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Identifying Risk Factors for High Incidence of Peripheral Intravenous Catheters Complications: Reducing Infiltration Rate within the Hospital

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This is to certify that the doctoral study by

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Abstract

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MS, University of Mobile, 2004

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Project Submitted in Partial Fulfillment

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Abstract

There are an increasing number of intravenous infiltrations within hospitals, leading to problems from infiltration, such as phlebitis and cellulitis, which result in a longer length of hospital stay. Using Abdellah's classification framework for identifying nursing problems, the purpose of this quantitative, descriptive project was determine how to reduce peripheral intravenous catheters infiltration in order to increase the longevity of the peripheral intravenous catheter. Data were collected from incidents of peripheral intravenous infiltration, which was identified in the patient safety event log throughout the 252-bed hospital. Each incident was assessed for several risk factors, such as age, diagnosis, length of time of catheter use, comorbidities, size of catheter used for insertion, and how many medications were being administrated intravenously. Descriptive statistics were used to analyze and summarize the data results collected from 50 patients' records to determine if risk factors had some correlation with increased incidents of infiltration of peripheral intravenous catheters. According to the study results, 56% of the patients had a diagnosis of hypertension. According to the data results, 82% of the peripheral intravenous catheters were located in the upper arm, which was a contributing factor to the longevity of the peripheral intravenous catheter site. The combination of patients with comorbidities, advancing age, and placement of the peripheral intravenous catheter had a direct correlation with the increased probability of infiltration before 96 hours. The results of this data played a key role in the decision to the change the organization's clinical practice and protocol related to peripheral intravenous catheter insertions and maintenance.

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Section 1: Nature of the Project

Introduction

Peripheral intravenous catheter infiltrations can cause many complications because they may interact with upper extremities that contain many compartments. Fluids that escape from the vein can become trapped in the compartments of the arm and produce problems (Rickard, McCann, Munnings, & McGrail, 2010). These problems can include increased pressure damages to nerves, arteries, and muscles with the possibility of irreversible nerve damage. This type of damage could occur within 4 hours of the IV infiltration (Rickard et al., 2010). Skilled assessment and interventions can protect patients from peripheral intravenous catheter infiltrations and subsequent complications. Information obtained and analyzed from patient safety incidents of peripheral intravenous catheter infiltration has the potential to determine practice approaches that may decrease the frequency of infiltration incidents. Identifying the risk factors that are related to the high incidence of peripheral intravenous ccatheters infiltration will contribute to decreasing the incidence of complications within the hospital at the study site.

Background

Problems that lead to infiltration of peripheral intravenous catheters include mechanical forces used, such as intravenous infusion pumps, which could displace the peripheral intravenous catheter, thereby causing obstructions of blood flow around or through the catheter, which initiates the inflammatory process

(Schiffer et al., 2013). In a study on the use of intravenous catheters, Safdara, McKinley, Davidson, Broome, and Schenk (2011) found that over 70% of inpatients in hospitals need peripheral venous catheters and over 200 million are used every year in the United States. The use of a peripheral venous catheter is often interrupted before completion of treatment due to irritation of the vein (phlebitis) with symptoms including pain, redness, swelling, and occlusion. Bloodstream infection associated with peripheral venous catheter is less common, but is a complication that occurs in approximately 0.1% of the intravenous, or 0.5 per 1,000 catheter, days (Safdara et al., 2011). A peripheral venous catheter is often used for a week or more, but their routine replacement by a new catheter has been recommended in order to reduce cases of phlebitis and infection (Safdara et al., 2011). Routine exchange requires additional venipunctures for the patient, increasing the workload of staff in addition to increasing hospital costs. The routine replacement of peripheral venous catheters every 72-96 hours in adults is recommended by the Centers for Disease Control and Prevention (CDC, 2011) in its 2002/2011 guidelines.

Modern intravenous catheters are manufactured with a low capacity of blood vessel irritation, and the materials may not need routine replacement. Increased dwell time of catheters increases the risk of phlebitis daily linearly, but exponentially. Researchers have highlighted concerns that changing the established practice would cause an increase in bloodstream infections. The CDC established that the exchange of peripheral venous catheters when clinically indicated is a matter still unresolved, indicating that further studies are needed, except for the area of pediatrics (Ahn, Illum, Wang, Sharma, & Dowell, 2013).

In this type infiltration, the tissue damage may take days to develop into an ulcer, sometimes after the patient has been discharged from the hospital (Hadaway, 2012). The ulcer forms when fluid increases and the venous end of the capillary bed become compressed. A compartment syndrome may also occur when the vessel within the vein cannot get rid of the pressure of the excess fluid and the pressure rises intravenously. Reflex sympathetic dystrophy syndrome is a chronic pain syndrome, which is caused by trauma to nerve complexes or soft tissue (Wallis et al., 2014). Although the complete reason it happens is unknown, some believe that reflex sympathetic dystrophy syndrome happens when the peripheral intravenous catheter is inserted within this area and traumatizes the nerve (Wallis et al., 2014).

Peripheral intravenous catheter placement is one of the most invasive procedures that will be performed by a nurse, and it is one of the most common procedures performed in hospitals. Peripheral intravenous catheters are inserted routinely by the nursing staff in various areas of the hospital and are maintained by the staff in the unit area that the patient is admitted. Each nurse is typically trained in nursing school on the proper methods for peripheral intravenous catheter insertion and maintenance. Also, hospitals educate the staff on the insertion and care of peripheral intravenous catheters according to the hospital policy (Chopra et al., 2012).

Problem Statement

The Quality Assurance Department at the hospital in which the study was preformed reported a more than 50% increase of reported peripheral intravenous catheter infiltration at this hospital ("Patient Safety Event," 2014). This rate was based on the assumption that all safety events of peripheral intravenous catheter complication were entered into the patient safety event program. Each episode of a complication that is created by peripheral intravenous catheter is reported to the quality assurance department by filling out a patient safety event (PSE).

With an increase in the incidence of peripheral intravenous catheter complications, there is a need to explore causative factors to gain a greater understanding of why so many peripheral intravenous catheter complication failures occur. Recognizing the complications that are associated with peripheral intravenous catheters may result in decreasing poor patient outcomes, which is related to localized phlebitis leading to infection and other problems, such as compartmental syndrome. One of the main goals of the project was to describe the factors involved in the preparation, administration, and management of peripheral intravenous therapy in the clinical setting in order to reduce the chances of infiltration of peripheral intravenous catheter site. Principles of asepsis (which play a key role in the administration, preparation, and management of peripheral intravenous therapy) are one of the components in decreasing infection complications of peripheral intravenous catheter (Alekseyv et al., 2012).

Purpose Statement

The purpose of this project was to determine patient risk factors for peripheral intravenous complication so that nurses will recognize and have more opportunities to decrease the incidence of complications of peripheral intravenous catheter sites. The research will help educate nurses on preventing infections from peripheral intravenous catheters

Project Objectives

The objectives for this project were to examine the following questions:

1. Does increasing the frequency of replacement and monitoring peripheral intravenous catheters result in a decrease in the number of infiltration or complications experienced in the hospital units?
2. Does advanced age and the presence of comorbidities increase the probability of infiltrations or complications?
3. Will the use of a secure device for a peripheral intravenous catheter help decrease the frequency of infiltration?

In this study, I reviewed the records of patients who had a reported peripheral intravenous catheters infiltration, and I reviewed the complications to determine whether comorbidities and advancing age were contributing factors to the increase in peripheral intravenous catheter infiltrations so that intervention and policies can be put in place to decrease peripheral intravenous catheter complications. The intervention included decreasing the length of time for peripheral intravenous catheters for patients with increased risk factors.

Despite regular assessment of peripheral intravenous catheter sites by staff, it is possible for a displaced cannula to be overlooked. When this happens, it is imperative that the nurse removes the peripheral intravenous catheter in order to limit complications. Subsequent complications can be masked by the dressing used to secure, such as opaque dressings, and by the use of infusion pumps. Performing an insertion of a peripheral intravenous catheter is one of the more challenging clinical skills nurses need to master, and nurses must be more informed of factors that place the patient at risk for developing complications.

Nature of the Project

A retrospective chart review was conducted after randomly identifying hospitalized patients who experienced peripheral intravenous catheter infiltration from a patient safety event list. I used a retrospective analysis to gather information on risk factors that may contribute to peripheral intravenous catheter infiltration. The patients were selected by identifying every 10^{th} patient from the population.

Definitions

There were several definitions that were associated with my project.

Infiltrating: The material collected in those tissues or cells (Medical-Dictionary, n.d.).

Necrosis: The death of cells in a tissue or organ caused by disease or injury (Medical-Dictionary, n.d.)

Peripheral intravenous catheter: A hollow flexible tube that is inserted into the vein to allow passage of fluids. A side effect of a peripheral intravenous

catheter infiltration is phlebitis, which is the inflammation of a vein, which usually occurs in superficial veins (Medical-Dictionary, n.d.).

Vesicant: A drug that is capable of causing tissue necrosis when it extravagates into the tissue from a peripheral intravenous catheter (Medical-Dictionary, n.d.).

Assumptions

In this project, I assumed that if staff is educated on the proper securement and sites of peripheral intravenous catheter placement, this will result in an increase in the longevity of the peripheral intravenous catheter. I also assumed that educating staff on determining the size of the peripheral intravenous catheter related to the type of treatment the patient will receive may increase the longevity of the peripheral intravenous catheter site. It was also assumed that educating the staff to consider comorbidities and advancing age as a factor in placement, size of peripheral intravenous catheters, and type of peripheral intravenous catheter will increase the longevity of the peripheral intravenous catheter sites and decrease the probability of complication.

Scope and Delimitations

The project was chosen to study the role of risk factors in the high incidence of peripheral intravenous catheters complications. The goal of this project was to reduce the infiltration rate within the hospital setting.

Limitations

The limitations of this project were based on the patient, diagnosis, and the nurses performing the procedure. The number of different medical diagnoses a

patient may have could affect the validity of the project. The number and types of medications may decrease the longevity of a peripheral intravenous catheter, regardless regardless of the securement device; the placement or size of the catheter may limit the results of the project due to the irritation from the medications. The different skill level of the nurses who were performing the task of inserting a peripheral intravenous catheter may also be a limitation of this project because less experienced nurses may not have a sufficient knowledge base to assess best placement. Also, this study was limited because the collected data were based on different nurses' assessment of the infiltrated peripheral intravenous catheter site.

The event reporting was the responsibility of the nursing staff. This limited the project because I depended on the nurses to report each event of infiltration of a peripheral intravenous catheter truthfully and without failing to report each occurrence. The project findings were limited to the population of the hospital due to the limited number of diagnoses that were used for this project. The project could be generalized to a larger population of patients if it is expanded to other hospitals in the area. The hospitals within the area share the same population of people who have to decide their hospital due to their insurance. The population of people in the area is also forced to change the hospital that is considered their regular hospital due to intervals of hospitals in the area undergoing diversion. A hospital may notify the emergency medical service (EMS) system of a temporary inability to provide care in the emergency department (ED) and request ambulances to divert patients to an alternate hospital facility (EMS, 2011). This is a reason why the hospitals are forced to share the same population of patients in the area.

Significance of the Project

Knowledge of vein wall anatomy and physiology is necessary to understand the potential complications of peripheral intravenous therapy and is the first step to having a working knowledge of the possible risk factors for complications. As illustrated in Figure 1, there has been a number of peripheral intravenous catheter complications at the study site based on recent information obtained from the patient safety event log (February 2013). On average, the hospital sees a significant number of peripheral intravenous catheter complications with the most noted in the telemetry units (Chopra, Anand, Krein, Chenoweth, & Saint, 2013).

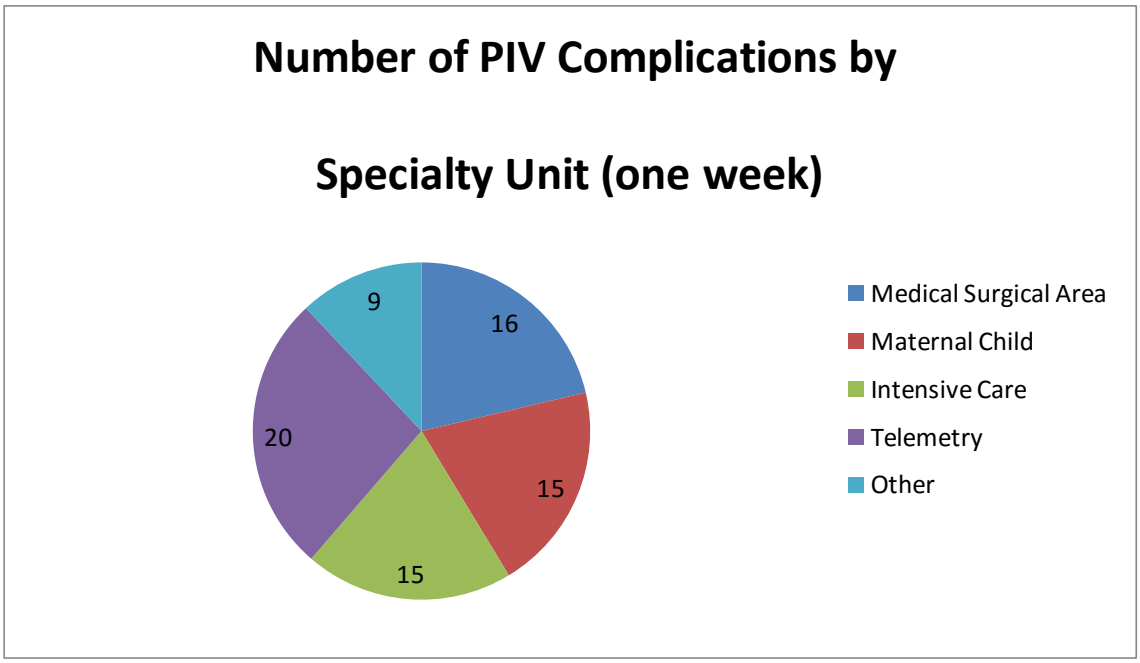

Figure 1. A representation of the number of PIV complications in a week

Summary

In this section, I discussed the nature of the project and peripheral intravenous catheter complications. I provided an overview of peripheral intravenous catheter

complications. Peripheral intravenous catheter complications occur in the study site hospital, and the aim of this section was to provide a background of peripheral intravenous catheter complications. Section 2 includes the literature review and framework that is related to peripheral intravenous catheter complications.

Section 2: Review of Literature and Theoretical and Conceptual Framework

Introduction

In this section, I will discuss the risk factors for the high incidence of peripheral intravenous catheter complications in order to reduce the infiltration rate within the hospital. I will present past studies conducted by scholars in the field of peripheral intravenous catheter complications.

Literature Search Strategy

To find literature for this study, I reviewed databases such as EBSCOHOST, ProQuest, and Science Direct using the following key words: *Intravenous cannula, central venous line, peripheral intravenous catheter, phlebitis,and Infiltration.* The literature review covers a span of 5 years dating 2010-2015.

Framework

Conceptual clarity refers to identifying a description of the concepts, as well as the identification of relational statements, to show an association among concepts. Abdellah (2013) proposed a classification framework for identifying nursing problems based on the idea that nursing is primarily oriented to meeting an individual client's total health needs. The risk factors that are associated with increased peripheral intravenous catheter complications for patients relates to Abdellah's classification on identifying a nursing problem. This project will enable the hospital to ensure that the patients will have a positive outcome of peripheral intravenous catheters using evidence-based practice as the guide (Abdellah, 2013).

Abdellah's (2013) patient-centered approach to nursing was developed inductively from practice and is considered a human needs theory, which will help guide the care of patients in the hospital. Abdellah promoted the image of a nurse who was not only kind and caring, but also intelligent, competent, and technically well prepared to provide safe care to the patient. The nursing image that is portrayed by Abdellah is needed so that the hospital nurses will be educated in order to provide evidence-based practice for peripheral intravenous catheters.

Literature Review

A peripheral IV catheter is the most common invasive procedure performed among hospitalized patients. However, is not free of risks. With the advancement in the development of treatments and drugs, intravenous therapy is becoming increasingly complex, increasing the risk of complications for patients (Carson, Dychter, Gold, & Haller, 2012). Knowing the patients and seeking information on safe practices, being alert to the signs and symptoms of risk factors, and treating them should be a priority for nurses. This requires the mastery of knowledge from anatomy, physiology, microbiology, pharmacology, psychology, and manual dexterity (Alekseyv et al., 2012).

With regard to intravenous therapy in newborns (NB), their venous network conditioned by the body is still in the development phase. Therefore, coupled with aspects of absorption, distribution, metabolism, and excretion of drugs, peripheral venous access is one of the most difficult procedures to perform in this type of clientele (Paiva et al., 2013).

It is necessary to establish preventive measures and maintenance in the neonatal intensive care units (NICU) nurses' venous access in order to allow venous infusions safely. Safe infusions ensure the establishment and restoration of the health of the newborn, increasing quality and humane care and avoiding the complications related to peripheral venipuncture. Peripheral venipuncture is defined as not expected or desired results associated with the proposed therapy, usually related to risk factors such as the nature of the drugs, the duration of therapy, the individual characteristics of the patient, the technical skill of the provider, or location and type of intravenous device (Westergaard, Classen, & Walther-Larsen, 2013). Considering the lack of nationwide surveys related to complications of peripheral venous access and the role of the nurse, it is important for peripheral venipuncture in newborns admitted to NICU to be reduced in order to minimize complications arising from this procedure. Researchers must analyze the care of the nursing staff in the prevention and treatment of complications of peripheral venipuncture in newborns admitted to NICU (Westergaard et al., 2013).

The hospital protocol relates to changing peripheral intravenous catheters in order to decrease the probability of complications. Ho and Cheung (2011) provided clinical strategies on methods for replacing peripheral intravenous catheters in an effort to decrease problems and to lower related expenses. The Cochrane Library Database was used to provide a systematic review to recover the best evidence-based research for the practice of replacing peripheral

intravenous catheters (Ho & Cheung, 2011). Ho and Cheung focused on six randomized controlled trials (RCT) to compare the routine replacement of peripheral intravenous catheters with clinically specified replacement in patients with catheters in hospitals. There was no convincing evidence showing that the repetitive replacement of peripheral intravenous catheters was more helpful than clinically specified replacements (Ho & Cheung, 2011). It is recommended that regular and random examinations of the peripheral catheter site should be supported to evaluate whether any complications have developed.

The use of securement devices has been included in the hospitals protocol as a strategy to decrease complications in peripheral intravenous catheters. Alekseye et al. (2012) used an integrative review to determine if securement device leads to a decrease in the complication of peripheral intravenous sites. Alekseye et al. found that a sacrament device has practical implications in evidence-based practices of maintaining a peripheral intravenous catheter in place to decrease complications. The strategies to improve peripheral intravenous catheter securements for increased patient comfort and safety may be needed to prolong the peripheral intravenous catheter function while preventing complication of infections, phlebitis, infiltration, occlusion, or unplanned catheter removal (Alekseyv et al., 2012). The use of peripheral intravenous catheter securement devices reduced problems associated with peripheral intravenous catheters and increased the length of time without complications (Alekseyv et al., 2012).

These studies were primarily concerned with the cost that would occur if peripheral intravenous catheters were left in place until clinical reasons require changes.

This would decrease the chance of a positive outcome for the patient. While the studies had merit, the reasoning for the outcomes needs to be re-evaluated. The studies need to be more representative of the patient in determining the best evidence-based practice for a peripheral intravenous catheter related to patient outcomes rather than the cost of replacing peripheral intravenous catheters.

Research was done on the incidence of phlebitis to evaluate related factors of this complication. Wilson et al. (2012) examined 300 patients admitted to medical and surgical wards of hospitals in Semnan, Iran from April 2003 to February 2004. Any patient who was discharged or their catheter removed before 3 days were excluded. Variables that were evaluated were age; gender; site and size of catheter; type of insertion; and underlying conditions, such as diabetes mellitus, trauma, infectious disease, and burns (Wilson et al., 2012). According to the final analysis of the study, phlebitis occurred in 26% of the patients (Wilson et al., 2012). There is an ongoing problem in patients with underlying problems who need more attention given to their peripheral intravenous catheter.

Following the publication of the CDC guidelines, the William S. Middleton Memorial Veterans Hospital (Madison VAH), a 100-bed acute care university hospital affiliated facility, extended the peripheral intravenous catheter (Becton Dickinson Insyte Autoguard Safety IV catheter) rotation from 48–72 to 72–96 hours in September 2001 (Safdara et al., 2011). The rates of peripheral vascular catheter-associated primary blood stream infections rose to 0.24, 0.10, and 0.17 per 1,000 patient days in 2002, 2003, and 2004 (Safdara et al., 2011, p.

178). According to Safdara et al. (2011), peripheral venous catheters left in >72 hours significantly increased the risk of complications.

The most frequent complication of peripheral intravenous catheter infusion is phlebitis, which may occur at rates as high as 50% or even as high as 75% in patients with infectious diseases (Carson et al., 2012); however, the incidence rate in patients who do not have diabetes, burns, or a need for urgent catheter insertion is approximately 20% (Carson et al., 2012). A number of risk factors have been implicated in the development of phlebitis. Carson et al. (2012) stated, "Patients who are female or who have poor quality peripheral veins, inserted in the lower extremity, or the presence of underlying medical conditions, including cancer and immunodeficiency, are at an increased risk for phlebitis" (p.85). An insertion of catheters into the veins around the elbow increased the risk of phlebitis more frequently when the catheter was inserted in a lower extremity (Carson et al., 2012). According to Carson et al., the CDC recommends that, in adults, an upper-extremity site should be used for catheter insertion instead of a lower-extremity site to reduce incidents of complications. Tuffaha et al. (2014) determined that it is not cost effective to do the routine replacement of the catheters. A replacement strategy was associated with a cost savings per patient, and there was a nonsignificant difference in the phlebitis rate when the replacement of peripheral intravenous catheters was only changed when it was clinically indicated (Tuffaha et al., 2014).

A peripheral venous catheter is the insertion of a catheter or peripheral intravenous catheters device for delivering therapeutic agents, thus avoiding the constant needling of the patient, which may lead to increased infections, injuries, and discomfort.

Up to 70% of patients in acute care hospitals require a short peripheral intravenous catheter. In the United States, 200 million catheters are used annually (Carson et al., 2012). Peripheral intravenous catheters often fail before the end of treatment due to vein irritation (phlebitis), with symptoms such as pain, swelling, redness, and palpable venous cord occlusion. Phlebitis is an indication of the removal and replacement of the catheter. The blood-borne infection related to peripheral intravenous catheter is a less common but serious complication that occurs in about 0.1% of glass ionomer cement (GIC) or 0.5 / 1,000 catheter / year (Ho & Cheung, 2011). In general, due to the need to remain in situ, GICs about ≥1 week was recommended to be dropped and replaced with a new catheter to reduce the development of phlebitis and infection. Replacement requires additional punctures, which increases the need for medical equipment; replacement also is the most common invasive procedure and, therefore, is a major contributor to the cost of the health system (Safdara et al., 2011).

Currently, the CDC recommends that in adults, peripheral intravenous catheter systematic replacement should be carried out every 72-96 hours. However, the CDC does not recommend routine replacement in children because routine replacement does not prevent modern peripheral intravenous catheter infection. Most of the in situ catheter retention increases the risk of phlebitis daily, more linearly than exponential (ie., more peripheral intravenous catheter days increases the overall risk on farthest from catheter insertion at no higher risk than the first day). Therefore, the systematic replacement of peripheral

intravenous catheters may not be benecial to patients, as it could have the same number of complications due to the increased number of devices placed.

Researchers have supported the removal of the catheter as a safe alternative compared to systematic replacement. Despite this evidence, questions remain as to whether the systematic replacements increase hematological infections. The CDC found that the replacement of the catheter was a clinical indication unresolved issue, indicating that more research is required (as cited in Ho & Cheung, 2011). Peripheral intravenous catheters can be removed for clinical reasons. This policy will prevent millions of catheter insertions, decreasing costs in both equipment and workload of the medical team. Close monitoring is needed to make timely treatment discontinuation and prompt removal of the catheter when complications occur. Peripheral intravenous catheters are a vital resource in the clinic, being predominantly used to infuse large volumes of fluids, drugs, and blood products, as well as managing agents that are altered by gastric juice or poorly absorbed from the gastrointestinal tract. Thus, the inclusion of the peripheral intravenous catheter is one of the most common procedures in the practice of nursing. It is estimated that over 60% of patients admitted to hospital care require peripheral intravenous catheter (Ho & Cheung, 2011).

Background and Context

Using data from the quality assurance (QA) department on the demographics of age, income, and gender, I evaluated the different paradigms of peripheral intravenous catheter complications.

Summary and Conclusions

In the literature review, I provided background information on peripheral intravenous catheters. Numerous interventions have been created to lessen the frequency of phlebitis, including new catheter materials and creative routines for securing the catheter (Rickard et al., 2010). Phlebitis is more likely to happen in the initial 2 days after the fringe intravenous catheter has been embedded; thusly, uprooting a useful catheter and resitting again may open patients to the unnecessary danger of contamination (CDC, 2011, para. 8.) Peripheral intravenous catheters should be changed on a routine basis from 72 to 96 hours or as needed to reduce possibilities of complications. Peripheral intravenous catheter left in >72 lead to an increased risk of complications; other diseases factor play a part in the risks of complications. Further studies should be done to determine how long a peripheral intravenous catheter should remain in a patient and what other factors should determine this timeline.

In Section 3, I present the methodology of the study.

Section 3: Methodology

Introduction

An increasing number of peripheral intravenous catheter infiltrations can result in complications leading to poor patient outcomes. In Section 3, I will provide information on the project methodology, patient population and sampling, ethical considerations, data collection procedures, data analysis, constraints, and an evaluation plan.

Methodology Approach and Rationale

In peripheral therapy, patients may experience serious, life-threatening, or life-altering complications, even with attentive nursing care (Rickard et al., 2010). This project involved reviewing records of patients who had a peripheral intravenous catheter in the hospital where certain factors contributed to them being more subject to complications in their peripheral intravenous catheter site. I used a quantitative, descriptive method to focus on identifying factors that contributed to frequent occurrences of peripheral intravenous catheter complications. I intended to determine whether the presence of comorbidities and the age of the patient related to peripheral intravenous catheter complications.

Population and Sampling

The setting of the study was a 252 bed, acute-care hospital that was accredited by the Joint Commission. It was a private, for-profit organization located in Southern Alabama. The nursing staff was comprised of registered nurses and licensed practical nurses. The hospital had approximately 650 patients a month per unit, according to the monthly budget reports. The sample size for the study included 50 patients records that

were randomly chosen from the PSE program list from June 2013 through June 2014. The limited number of patients was decided based on the timeline for the project and the length of time it would take to review each electronic record. These were patients who had peripheral intravenous catheter complications while in the hospital. Data collected included the information obtained by the hospital's PSE program. The evidence was collected from the facility to change policies and disseminate evidence-based practice into the clinical area with the hopes of decreasing the incident of peripheral intravenous catheter complications. The patients were selected from the PSE list because the patients were not recognized by their unit, which increased the chances of a variable sample from each unit of the hospital. The patient had a complication with a peripheral intravenous catheter, and it was recorded in the PSE program.

Confidentiality of Patients

The PSE program is a software that the QA department uses to collect data on safety events that occur within the hospital, such as falls and peripheral intravenous catheter complications. Due to the nature and information needed for the project, I had to seek approval from the hospitals' vice president and the Walden Institutional Review Board (IRB) committee. The program was protected by a password and could only be accessed by the director or assistant director of QA. The PSE list is reviewed in the QA department because this information is considered protected patient health information. Because this program is also used

for other safety events, I only had access to the PSEs that were related to peripheral intravenous catheter complications.

Data Collection Procedures

In this study, I accessed patient information regarding peripheral intravenous catheter complication once it was entered into the PSE program. There are several parts of this form that must be completed, which assisted me in collecting the data needed for the project. The information includes when the peripheral intravenous catheter complication occurred and the sign and symptoms that went along with the complications. The data were pulled from the PSE by the director of QA. The PSE chosen to be reviewed included information collected on insertion site, complication date, diagnosis of the patient, age, and evidence of any comorbidities. Time and dates of the peripheral intravenous catheter insertion and removal were recorded along with the reason for the peripheral intravenous catheter removal and any protocol deviations. The age and diagnosis of the patient were recorded as a part of the data collection used when analyzing the results. The patient was excluded if he or she did not have data in the PSE program, which would suggest that there were not any peripheral intravenous catheter complications during this patient stay in the hospital. Patient- and catheter-related variables were considered in the model and included the size of the cannula and poor skin or vein integrity. The information was gathered in order to note if there was a relationship between age, diagnosis, length of time from when the peripheral intravenous catheter was inserted, and/or if the patient had any comorbidities.

Data Analysis

The data were analyzed through the generation of descriptive statistics. Descriptive statistics was used to present quantitative descriptions in a manageable form. Once the data were collected, I inserted them into an Excel spreadsheet so that they could be analyzed using the Excel statistical analysis tool. Descriptive statistics were used to find results that would explain the correlations between risk factors that increased the probability of infiltrations of peripheral intravenous catheters in order to present an overview of the statistical results.

Time and Resource Constraints

There were limitations associated with the qualitative, such as the existing information might not be related to the research topic selected for the study. Also, qualitative data might not be published on authentic websites, which might have had an impact on the reliability of the information included in the study. The perspectives behind the information collected from other researchers might not match with the aims and objectives of the study. There was a chance that the qualitative data included in the study might be based upon the biasness of the researcher.

Evaluation Plan

Success of the project will be achieved by determining if the objectives are achieved. The protocol for the hospital is to change peripheral intravenous catheters every 96 hours regardless of comorbidities; therefore, these peripheral intravenous catheters are changed when complications occur even in a situation

when the peripheral intravenous catheter is leaking. The practitioner should recognize the impact that chronic diseases and age have on the infiltration of peripheral intravenous catheters. The development of a policy using an evidence-based model from the literature review and nursing practice could affect patient outcomes. An available policy and computer system that supports the nurses involved in peripheral intravenous catheter insertion is needed to review the data. Also, regularly updating the nurses' knowledge in peripheral intravenous catheter preparation, administration and management, and regular auditing of aseptic techniques and identifying shortcomings will help nurses to be able to provide evidence-based care. Such strategies will encourage nurses to take responsibility for the problems identified in their practice and improve the standards of insertion of a peripheral intravenous catheter to reduce complications.

Summary

Obtaining peripheral venous access is an essential part of nursing care offered to the majority of hospitalized neonates. For peripheral intravenous puncture, multiple devices are employed. Nurses must know the indications and specifics of each material for a safe choice and to reduce the risk of infection and complications. Having reliable peripheral venous access is an essential piece of medical care used in hospitals in order to hydrate and medicate patients and to perform different tests. Research is needed to find the best evidence-based practices for when to change the site of peripheral intravenous catheters to decrease complications. Complications of peripheral intravenous catheters can be serious, but with attention and an eye on prevention, nurses can help patients avoid peripheral intravenous catheter complications. Clinical, evidence-based practice

indications for changing of sites would achieve savings in patient discomfort and complications.

When applying evidence, the hospital will recognize the impact that comorbidities and age may have on the infiltration or complications of peripheral intravenous devices. The hospital should use the policy that is advocated by the CDC and change the peripheral intravenous catheters every 3 to 4 days. The most widely practiced intervention, however, is the routine replacement of the catheter (Hadaway, 2012). The CDC advocates for replacing catheters every 72-96 hours to limit the potential for infection, but the recommendation was based on limited evidence. Catheters may be safely left in place for a certain amount of time using age and comorbidities to determine the time frame. Phlebitis is more likely to occur 2 days after the peripheral intravenous catheter has been inserted; consequently, removing a functional catheter and replacing it in a different site often exposes patients to unnecessary risk (CDC, 2011, para. 8). A policy using an evidence-based model from the literature review and nursing practice will give the hospital the best chances of the patients having a positive outcome.

In Section 4, I will present the findings of the study.

Section 4: Findings, Discussion, and Implications

Introduction

The purpose of the project was to identify factors that contribute to the increase in the potential for infiltrations of peripheral intravenous catheters. The overarching goal of the project was to reduce peripheral intravenous catheters infiltration and increase the longevity of the peripheral intravenous catheter within the organization. The collected data were from 50 random patients who had an occurrence of a peripheral infiltrated catheter during their inpatient stay at the organization. There were six chronic diseases that were used as comorbidities in the project: diabetes (DM), chronic obstructive pulmonary disease (COPD), chronic kidney disease (CKD), congested heart failure (CHF), hypertension (HTN), and cardiovascular accident (CVA). Although 72% of the patients had comorbidities, I did not find a direct effect on the infiltration of the peripheral catheter. I did find that 56% of the patients had HTN as shown in Figure 2 on the graphical representation of chronic diseases. When HTN veins and valves become weak or damaged, it can lead to problems with circulation, which can cause problems with peripheral intravenous catheters. Peripheral intravenous catheters used for medication and continuous intravenous fluids can put pressure on the vein, which can cause the vein to expand and infiltrate (Schiffer et al., 2013).

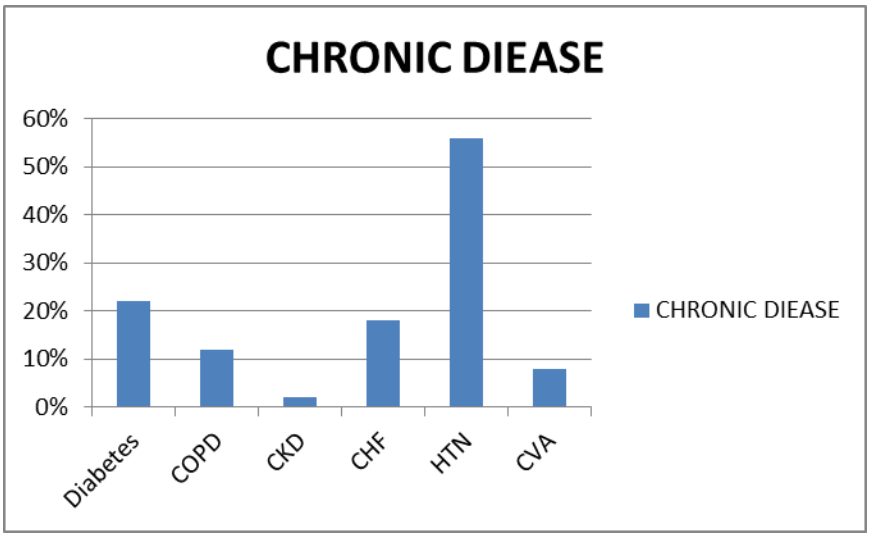

Figure 2. A graphical representation of number of patients (percentage) suffering from chronic diseases

According to the data shown in Figure 3, 48% of patients in the age ranges of 61-80 had frequent problems with infiltrations. The mean age of the patient was 65, and the median age was 63; no data were collected based on gender. According to the data, 46% of the patients had peripheral catheters inserted in the right or left forearm. In accordance with the data, 84% of the patients' peripheral intravenous catheters were 20 gauge jelco. The data showed that 82% of the peripheral intravenous catheters were inserted in the upper portion (anticubital and forearm) of the arm, which could have been a contributing factor in the longevity of the catheter due to placement and the frequent bending of the patient's arm. The average time the peripheral intravenous catheter lasted when inserted in the area of the forearm was 24 hours or less. The use of a peripheral intravenous catheter securement device would reduce the problems associated with the placement of the peripheral intravenous catheter (Alekseyv et al., 2012). Issues such as skin turgor and

poor vein source were not available within the patients' charts, so they were not used as variables.

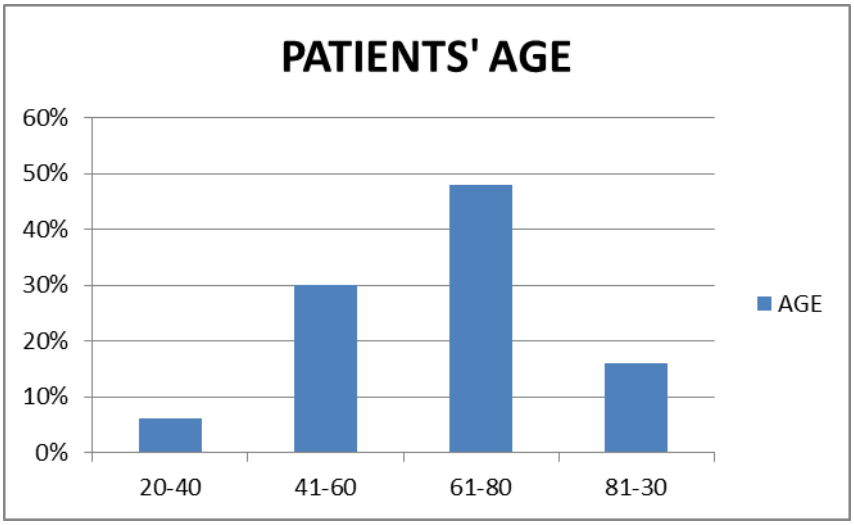

Figure 3. A graphical representation of patients ages versus percent use of intravenous injections

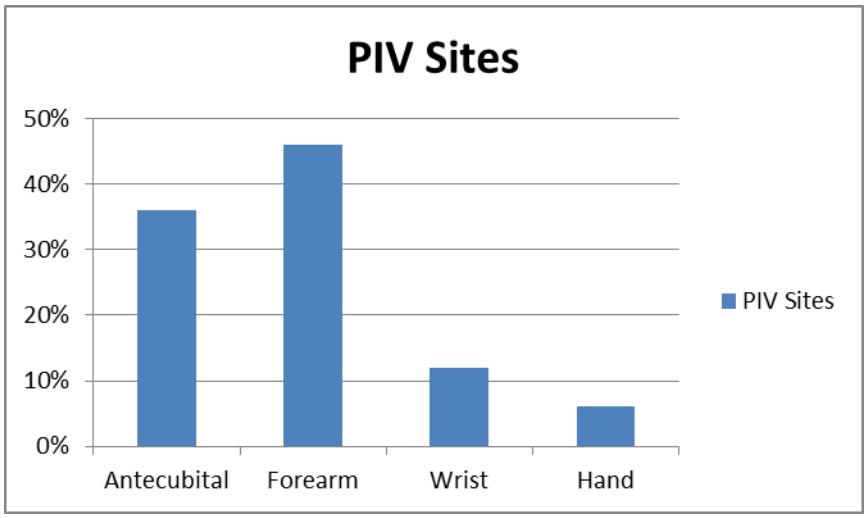

Figure 4. A graphical representation of the number of patients in percent versus the point of PIV

The combination of patients with comorbidities, advancing age, and placement of the peripheral intravenous catheter had a direct correlation with the increased probability of infiltration before 96 hours. According to the data, 54% of the patients in the project had three or more medications, which also led to an increase in peripheral infiltration within the first 24 hours of insertion. It was recommended that the frequent observation of peripheral intravenous catheters would decrease the complications that are associated with infiltrations of peripheral intravenous catheters due to early intervention. Ho and Cheung (2011) revealed that there is no convincing evidence that repetitive replacing of peripheral intravenous catheters is more helpful than regular and random assessments of the site for complications.

In accordance with the CDC's (2011) recommendation to prevent intravascular-related infections, peripheral intravenous catheters should be changed at least every 96 hours. The recommendation does not take in consideration the different types of medication that a patient may have infused into the peripheral intravenous catheters. With 54% of the patients in the project receiving three or more medications, it is important to consider that medications decreases the length of time a peripheral intravenous catheter should remain in place and should be considered when determining what type of peripheral intravenous catheter to place in a patient.

Implications

The findings were disseminated to the chief executive of nursing who allowed the intensive care nurses to form an intravenous catheter team that implemented a protocol to assist the nurses with peripheral intravenous catheter insertions. Due to the inability to

collect data on techniques, the project did not relate frequent infiltration to the techniques being used by the nurses, so to the best of my knowledge, decreasing the number of attempts to start peripheral intravenous catheters will have an effect on the length of time a peripheral intravenous catheter can remain in place. The new protocol involved nurses only getting two attempts to insert a peripheral intravenous catheter before requesting a consult from the intravenous catheter team. According to the nurses' assessment, a patient can receive a midline if he or she only has one arm to have a peripheral intravenous catheter or has had difficulties in the past with peripheral intravenous catheters. The intravenous catheter team is responsible for inserting midline peripheral intravenous catheters, which can have low infiltration rate; further research should be done to provide data to support this assumption. The midline is a 20-gauge jelco that is one and a half in length so it is inserted further into the vein using a portable ultrasound machine. The midline will stay in place for up to 30 days, with weekly dressing changes. Peripheral intravenous catheters are necessary in order to receive needed medications that are only given through an intravenous vein; therefore, changing the protocol was necessary to decrease infiltrations. Without actually performing an additional project on the results since the change in the policy, the organization has noticed a 40% decrease in the number of PSEs related to peripheral intravenous catheter infiltrations in accordance to the QA department (Springhill Medical Center [SMH], 2014).

Strengths and Limitations of the Project

The project will help to educate the staff on how the combination of comorbidities, advancing age, and placement of the peripheral intravenous catheter will

increase the probability of peripheral intravenous catheter infiltrating before the policy time frame of 96 hours. I identified a problem and implemented measures to encourage nurses to be more aware of their techniques and placement of peripheral intravenous catheters. This project has the ability to improve the health of the patient and increase patient satisfaction during their stay in the hospital. Education and training benefits may improve clinical practice.

The project had some major limitations, which were the sample size and me being employed by the organization. The organization is a small, for-profit hospital that has one owner. Another limitation was the time frame, which was limited to pulling patients from only 3 months of the year of 2014. Finally, the results of the research apply to only the organization where I was employed. Recommendations for the remediation of the limitations would be to increase the sample size and time line and to perform the project within an organization where I am not employed. It is also recommended to find a way to include the nurses' techniques that are used when inserting peripheral intravenous catheters.

Analysis of Self

As a scholar, I have learned to challenge the traditional ways that clinical procedure is being performed at the organization in order to perform evidence-based practices. It is important to have the ability to use the evidence base in order to strengthen practice within my organization. I am able to critically appraise the existing literature and compare it to the clinical practice within my organization to get the best patient outcomes and to also encourage nurses to further their education. According to Huston (2014),

being able to use knowledge created by researchers and theoretical scholars is essential for the delivery of high quality health care in any health care facility. As a practitioner, I have learned the importance of research in my clinical practice within my organization. As a practitioner, my curiosity has been increased, making me more willing to take risks for future changes. I have a determination to acquire new information through research that will help the staff to engage in changes using evidence-based practices at my organization. I help to solve specific problems, such as how to reduce peripheral intravenous catheter infiltrations within my organization.

I have learned that as a project developer there are key points that make up a successful project, such as analyzing the problems, in order to take the needed steps for the resolution of the problem. I have also learned the pitfalls to avoid during the timeline that I am researching and how to develop resolutions to problems. Being a project developer taught me to take advantage of all the information that is helpful to the project, and most importantly, to improve the educational experience while developing the project. As a project developer within my organization, I will have the opportunity to influence and invoke changes that may impact changes in health policies.

This project will have an impact on professional development in the future by teaching nurses risk management in determining the best possible site and type of peripheral intravenous catheter that the patient may need for his or her inpatient stay in the hospital. The project will be used to educate professionals on the importance of obtaining patient history of their experience with peripheral intravenous therapy. The nursing professionals will know the importance of educating patients about treatment

plans that will require a peripheral intravenous catheter, such as intravenous fluids and medication, and how these type treatments can impact the peripheral intravenous catheters sites. It could also have a positive impact for patients, due to nurses' professional development that contributes to their experience with placing peripheral intravenous catheters. The project will promote nurses to take responsibility of the problems identified in their practice and improve the standards of insertion of a peripheral intravenous catheter to reduce complications.

Summary

The project can be used to educate the staff on factors that could have a direct or indirect involvement in how long a peripheral intravenous catheter remains in place. The factors included in the research project were age, site, the size of the peripheral intravenous catheter, and comorbidities. A collaboration of factors contributes to the longevity of a peripheral intravenous catheter. Although the project had limitations, it showed the organization that there are factors related to the peripheral intravenous catheters that can decrease the frequent occurrence of infiltrations. The study site hospital will continue to use the policy that is required by the CDC (2011) when inserting regular peripheral intravenous catheter, but, the nurses can increase their observation of the catheter. With the changes in protocol, the organization will observe a change in the longevity of peripheral intravenous catheters and a better patient outcome.

In Section 5, I will present the project.

Section 5: Scholarly Product

Abstract

There are an increasing number of intravenous infiltrations within hospitals, which pose problems for patients including phlebitis and cellulitis resulting from an extended hospital stay. The purpose of this study was to identify factors that contribute to the increase in the potential of peripheral intravenous catheters. The primary goal of this study was to determine the ways to reduce peripheral intravenous catheter infiltration in order to increase the longevity of the catheter. Quantitative data were collected from incidents of peripheral intravenous infiltration identified in the patient safety event log throughout the 252-bed hospital. Each incident was assessed for several risk factors, such as age, diagnosis, length of time of catheter use, comorbidities, and size of catheter used for insertion. The data collected had an impact on the decision to the change the organization's clinical practice and protocol related to peripheral intravenous catheter insertions.

Publication

The *Journal of Infusion Nursing* is a nonprofit organization that is committed to bringing new resources and evidence-based practice to health care professionals. The *Journal of Infusion Nursing*, the official publication of the Infusion Nurses Society (INS), seeks to promote excellence in infusion nursing by presenting new research, clinical reviews, case studies, and professional development information relevant to the practice of infusion therapy (INS, n.d.). I will submit my project for possible publication to the *Journal of Infusion Nursing* upon completion. Articles that are submitted will be

subjected to the journal's editorial review board members who are considered experts in their individual areas of infusion nursing. Articles selected for publication represent the broad scope of the infusion specialty and draw on the expertise of all health care providers who participate in the delivery of infusion therapy (INS, n.d.).

Presentation

My project was presented in a Power Point presentation to the staff development department. The study results provided information to staff on understanding various impacts of complications with peripheral intravenous catheters. According to study findings, advancing age, comorbidities, intravenous medications, and site of a peripheral intravenous catheter has a direct correlation to complications for patients. The data will be incorporated into the orientation process for hiring nurses during the review of the hospital policy and protocol for peripheral intravenous therapy after the completion of the program.

Project Summary

The goal of this project was to investigate peripheral intravenous catheters because it is one of the most invasive procedures performed by a nurse in most hospitals. The QA department reported a more than 50% increase of reported peripheral intravenous catheter infiltration at this hospital (PSE, 2014). With this increase in the incidence of peripheral intravenous catheter complications, there was a need to explore causative factors to gain a greater understanding of why so many peripheral intravenous catheter complication failures occur. Recognizing

the complications that are associated with peripheral intravenous catheters may result in decreasing the prevalence of poor patient outcomes related to localized phlebitis leading to infection and sometimes extreme problems, such as compartmental syndrome. One of the main goals of the project was to describe the factors involved in the preparation, administration, and management of peripheral intravenous therapy in the clinical setting in order to reduce the chances of infiltration of the peripheral intravenous catheter site.

This study involved reviewing records of patients who had a peripheral intravenous catheter in the hospital where certain factors contributed to them being subjected to complications with their peripheral intravenous catheter site. A quantitative descriptive method was used to focus on identifying factors that contributed to frequent occurrences of peripheral intravenous catheter complications. It aided in determining whether the presence of comorbidities and the age of the patient related to peripheral intravenous catheter complications.

The setting of the study was a 252 bed, acute-care hospital that is accredited by the Joint Commission. It is a private, for-profit organization located in southern Alabama. The nursing staff is comprised of registered nurses and licensed practical nurses. According to the monthly budget reports, the hospital has approximately 650 patients a month per unit. For the purposes of this project, 50 patients' records were selected at random from the patient safety event program list from June 2013 through June 2014. These were patients who had peripheral intravenous catheter complications while being in the hospital.

Although 72% of patients had comorbidities, I did not find a direct effect on the infiltration of the peripheral catheter. I did find that 56% of the patients had hypertension (HTN); the HTN veins and valves became weak or damaged and cause problems with circulation, leading to complications with the peripheral intravenous catheters. According to the data, 82% of the peripheral intravenous catheters were inserted in the upper portion (antecubital and forearm) of the arm, which could have been a contributing factor in the longevity of the catheter due to the placement and the frequent bending of the patient's arm. The average time the peripheral intravenous catheter lasted when inserted in the area of the forearm was 24 hours or less. Issues such as skin turgor and poor vein source were not available within the patients' charts, so they were not used as variables.

Combinations of patients with comorbidities, advancing age, and placement of the peripheral intravenous catheter had a direct correlation with the increased probability of infiltration before the 96 hours. According to the data, 54% of the patients in the project were taking three or more medications, which led to an increase in the likelihood of peripheral infiltration within the first 24 hours of insertion. Frequent observation of peripheral intravenous catheters may decrease the complications that are associated with infiltrations of peripheral intravenous catheters, with early intervention. In accordance with the Center for Disease Control and Prevention (2011) recommendations to prevent intravascular-related infections, peripheral intravenous catheters should be changed at least every 96 hours. However, the recommendation does not take in consideration the different types of medication that a patient may have infused into the peripheral intravenous catheters. With 54% of the patients in the project receiving three or more

medications, it is important to consider that medication may decrease the length of time a peripheral intravenous catheter should remain inserted. Medication should also be considered when determining the type of peripheral intravenous catheter to place in a patient.

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Appendix A: Permission for DNP Project

Subject : Re: Permission for Research Project

Date : Mon, Feb 17, 2014 08:33 PM CST

From : Paul Read <Paul.Read@springhill.org>

To : Janise Banks <janise.banks@waldenu.edu>

Ms. Banks,

Your research project is approved

PAUL

On Feb 17, 2014, at 6:55 PM, Janise Banks <janise.banks@waldenu.edu> wrote:

Paul Read RN, MSN

Vice President /Chief Nursing Executive

Springhill Medical Center

Dear Mr. Read,

I am requesting your permission to conduct my Walden University DNP research at Springhill Medical Center. My research is on "To Identify Risk factors that Correlates with high incidents of Peripheral Intravenous Devices Complications" If you are in agreement with me conducting this research at Springhill Medical Center please send me an email for permission.

Sincerely,

Janise Banks, RN, MSN, OCN

Nurse Manager 4200/Pre Admit/OPIV Services

This transmission may contain confidential health information that is legally protected. As the recipient of this transmission, you are obligated to maintain it in a safe and confidential manner. Unauthorized re-disclosure or a failure to maintain the confidentiality of the information contained herein could subject you to penalties under State and Federal Law.

Appendix B: Confidentiality and Security Agreement

A

Springhill Medical Center
Confidentiality and Security Agreement

As an employee, student, or volunteer, I understand and agree that I must hold medical and other patient information in confidence. I understand "Confidential Information" (i.e. medical records, surgery schedules, physician-patient correspondence, etc.) to mean any patient information which I have seen, heard, or acquired while within a facility owned or operated by Springhill Hospitals, Inc. d/b/a Springhill Memorial Hospital ("SMH") or obtained remotely from SMH's computerized patient information system(s). I further understand that I must sign and comply with this agreement in order to obtain authorization for access to Confidential Information.

1. I agree to access and use Confidential Information only when it is necessary to perform my job related duties and in accordance with SMH's Privacy and Security Policies.
2. I agree not to discuss, reveal, copy or in any other manner disclose the contents of any Confidential Information, unless I am authorized to do so through an appropriate and properly executed "request for release of medical information" and it has been determined and ordered by the appropriate authority that the information is to be released, or the necessary authorization and consent has been obtained from the patient.
3. I understand that medical records, whether in paper or electronic form, are confidential and I agree to comply with all state and federal laws and regulations related to patient information including the Standards for Privacy of Individually Identifiable Health Information under the Health Insurance Portability and Accountability Act of 1996, as any of such laws and regulations may be amended from time to time.
4. I understand that any information concerning a patient obtained during the course of my affiliation with SMH is Confidential Information, and that I have the responsibility for safeguarding the Confidential Information regardless of whether the patient is currently receiving medical services from SMH.
5. I agree to maintain the confidentiality of the Confidential Information both in and outside of SMH.
6. I understand that disclosure of Confidential Information to persons other than authorized health care professionals may be an invasion of a patient's privacy rights and is of a personal and private nature.
7. I agree to take all reasonable precautions to prevent the unauthorized disclosure of any Confidential Information and will destroy such appropriately.
8. I will:
   a. Use only my officially assigned SMH User-ID and password.
   b. Maintain the confidentiality of my SMH password.
   c. Notify the SMH IT&S Department of a breach in security of my SMH password.
   d. Notify the SMC IT&S Department of any suspected or confirmed breach of PHI.
   e. Not attempt to learn the password of any other authorized user of the Information System.
9. I will never:
   a. Share/disclose my SMH User-ID and/or password with anyone, not even family members or coworkers.
   b. Use tools or techniques to break/exploit SMH's security measures.
   c. Connect to unauthorized networks through the Information System or an SMH device.
10. I will immediately report to SMH, in writing, any use and/or disclosure of Confidential Information that is not permitted by this agreement of which I become aware.
11. I will practice good workstation security measures, i.e. not leaving the Information System up with patient information when away from desk, pointing screens away from public view.
12. I will only access or use the Information System or an SMH device that I am officially authorized to access or use, and will not demonstrate the operation or function of the Information System or an SMH device to unauthorized individuals.
13. I understand that violation of this agreement may result in disciplinary action by my employer, up to and including termination of employment.
14. I agree that my obligations under this agreement will continue after termination of my employment or my relationship ceases with SMH.
15. I agree to only request and access confidential information that is needed for purposes of patient care.
16. I understand and agree that SMH may, at any time and for any reason or no reason, restrict and /or permanently cancel my access into the Information System.
17. I hereby acknowledge that any and all information stored in, derived from, and/or accessed from the Information System provided by SMH is the sole property of SMH.

By signing this document, I acknowledge that I have read this agreement and I agree to comply with all the terms and conditions stated above.

Student of Walden University

Employee Signature: [signature] Date: 4/28/14

[signature] RN, CMSRN 4-23-14

Appendix C: Data Collection Tool

Data Collection Tool

Date of Insert Unit	Patient #/Age	Diagnosis	Date of Complications	Type of Problem /Sign of Cannula	What was the patient getting IV	Co-Morbilities (Identify which chronic illness or other problems and the number of problems)	Variables (such as Poor skin turgor and poor vein source)