20/2019)
- Other - Research Routing Form- Affiliate- S Gibbons.pdf (UPLOADED: 10/28/2019)
- Other - Rsearch Routing Form.pdf (UPLOADED: 10/3/2019)
- Training/Certification - citiCompletionReport7895104-Sara Gibbons.pdf (UPLOADED: 09/20/2019)

If you have any questions at any time, please feel free to contact the CHIRB at 1-844-626-2299 or CHIRB@CatholicHealth.net. Please include your project title and reference number in all correspondence with the CHIRB so that we can best assist you.

Thank you.

Appendix H

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM) COMPLETION REPORT - PART 1 OF 2 COURSEWORK REQUIREMENTS*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Sara Gibbons (ID: 7895104)
- **Institution Affiliation:** Regis University (ID: 745)
- **Institution Email:** nels393@regis.edu
- **Institution Unit:** Nursing
- **Phone:** 3039291118

- **Curriculum Group:** Human Research
- **Course Learner Group:** Social Behavioral Research Investigators
- **Stage:** Stage 1 - Basic Course

- **Record ID:** 30535817
- **Completion Date:** 11-Feb-2019
- **Expiration Date:** 10-Feb-2022
- **Minimum Passing:** 80
- **Reported Score*:** 91

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
Unanticipated Problems and Reporting Requirements in Social and Behavioral Research (ID: 14928)	10-Feb-2019	4/5 (80%)
Populations in Research Requiring Additional Considerations and/or Protections (ID: 16680)	11-Feb-2019	5/5 (100%)
Conflicts of Interest in Human Subjects Research (ID: 17464)	11-Feb-2019	4/5 (80%)
History and Ethical Principles - SBE (ID: 490)	11-Feb-2019	5/5 (100%)
The Federal Regulations - SBE (ID: 502)	11-Feb-2019	4/5 (80%)
Assessing Risk - SBE (ID: 503)	11-Feb-2019	5/5 (100%)
Informed Consent - SBE (ID: 504)	11-Feb-2019	5/5 (100%)
Privacy and Confidentiality - SBE (ID: 505)	11-Feb-2019	5/5 (100%)
Defining Research with Human Subjects - SBE (ID: 491)	11-Feb-2019	4/5 (80%)
Students in Research (ID: 1321)	11-Feb-2019	4/5 (80%)
Internet-Based Research - SBE (ID: 510)	11-Feb-2019	5/5 (100%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: www.citiprogram.org/verify/?k5e47b433-30ce-4cb7-8b63-033e684c7eed-30535817

Collaborative Institutional Training Initiative (CITI Program)
Email: support@citiprogram.org
Phone: 888.539.5979

Appendix I**Letter of Agreement**

Thursday, August 22, 2019

To Regis University Institutional Review Board (IRB):

I am familiar with Sara Gibbon's quality improvement project entitled Peripheral Intravenous Education for Nurses. I understand Littleton Adventist Hospital's involvement to be allowing a class to be taught to nurses on a pilot unit and pre and post survey data collection on that unit.

I understand that this quality improvement project will be carried out following sound ethical principles and that participant involvement in this project is strictly voluntary and provides confidentiality of all data, as described in the proposal.

Therefore, as a representative of Littleton Adventist Hospital, I agree that Sara Gibbon's quality improvement project may be conducted at our agency/institution.

Sincerely,



Kelley Kovar, MSN, RN, NE-BC, OCN
Interim Chief Nursing Officer, Littleton Adventist Hospital
KelleyKovar@Centura.org
303-734-3959