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**EVALUATION OF COMFORT LEVELS AND COMPLICATION RATES AS
DETERMINED BY PERIPHERAL INTRAVENOUS CATHETER SITES**

BY

Anne Marie Marsigliese

**A Thesis
Submitted to the College of Graduate Studies and Research
Through the School of Nursing
In Partial Fulfillment of the Requirements for
the Degree of Master of Science
at the
University of Windsor**

Windsor, Ontario, Canada

2000



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Abstract

The purpose of this study was to investigate the effect of anatomical site location of a peripheral intravenous catheter (PIVC) on patient comfort and incidence of complications. The anatomical site locations examined were dominant hand (DH), non-dominant hand (NDH), dominant forearm (DFA) and non-dominant forearm (NDFA). The study used a four-group correlational design and a convenience sample of 139 hospitalized admitted in-patients. An IV Team of nurses was part of the research team that initiated all PIVCs studied. Complications recorded included incidence of phlebitis, leaking of IV fluid, re-taping, dressing changes, disconnection, extravasation, dislocation, and occlusion of the IV catheter. Comfort was measured by assessing how the location of the PIVC affected the participant's ability to perform certain self-care activities and actual pain level. Orem's Self-care Deficit Theory of Nursing was used as the framework for the development and design of the research study. A self-care questionnaire based on the Older American Multifunctional Assessment Questionnaire (OMFAQ) was used to measure the subject's ability to perform self-care. A score obtained on a numerical rating scale (NRS) was used to assess perceived pain. These tools were administered to the patient after the PIVC was discontinued.

Results showed that participants with a PIVC located in the dominant hand (DH) and non-dominant hand (NDH) experienced more frequent complications and recorded higher pain scores on the NRS (indicating greater pain) than those with a PIVC in either forearm. Patients with their PIVC in the DH and NDH locations also scored lower on the self-care questionnaire indicating that their PIVC caused greater interference when performing self-care activities. PIVCs placed in the DFA and NDFA remained insitu

longer. Females in general reported higher pain scores than males. There was also a positive correlation between age and self-care.

The information from this study can be applied to protocols and guidelines for the insertion of a PIVC which supports evidenced-based practice. This study contributes to our understanding of the effects of PIVC site location on patient comfort and rate of complications

Dedication

To my husband Jim and my daughters Deanna and Christina whose love, patience and support help me survive each day.

Acknowledgments

To my advisor, Dr. Sheila Cameron for her guidance, support, clarity and wisdom throughout the process of completing this thesis. My sincerest thanks are also extended to my internal reader, Prof. Dale Rajacich and my external reader, Dr. Kathryn Lafreniere for their encouragement and assistance.

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Thanks to God and St. Jude for your many favours received. Most of all, infinite thanks to my husband Jim and my daughters Deanna and Christina who are and will always be the center of my life. I'm all yours now.

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**Evaluation of Comfort Levels and Complication Rates as
Determined by Peripheral Intravenous Catheter Sites**

Peripheral intravenous catheter (PIVC) placement for the purpose of delivering various types of intravenous therapy is considered one of the most common and essential procedures of modern medical care (Maki, 1992; Soifer, Borzak, Edlin & Weinstein, 1998). A great deal of research conducted by the medical community has been concerned with the incidence and prevention of infections related to peripheral intravenous catheters (Lundgren, Wahren & Ek, 1996; Maki, 1992; Pearson, 1996; Soifer et al., 1998). As an added nursing skill, the insertion and maintenance of PIVCs are the responsibility of many designated registered nurses (RNs) who also ultimately determine the majority of anatomical site placements for PIVCs in the patient. The RN should be concerned with causing the patient minimum discomfort and promoting patient safety both during insertion of a PIVC and while it is in place.

The focus of this study is on the anatomical location of peripheral intravenous catheters, and how their placement in four particular areas of a person's upper extremity (dominant hand, non-dominant hand, dominant forearm, and non-dominant forearm) affects that person's level of comfort and the person's ability to perform self-care activities.

Repeated observations by the researcher and other experienced RNs involved in years of clinical practice within a hospital setting, has led to the identification of problems that relate directly to the anatomical location of PIVCs. It appears that a PIVC placed in a patient's hand may be more prone to complications and may cause the patient greater discomfort and inconvenience. The significance of the problem is apparent when

one considers the implications of patients experiencing restricted movements due to PIVCs placed in their hands. The researcher has had several patients report difficulties performing basic self-care tasks such as the maintenance of personal hygiene and nutrition related directly to this particular PIVC placement. Many have also requested the PIVC be removed from their hands and reinserted into a forearm location.

There is little research that deals specifically with a patient's perception of comfort or PIVC related complications other than infection, as determined by peripheral intravenous catheter placement. Documented reports of patients' dissatisfaction with placement of PIVCs are anecdotal and refer to their causing physical discomfort (Lundgren et al., 1996).

Current trends in nursing research support the development of evidenced-based nursing interventions that can be utilized in the clinical setting and assist in the development of practice guidelines. Goals of these interventions are directed at promoting optimal health and wellness and increasing patient satisfaction. Interventions that adversely affect patient comfort and increase their susceptibility to complications may translate into an impaired sense of personal wellness, an increase in health care costs and less satisfaction of patients with the care provided them within the institution (Titler et al., 1994).

It is essential that the nurse apply findings of sound clinical research that legitimizes nursing practice and enhances patient care. The nurse can manipulate the patient's environment by controlling the anatomical placement of a PIVC in the patient. Research is required that supports the premise that specific PIVC location facilitates performance of self-care, and is also conducive to patient comfort. Nurses and health

care economists can translate data that reveal differences in complication rates associated with specific PIVC location to estimate cost savings as well as promote patient comfort and safety.

Theoretical Framework

Orem's (1995) Self-care Deficit Theory of Nursing inspired the inception of this study. Orem describes her self-care deficit theory of nursing as a general theory that provides a framework for the development of nursing knowledge, for teaching and learning nursing, and for nurses engaged in nursing practice (Orem, 1995). She built her general theory on three separate theoretical constructs: the theory of self-care, the theory of self-care deficit and the theory of nursing system. The theory of nursing system encompasses the theory of self-care deficit and through it the theory of self-care. Self-care deficit theory encompasses the theory of self-care as shown in Figure 1.

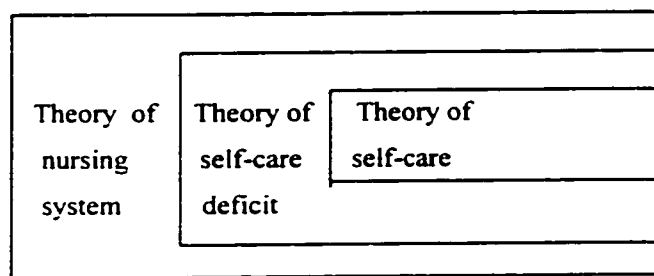


Figure 1. Constituent theories, the self-care deficit theory of nursing (Orem, 1995, p.172).

The theory of self-care is fundamental to the development of Orem's self-care deficit theory of nursing. Central to the theory is the concept or idea of self-care. Self-care is explained as essential human regulatory functions that individuals must perform for themselves or have performed for them (dependent-care) each day in order to

maintain life (Orem, 1995, p.172) . The theory of self-care consists of behaviours that are learned and deliberately performed (deliberate action).

Several propositions and presuppositions comprise Orem's theory of self-care. These include the conception that conditions maintained through self-care concern the safe engagement in human excretory functions, the maintenance of personal hygienic care, the protection from self-imposed and environmental hazards, and the provision of materials that are essential for life, for example: air, water, and food. These factors are also identified as universal self-care requisites common to men, women and children and are explained as universally required goals to be met through self-care or dependent-care that have their origins in human structural and functional integrity at various life stages (Orem, 1995, p. 191). Self-care that is performed by persons with the intention of doing good for self may be hampered due to lack of knowledge, skill or physical limitation (Orem, 1995, p.172).

The theory of self-care deficit expresses and develops the reason why people require nursing. Propositions included in this particular theory suggest that persons who provide their own self-care or dependent-care have specialized capabilities to perform the necessary actions (Orem, 1995, p. 174). An individual's ability to engage in self-care or dependent-care is affected by basic conditioning factors. Basic conditioning factors are conditions or events that affect the values or ways of how a person meets existent self-care needs or requisites, or brings about new self-care requisites (p. 108). Examples of basic conditioning factors include age, gender, developmental state, life experience, socio-cultural orientation, health, health care system and treatment factors, environmental factors, family system factors and available resources (p. 285). These basic conditioning

factors affect the development, operability, or adequacy of a person's capability to care for self or his/her dependents (Orem, 1995, p. 456).

A relationship is established between a person's ability to perform self-care (self-care agency) and the demands for care (self-care demand) and is expressed as being equal to, less than, and more than. A self-care deficit exists when care abilities are less than those required for meeting a known self-care demand. As explained in the theory of self-care deficit (Orem, 1995), nursing is a legitimate service when: a self-care deficit is identified in a patient, when a future deficit relationship can be foreseen because predictable decreases of care abilities are recognized; or when there is an increase in the patient's care demands (p. 175).

The theory of nursing system establishes the structure and the content of nursing practice (Orem, 1995). Nursing, considered a practical human health service, is understood as an art, which engages in operations. Operations are expressed as forms of care that ideally and ultimately result in the movement towards achieving positive health of others. Legitimate patients of nurses are persons whose self-care agency is not adequate (or potentially inadequate) for knowing or meeting their own self-care demands as a result of their health state or health care requirements. Legitimate nurses are described as educated and trained persons in nursing who have the capability and the willingness to exercise the quality defined as "nursing agency". Nursing agency is explained as a complex property possessed by nurses that enables patients by helping them know and meet their self-care demands, and regulate or develop their self-care agency (Orem, 1995). "Nursing agency is analogous to self-care agency. They differ in

that nursing agency is developed and exercised for the benefit of others and self-care agency is developed and exercised for the sake of one's self" (Orem, 1995, p. 247).

Nursing agency is identified as an essential element of the theory of nursing systems and is the principal concept upon which this particular study is based (Orem, 1995, p.246). Nursing actions are developed through the power of nursing agency, and result in the accomplishment of nursing purposes that contribute to the life, health and well-being of clients. Included in the description of desirable nursing characteristics is the ability of the nurse to reduce patients' physical discomfort and pain by effecting conditions that increase patients' comfort and satisfaction within the nurse-patient relationship. Orem (1995) states that the nurse is required to have "mastery of valid and reliable techniques for nursing diagnosis and prescription; for meeting the self-care demands of individuals ... and for regulating the exercise of the self-care agency of individuals, its protection and its development" (p. 250).

The following example demonstrates the relevance of Orem's theory as applied to this study. A PIVC located in a patient's dominant hand can present a barrier to the patient's ability to perform self-care and affects their self-care agency. One of many self-care actions is simply related to the maintenance of basic hygiene such as washing hands properly, or bathing. The location of the PIVC becomes a basic conditioning factor (health care treatment modality factor). The need to maintain proper hygiene (self-care demand) is essential for the prevention of spread of infection and can reduce the patient's susceptibility to nosocomial illnesses within the hospital setting. The patient may not be aware of the importance of proper hand washing or understand fully the serious consequences of not being able to perform the task adequately. Thus a self-care deficit

exists. If the location of a PIVC becomes a self-care limitation by hampering the patient's ability to meet universal self-care requisites, then it is the responsibility of the nurse to alter or manipulate the environment in order to facilitate the patient's achievement of self-care. Orem's conceptual framework for nursing and how the elements of her theory interrelate and function is expressed in the model depicted in figure 2.

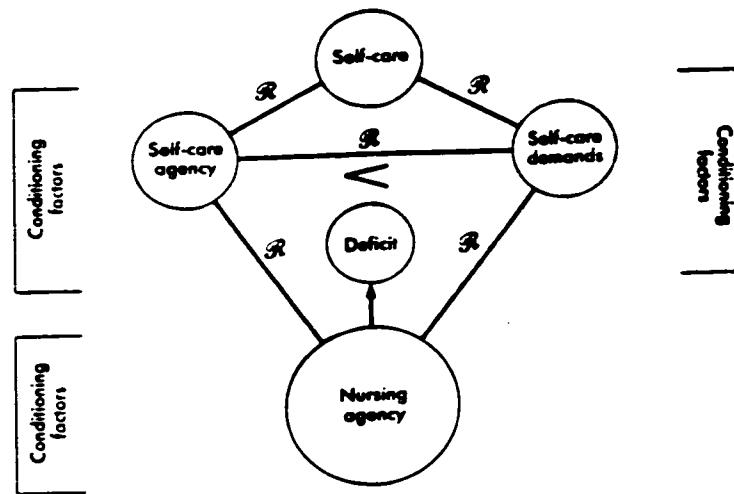


Figure 2. A conceptual framework for nursing (Orem, 1995, p. 435)

Research using Orem's conceptual framework is encouraged in order to accumulate data that will assist nurses in the development of treatment modalities and guidelines. It will also facilitate nurses to advance their skills and qualities of nursing agency, which will support the patient in meeting self-care deficits.

Purpose

This study will examine the relationship between the anatomical location of a PIVC (dominant hand, non-dominant hand, dominant forearm and non-dominant

forearm) with perceived patient comfort levels and incidence of complications. Orem's self-care deficit theory of nursing is utilized as the theoretical framework to guide conceptualization of the study.

Comfort is defined in this study as freedom from physical pain, and the degree of inconvenience and interference in the person's ability to perform certain self-care activities while in hospital which are directly related to the location of the PIVC. Complications are explained as observable events that occur, which disrupt the integrity of the intravenous delivery system, interfere with the optimum delivery of the intravenous solution, or cause physical harm to the patient.

By applying the concepts of nursing agency and self-care agency as defined by Orem, it is assumed that the nurse can selectively insert the PIVC in an anatomical location that does not interfere with the capability of the patient to perform basic care needs properly. This assists the patient in meeting and maintaining his/her therapeutic self-care demands. Facilitating in performing basic care needs and meeting therapeutic self-care demands can increase patient satisfaction and feelings of health and well-being by fostering independence.

In summary, PIVCs are part of common medical therapy for the treatment of numerous health conditions. Their initiation, maintenance and monitoring of associated complications in many hospitals have become the primary responsibility of the Registered Nurse. The data obtained from this study is intended to provide valuable information that can benefit the development of guidelines for optimal PIVC site selection in patients that will facilitate self-care actions by patients, are less painful, and

are prone to fewer complications. These factors are cost-effective care practices and help to achieve greater patient satisfaction levels.

Chapter 2

Literature Review

This literature review focuses on research studies and published articles that discuss physiologic complications related to PIVC placement and anatomical location. The concept of comfort is explored with its particular relevance to the nursing care of patients with intravenous catheter devices, perception of pain, and the effect of PIVCs on performance of self-care activities.

Complications and Peripheral Intravenous Catheters

There is an abundance of research that addresses the incidence and prevention of complications related to PIVCs. Some of these complications are listed as bacterial infection, phlebitis, occlusion and infiltration (Hagle, McDonagh & Rapp, 1994; Lundren et al., 1996; Maki, 1992; Pearson, 1996; Soifer et al. 1998). Several studies have also examined the proficiency of different dressings applied to the insertion site of intravascular devices and how these types of dressing have affected the incidence of infection. Pettit and Kraus (1995) demonstrated that there was no significant increase in the infection rate of PIVC sites with the use of transparent dressings as compared to gauze dressings. Dugger, Macklin and Rand (1994) conducted a study comparing the effectiveness of two types of manufactured transparent dressings on securing hemodynamic catheters located in neck jugular sites. They proposed that the main catheter sepsis prevention strategy is the maintenance of an intact dressing over the insertion site. Moisture, mechanical movement, and manipulation of the catheter promotes the migration of bacteria which then increases the susceptibility of the site to developing infection (Dugger, et al. 1994). Veni-Gard dressings were reported by the

authors to remain intact longer than a standard dressing, thus requiring fewer nursing care hours in dressing changes. A lack of random assignment of subjects into the two groups used for study and a standard protocol for dressing applications are limitations of this study although they are not considered by the researchers as impacting on the results of the study. However, replication of the study with appropriate correction to study limitations would further clarify and validate results.

Lee and Vallino (1996) studied the effects of moisture accumulation in devices used to protect intravenous site protectors. Congruent with the findings of Dugger et al. (1994), these researchers also assert that an increase in cannula movement can promote its dislodgment, leading to infiltration or leaking at insertion sites, which in turn increases the chance of infection. They suggest that any leaking of intravenous fluid from any part of the intravenous device be managed by discontinuation of the catheter and restarting of a new PIVC. Lee and Vallino (1996) recommend that insertion sites located near a joint be immobilized to restrict potentially damaging flexion movement. Nonetheless, the use of restraints to immobilize an extremity, which may compromise joint mobility, generates concerns pertaining to patient comfort. The authors make a valid point on the use of restraints creating questions and concerns regarding legal and ethical issues. The use of restraints on patients for the purpose of PIVC site stability may contradict existing policies of the institution and violate patients' legal rights.

PIVC site selection

Various sources have printed guidelines for the management of intravenous therapy that influence and direct nursing interventions. Factors to consider when selecting a site for a PIVC (Delaney & Lauer, 1993) include asking the patient his/her

preference and arm dominance. They recommend that lower extremities (legs, feet and ankles) be avoided due to an increase in incidence of thrombosis formation and a greater presence of venous valves that make successful insertion more difficult. Such a location is also stated to interfere with patient mobility. The authors also suggest that the most distal site on the upper extremity be selected (hand and wrist), although rationale for this preference is not presented.

In contrast, Advanced Cardiac Life Support (ACLS) guidelines (Grauer & Cavallaro 1993) advise that intravenous access site selection utilize a proximal site (antecubital fossa) to facilitate adequate drug delivery to the central circulation. It is intended that this practice be applied during life threatening situations, though the rationale behind the directive can be generalized to enhance the effectiveness of all intravenous therapy.

Guidelines for the prevention of intravenous device-related infections (Pearson, 1996) also suggest that several factors be assessed when determining the site of catheter placement, yet do not indicate which location is superior. Maki and Ringer (1991), in a prospective study, have shown that the anatomic site of cannulation significantly influenced the risk of infusion phlebitis, specifically that hand vein insertions have a lower risk of phlebitis than upper arm or wrist vein insertions. Tomford, Hershey, McLaren, Porter and Cohen (1984) and Soifer et al. (1998) have studied the relationship of incidence of PIVC complications to the utilization of an Intravenous Therapy Team. They demonstrated that personnel specially designated with the responsibility for insertion and maintenance of intravascular devices effectively reduced catheter-related infections, phlebitis and extravasation.

Related studies

The findings from an experimental study conducted by Lundgren et al. (1996) indicate that a short indwelling time for PIVCs helps to prevent complications. Patients with a PIVC inserted for less than 24 hours had fewer complications and reported less discomfort compared to those with longer indwelling times. These researchers reported that there was no significant difference when comparing the insertion place and incidence of thrombophlebitis. Yet these patients felt that a PIVC placed in their wrists or in the antecubital fossa was more troublesome than those placed in their hands or their forearms. These “complaints” were documented as general comments only and did not include a statistical analysis with regards to the frequency of patients with similar complaints or how these complaints relate to the specific location of the PIVC.

Catheter displacement, disconnection, or occlusion can cause disruption of intravenous therapy. These factors can also increase the risk of PIVC related infection (Maki, 1992). Research that investigates the disruption of intravenous therapy related to anatomical placement of PIVCs is lacking. It is anticipated that the data collected from this study will add to this particular body of knowledge.

Comfort

Comfort is a popular concept referred to in the most basic of nursing textbooks. It is also the topic of countless nursing journal articles and is frequently used as an evaluative nursing outcome for a variety of nursing research studies. However, there is limited data available that specifically measures perceived comfort levels of patients as determined by the anatomical site of their PIVC.

Definitions of comfort vary with the type and purpose of the research conducted. Many nursing theorists refer to comfort as an outcome of nursing interventions directed towards patients. Orem refers to the goals of nursing actions through nurse agency as providing comfort for patients and preventing actions that may cause them discomfort (1995). Hamilton (1989) explored the meaning of comfort from the patient's perspective. She indicated that some patient comfort needs are related to physical sensation, others to social interactions, spiritual life, environmental factors or activities. Hamilton believes that comfort is considered multi-dimensional, and that it means different things to different people.

Cameron (1993), studied the nature of comfort to hospitalized medical surgical patients. Comfort was found to be a dynamic process, identified as "integrative balancing" whereby the lack of comfort or a state of discomfort was found to be the stimulus for patients to seek solutions and activities to increase their personal comfort levels. Through this process, the individual strengthens the individual self, determines appropriate health care action and personal growth action, and works toward self-determined goals of health and healing.

It is important to note that comfort cannot be disassociated completely from its antonym discomfort. Operational definitions of comfort can sometimes be more explanatory and definitive when referred to as an absence of stimuli which can cause a person varying levels of discomfort or basically, relief from discomfort (Kolcaba & Kolcaba, 1991; Morse, Bottorff & Hutchinson, 1994, 1995). Kolcaba and Kolcaba (1991) in their analysis of the concept of comfort, claim that comfort measures in many cases are referred to as nursing interventions if the aim is to promote a state of physical or

mental ease. Nurses are noted as agents who identify and eliminate a source of discomfort before it affects a patient. Therefore, a state of comfort may exist without a prior state of discomfort. If the discomfort is unavoidable, the nurse neutralizes or counteracts it by providing additional comfort measures.

Comfort is defined theoretically by Kolcaba (1991), as the immediate experience of having met basic human needs for relief, ease, and transcendence. The structure of comfort is considered a higher order construct that is complex because it entails a multidimensional, personal experience (Kolcaba, 1992). Kolcaba (1992) describes comfort as a noun and considers it to be a positive outcome of nursing care. She operationalizes comfort into a bi-dimensional construct. The first dimension of the bi-dimensional grid involves the intensity of unmet/met comfort needs, which consists of relief, ease, and transcendence. The second dimension is viewed as degrees of internal or external comfort needs that were derived from the concept of holism. These two dimensions are based on patient's needs, timing of when these needs are met, and when comfort is increased.

Holistic comfort has rarely been used previously as an outcome variable in nursing research because of difficulties associated with the accurate measurement of this construct. Kolcaba (1992) suggests that operationalizing comfort can be achieved by developing an instrument for a specific nursing practice with self-report and observational items generated by specialists in the particular area of research interest. She believes that nurses can assess the effectiveness of their interventions aimed at achieving holistic comfort by gauging the degree of comfort attained when comfort needs are targeted specifically. Consequently, nurses involved in clinical practice who are

responsible for the initiation, maintenance and monitoring of PIVCs in their patients, are in optimal position for determining which factors and outcomes to consider when measuring patient comfort levels and related types of complications.

Morse, Bottorff and Hutchinson's (1994, 1995) phenomenological study of comfort, identifies a common theme of the "violated body" whereby patients experience their bodies being invaded by strangers while receiving care. Feelings expressed by patients associated with this theme are embarrassment, anger, outrage and the loss of one's own personhood. Comfort is considered a concept that involves the enhancement of strength and health. Nurses are asked to support the restoration of the patient's taken-for-granted bodily experiences in order to assist them in achieving comfort. This is accomplished by keeping the patient's state within their comfort level so they can cope, move, rest, and seek wellness. Things that are recognizable, safe and make one feel less vulnerable often render comfort. Understanding of patients' comfort is believed to be linked with empowering the ill person in relation to their bodies. Nurses are urged to find innovative strategies that keep patients at the maximum level of comfort in order for them to move towards total comfort and health and maintain or restore their orientation to their familiar environments.

The views of Morse et al. (1995) and Kolcaba (1991, 1992) are noted as relevant to this particular study. In this study, the concept of comfort as perceived by the patient is considered multi-dimensional when it is examined in relationship to the anatomical placement of a PIVC. The definition of comfort in this case, includes aspects of physical discomfort, limitations of self-care activities, and environmental restrictions caused by

the location of the PIVC. These views also help guide the development of instruments utilized in the measurement of this concept for this study.

Gaps in the literature include an absence of studies that explore the practices and preferences of designated nurses qualified in PIVC insertion. In particular, what are the criteria or defining factors that influence PIVC insertion site selection by the nurse?

There is also a lack of research that investigates the association between the location of a PIVC and perceived comfort levels reported by the patient, as well as complication rates.

The purpose of this study was to investigate whether the location of a peripheral intravenous catheter in a person's upper extremity directly influenced the level of perceived patient comfort and incidence of complications. The anatomical sites studied were: dominant hand, non-dominant hand, dominant forearm and non-dominant forearm. The definitions of comfort and complications utilized in this study are presented.

Comfort was defined as the patient's perception of physical pain caused by the PIVC, and also the degree of inconvenience and interference in the person's ability to perform certain self-care activities which were directly related to the location of the PIVC. Complications were defined as observable events that occurred and disrupted the integrity of the intravenous delivery system, interfered with the optimum delivery of the intravenous solution or caused physical harm to the patient. The complications studied were: catheter occlusion, phlebitis, infiltration of intravenous solution, dislodging of PIVC, disconnection of intravenous tubing or catheter, re-securing or re-taping of PIVC, and replacement of PIVC dressing.

There is a paucity of nursing research that investigates comfort level and complication rates other than infection, as related to the anatomical location of a PIVC,

particularly those situated in a person's hand or arm. There is also little information on how the location of a PIVC affects a person's ability to perform self-care activities. The addition of this information is needed in order for nurses to deliver intravenous therapy in a manner that is safe, efficient and provides the patient optimal comfort. The problem of how nurses can achieve this goal led to the premise that is central to this study.

Hypotheses

It was hypothesized that a PIVC located in the non-dominant forearm would be subject to fewer complications than a PIVC located in the non-dominant hand, dominant hand or dominant forearm. It was also hypothesized that the patient with a PIVC in the non-dominant forearm would experience greater comfort as defined by a lower pain score and a greater ability to perform self-care activities.

Research Questions

The research questions were as follows:

1. Is there a difference in the patient's perception of comfort level (defined by physical pain and ability to perform self-care activities) as determined by the anatomical site of a patient's PIVC (dominant hand, non-dominant hand, dominant forearm, and non-dominant forearm)?
2. Does the anatomical location of a PIVC influence the incidence of associated complications?
3. Is there a relationship between time insitu of a PIVC and rate of complications and perceived level of comfort?
4. Is there a relationship between age and gender of the person and rate of complications and perceived level of comfort?

Research design

The study used a descriptive correlational design in order to describe and understand the nature of the relationships between variables. The research was conducted within a community hospital that provided a variety of health care services and employed a team of specialized nurses (IV Team) trained in the initiation and maintenance of intravenous therapy. The research team was comprised of the researcher and members of the IV Team.

Chapter 3

Method

Participants

The sample for the study was obtained by convenience and selected from a group of voluntary participants who were admitted in-patients within the hospital, excluding critical care, emergency and pediatric departments. The sample consisted of approximately 132 subjects or 33 participants in each of four groups (dominant hand, non-dominant hand, dominant forearm and non-dominant forearm). Determined sample size was based on a .80 power analysis for testing a medium effect size at the .05 significance level for a four group design, using ANOVA statistical analysis (Aron & Aron. 1994). Eligible patients were those who met a series of inclusion and exclusion criteria.

Inclusion Criteria /Exclusion Criteria

The inclusion and exclusion criteria that determined a person's eligibility in the study were as follows: the individual was coherent and capable of reading, writing, and speaking the English language; the person was 18 years of age or older; the person could not have more than one PIVC in place; there was a written order from the attending physician for the initiation of a PIVC; the individual was able to identify one arm as being dominant or non-dominant; and the individual was assessed by the IV Team nurse as having normal vasculature in both hands and forearms.

The generalization of study results was limited to adult patients who did not require multiple PIVCs. The results cannot be generalized to those patients who require long-term intravenous therapy, which may necessitate the initiation of serial PIVCs. The

individual must also have a fairly healthy vasculature and skin integrity cannot be impaired. Gender and age of the participants (other than the required 18 years of age or older), were recorded but not recognized as problematic factors requiring specialized control.

Ethical Considerations

All participants were treated in accordance with the ethical guidelines of the University of Windsor and Hotel Dieu-Grace Hospital. Approval for the study was obtained from the School of Nursing Ethics Committee at the University of Windsor and the Ethics Committee at Hotel Dieu-Grace Hospital.

Consent was also obtained from each participant once the general purpose of the study was explained. The participants were assured that the answers on their questionnaires remained confidential and that they were able to withdraw from the study at any time (consent form is included in Appendix A). A code number identified the data obtained from each subject. Data analysis was conducted and reported by group. Dissemination of findings will be through scientific journals, and shared with the institution of study as well as the patients themselves if so desired.

Data Collection

Measures

The main outcomes measured in this study were perceived comfort level of the patient and frequency of complications related to the anatomical placement of the PIVC. The corresponding tools and methods utilized to collect and quantify data in this study are discussed separately with each respective research question.

In this study, comfort was defined as the patient's perception of physical pain caused by the PIVC, and also the degree of inconvenience and interference in the person's ability to perform certain self-care activities which were directly related to the location of the PIVC. Selected measures were adapted to evaluate self-care activities and pain in individuals with a PIVC.

Older Americans Resources and Services Multidimensional Functional Assessment

Questionnaire (OMFAQ)

Self-care ability was evaluated by a questionnaire adapted from the Older Americans Resources and Services Multidimensional Functional Assessment Questionnaire (OMFAQ). The OMFAQ (Fillenbaum, 1988) was designed to assess the overall personal functional status of adults. Part A of this structured questionnaire is the Multidimensional Functional Assessment Questionnaire. This segment of the questionnaire consists of five sections: social resources; economic resources; mental health; physical health; and activities of daily living. Self-care capacity is also referred to as activities of daily living (ADL) which describe those actions that people need to perform on a daily basis. These activities of daily living have an instrumental dimension (IADL) and a physical dimension. Examples of these activities include: the ability to eat, walk, care for personal hygiene, housework, pay bills, and shop for food and clothing. The section concerning ADL (self-care capacity) which includes both the physical and instrumental dimensions was used in this study to evaluate self-care activities.

Fillenbaum and Smyer (1981) presented criterion validity results for the OMFAQ on 33 family medicine patients, using separate criterion ratings for each section in the questionnaire. Spearman correlations between the OMFAQ and these ratings were 0.68

for the economic section, 0.67 for mental health, 0.82 for physical health, and 0.89 for self-care capacity (Fillenbaum, 1988; Fillenbaum & Smyer, 1981). Recognizing that these four sections cover different themes, Fillenbaum ran factor analyses on each section of the OMFAQ separately and identified separate factors for each of the sections and in particular, one factor each for IADL and the physical dimension of ADL. Factor analyses of the physical function questions broadly confirmed the appropriateness for their classification into the physical ADL and IADL sections (McDowell & Newell, 1996). The reliability coefficients for the physical dimension of ADL and instrumental dimension of ADL are reported at 0.84 and 0.87 respectively (Fillenbaum, 1988, p. 23).

The ADL section of the OMFAQ consists of 15 items scored on a three-point scale. Answers selected for these questions range from performing activities independently (without help), with some help, and the complete inability to perform the activity. The questionnaire developed for this study consisted of 10 items, also scored on a three-point scale. Four items were selected directly from the physical dimension of the OMFAQ scale. These included the ability to eat, bathe, take care of personal appearance, and walk. The other 11 items of the OMFAQ questionnaire did not relate to activities that would be applicable to a patient in hospital with a PIVC. Therefore, an additional six items related to self-care activities of daily living were developed based on a similar type of question structure. Three of these questions pertained to the physical dimension of the scale. These referred to the ability to wash one's hands, sleep and use washroom facilities. The remaining three questions related to the instrumental dimension which included the ability to read, write and reach for things. A score of two points was awarded to an answer that indicated independence, one point for partial independence

and a score of zero was awarded for dependence or inability to perform the activity. The total score range for the questionnaire is zero to 20 (PIVC questionnaire is included in Appendix B).

Numerical Rating Scale (NRS)

In this study, pain was evaluated using a numerical rating scale (NRS). The NRS is an adaptation of a visual analogue scale (VAS) which is commonly used by researchers to evaluate pain. Visual analogue scales have been used in psychological assessment since the early 20th century (McDowell & Newell, 1996). Huskisson (1974) is attributed with the application of VAS to pain measurement. The VAS provides a simple way to record subjective estimates of pain intensity, and may be used to rate overall severity of pain (McDowell & Newell, 1996). A VAS is a straight line, usually 10 centimeters long, that represents the continuum of symptoms to be rated (McDowell and Newell, 1996, p. 341). Terms used to describe the severity of the symptoms are marked at each end of the line.

The NRS tool used in this study was adapted from Downie et al. (1978), and consisted of a 10 centimeter long, boxed scale that was numbered from zero to ten and was printed horizontally. The zero end of the scale represents no pain, whereas ten represents unbearable pain. The patient was asked to retrospectively evaluate the worst pain experienced during the time the PIVC was in place (excluding insertion). The number selected by the person to estimate their perceived pain level was recorded as the actual score. For example, a selected numerical score of seven was recorded as seven points out of ten. Scoring for the pain scale ranged from zero (no pain) to ten

(unbearable pain). The pain scale was completed after the PIVC was discontinued (pain scale is included in Appendix B)

Huskisson (1982), reported a correlation of 0.99 between vertical and horizontal VAS pain scales administered to 100 rheumatology patients. McDowell and Newell (1996) also present several reasons that favor the horizontal format. Horizontal lines are suggested to be generally preferred to vertical lines, vertical scales give less normally distributed data, and failure rates may be higher in vertical than horizontal scales (p.344).

Retest reliability scores for the NRS used with literate and non-literate patients were reported at 0.96 and 0.95, suggesting that the NRS was not affected by literacy level. Validity of both VAS and NRS has shown similar correlations when standardized to the same scale range. In a study which investigated the degree of correlation between pain rating scales, Downie et al. (1978), reported correlations of 0.62 and 0.91 between NRS and horizontal VAS. The authors also reported that the NRS performs better than a 4-point descriptive scale or a VAS. Due to its simplicity, the NRS has been recommended over the VAS (Guyatt, Townsend, Berman, & Keller, 1987).

Complications

Complications were explained as observable events which occurred that disrupted the integrity of the intravenous delivery system, interfered with the optimum delivery of the intravenous solution or caused physical harm to the patient. These complications included catheter occlusion, catheter dislodging, phlebitis, infiltration of intravenous fluid, and those situations that increase the risk for the development of infection such as disconnection of intravenous tubing, leaking of intravenous fluid around the catheter site, and of PIVC requiring re-taping and re-dressing. These complications were identified as

frequently occurring from various research studies and literature discussing complications associated with intravenous therapy (Hagle, McDonagh & Rapp, 1994; Lee & Vallino, 1996; Lundgren et al., 1996; Maki, 1992; Pettit & Kraus, 1995; Pearson, 1996; Soifer et al. 1998).

A checklist comprised of complications that result in the PIVC being withdrawn was completed by the IV team nurse at the time of discontinuance. Complications included development of phlebitis, occlusion of the catheter, infiltration of intravenous fluid, leaking of blood or intravenous fluid around the catheter, and dislodging of the intravenous catheter. The classification of phlebitis was done in accordance with those standards and policies practiced within the hospital where the study was conducted (Hotel Dieu-Grace Hospital, 1996). The subject completed a second checklist of complications. These complications included re-taping, re-dressing or disconnecting of the intravenous catheter. Scores are reported as the sum of the number of recorded observed complications (PIVC complication checklists are included in Appendix C).

Demographic data with regard to age and gender of the participant were collected and correlated with frequency of complications and comfort level experienced by the patient. Time insitu was estimated and recorded as the time the PIVC was initiated until the time the PIVC was discontinued (demographic data sheet is included in Appendix C).

Dominant extremity was identified as the arm and hand that the patient worked with, and used most often, to perform routine activities of daily living. The hand location was limited to the use of those veins situated on the dorsal aspect and including the digits and wrist. The forearm included veins located below and excluding the antecubital fossa and veins above and excluding the wrist.

Procedure

Any admitted in-patient on a medical or surgical unit who required a PIVC per order of their physician, was evaluated by a qualified member of the IV Team for eligibility to participate in the study. Once inclusion and exclusion criteria were assessed and the patient qualified as a study subject, the patient was asked to participate in the study and informed consent was obtained. The participant was assigned a code number and demographic data were collected and documented.

The IV nurse established a PIVC in a site that was most suitable for that patient as outlined in hospital policy (Hotel-Dieu Grace Hospital, 1996), and documented the time and anatomical site that the catheter was initiated in. If a PIVC was not successfully established, the patient was not included in the study.

The PIVC site was evaluated once every 24 hours by the IV team nurse. The patient was given a short list of complications to record if they occurred. This assured a more accurate and consistent accounting of pertinent events. These events were recorded as a check mark as they occurred. These complications were reviewed with the patient and discussed with the IV nurse once every 24 hours for accuracy and clarification of observations by the researcher. The complications the patient recorded included re-taping and re-dressing of the PIVC by their attending nurse, or accidental disconnection of the PIVC. More than one complication could be observed and documented at one time.

The IV team nurse documented occurrence of remaining complications which included: leaking of IV solution or blood around the PIVC, dislocation of the catheter, phlebitis, extravasation of IV fluid into surrounding tissue, and occlusion of the PIVC.

These complications were documented once they occurred, as any one of these would have resulted in the discontinuance of the PIVC.

In accordance with hospital policy (Hotel-Dieu Grace Hospital, 1996), the PIVC was discontinued 72 hours after initiation. This marked the end point of the study for the participant. An end point also occurred if the PIVC was dislodged or was accidentally pulled out from the patient, was re-established, or ordered discontinued by the patient's physician prior to 72 hours. The specific time that the PIVC was discontinued was recorded. At the end point of the study, the attending IV Team nurse or researcher presented the participant with the PIVC questionnaire (self-care / pain assessment tool) and was responsible for its collection.

The entire research project was terminated once a sufficient number of subjects had been enrolled into each of the four groups. In order to assure equal numbers of participants in each of the four study groups, the IV Team nurse started a PIVC in the appropriate anatomical location as group number requirements dictated necessary. This was not considered a breach in ethical conduct as it is already standard practice in the hospital, that PIVCs be inserted in a specified upper extremity site when a patient is scheduled for certain medical diagnostic testing or operations in order to facilitate access of the PIVC during the procedure (PIVC study pathway is included in Appendix D).

Statistical Analyses

The descriptive statistics reported on each of the four groups will be: age, gender, average length of time that PIVCs remained in place before being discontinued and frequencies of participants in each of the four PIVC site groups. Four PIVC anatomical

sites were documented and evaluated: dominant hand, non-dominant hand, dominant forearm and non-dominant forearm.

Data analysis focused on the research questions.

1. Is there a difference in the patient's perception of comfort level (defined by physical pain and ability to perform self-care activities) as determined by the anatomical site of a patient's PIVC?

Internal consistency reliability of the comfort/self-care activity scale questionnaire was assessed using Cronbach's alpha. An alpha reliability score of more than .65 was accepted. Comfort level was determined by data collected from the PIVC questionnaire evaluating self-care activities and pain (dependent variables). Site location consisted of two independent variables. One independent variable examined the effect of dominance (dominant limb and non-dominant limb). The second independent variable examined the effect of anatomical location (forearm and hand).

Separate factorial ANOVAs were conducted to compare the effect of site location on self-care activities as well as the effect of site location on perceived pain level. Significant interactions between the independent variables were further explored with simple main effects to determine significant differences in self-care activity and pain level by dominance of limb (dominant versus non-dominant) and anatomical location (hand versus forearm).

2. Does the anatomical location of a PIVC influence the incidence of associated complications?

The specific type and frequency of each complication was reported separately. The frequency of total number of complications as they occurred for each individual site

group was also reported. A chi-square test of independence was conducted to determine if there was an association between each of the four group sites (dominant hand, non-dominant hand, dominant forearm and non-dominant forearm) and type of complications. Frequencies of complications for each group were compared to determine whether a particular anatomical location was more or less prone to complications.

3. Is there a relationship between time insitu of a PIVC and rate of complications and perceived level of comfort (defined as physical pain and ability to perform self-care activities)?

Time insitu for each PIVC was calculated and means reported for each of the four group sites. Correlations were calculated using Pearson r coefficient to determine if there was a relationship between time insitu of a PIVC and comfort level (self-care activities / pain). Correlations were also calculated to determine if there was a relationship between time insitu and frequency of complications.

4. Is there a relationship between age and gender of the person and rate of complications and perceived level of comfort (self-care activities / pain)?

Mean age of participants was reported for each of the four groups. A correlation was calculated using Pearson r coefficient to determine if a relationship existed between age and rate of complication, as well as perceived patient comfort level (self-care activities / pain). Frequency of complications was reported according to gender. Separate ANOVAs were conducted to determine the effect of gender on incidence of complications, and gender with perceived patient comfort level.

Limitations

The inability to manipulate the independent variables, use of a convenience sample, and the failure to randomly assign individuals to experimental treatments are recognized as limitations of the descriptive-correlational design of this study. There are no existing instruments that evaluate perceived patient comfort and complications related to the anatomical placement of PIVCs. The instrument used to evaluate complications as defined by this study does not have established reliability and validity.

Several extraneous variables posed threats to the internal and external validity of this study. To reduce the possibility of researcher bias, the researcher was not involved in the initiation of PIVCs. The IV nurses were told the purpose of the study but not the proposed hypotheses. Personal preferences, technical expertise and bias demonstrated by the individual IV Team nurse were difficult to control. However, terminology and criteria used to evaluate PIVC complications was regulated as much as possible using standardized measures for comfort and complication. Check lists were made available to each IV team in order that the PIVC location was documented and complications recorded. Skin preparation and securing of the PIVC were standardized in accordance with the policies of the institution.

The size of the PIVC, medications and viscosity of the intravenous solution given through the PIVC varied between subjects and site of the PIVC. It is known that certain medications such as vancomycin, metronidazole, or potassium, and intravenous fluids with a higher viscosity such as blood and blood products, are substances that increase the risk of developing phlebitis or infection (Canadian Pharmaceutical Association, 1998);

Maki, 1992). The possibility of these variables occurring in greater frequency in certain study groups was not controlled for and may have affected the data obtained in this study.

In summary, this study used a descriptive correlational design which examined the relationship between a person's perceived comfort level (defined by physical pain and ability to perform self-care activities) and rate of complications as determined by the anatomical location of a PIVC. The four anatomical locations studied were: dominant hand, non-dominant hand, dominant forearm, and non-dominant forearm. A convenience sample of admitted patients in a community hospital were recruited once they met inclusion and exclusion criteria. The research team, which included the researcher and IV Team nurses, were responsible for the implementation and collection of data. Analysis of data with appropriate dissemination of results was performed.

Orem's Self-Care Deficit Theory of Nursing was utilized as the theoretical framework for this study. The anatomical location of a PIVC was identified as a basic conditioning factor (treatment modality). It was theorized that the placement of a patient's PIVC could influence the ability of a patient to adequately meet various universal self-care requisites such as the maintenance of personal hygiene, provision of food, or maintenance of a safe environment. This may result in the patient developing a self-care deficit. The legitimate nurse through nursing agency, utilizes nursing knowledge to guide her decision when selecting a PIVC site for the patient in order to prevent a self-care deficit.

It is anticipated that the information obtained from this study will assist in the development of protocols and treatment modalities that guide nursing practice and help nurses to develop their nursing agency. It will also benefit in legitimizing nursing by

promoting evidence-based practice and be representative of how nursing theory is incorporated into practice. The data collected from this study will add to the body of nursing knowledge and encourage future research.

Chapter 4

Results

The purpose of the study was to examine the relationship between the anatomical location (dominant hand, non-dominant hand, dominant forearm, and non-dominant forearm) of a peripheral intravenous catheter (PIVC) with perceived patient comfort levels and incidence of complications. Comfort level was measured by scores obtained from self-care and pain questionnaires completed by participants. Specific complications were recorded that consisted of events which resulted in discontinuation of the PIVC or interruption of the intravenous delivery system. It was hypothesized that a PIVC catheter in a patient's non-dominant forearm would be subject to fewer complications than a PIVC located in the non-dominant hand, dominant hand or dominant forearm. It was also hypothesized that the patient with a PIVC in the non-dominant forearm would experience greater comfort as defined by a lower pain score and a greater ability to perform self-care activities.

A convenience sample of 139 participants receiving intravenous (IV) therapy in an acute care hospital was enrolled in the study between October 12, 1999 to December 5, 1999. Of this total, 135 had demographic and complication data recorded, and 130 completed the self-care/pain questionnaire. The data for nine participants were incomplete as a result of early discharge from hospital or checklist sheets being misplaced by the participant. The age of participants ranged from 18 - 85 years with a mean age of 56.68 years ($SD = 17.78$). The sample of 135 participants consisted of 57% males and 43% females. Subjects were divided into four groups: dominant hand (DH), non-dominant hand (NDH), dominant forearm (DFA) and non-dominant forearm

(N DFA). Table 1 includes frequency and percentage of participants by gender and IV site. It should be noted that all PIVCs located in the DFA and N DFA locations were situated in the superficial veins of the dorsal aspect of the forearms. The IV Team nurses initiated the PIVC according to hospital policy selecting the most suitable site for each subject. Nearing completion of the study, PIVCs were initiated in a specific site in order to assure adequate sample size for each group. The IV Team nurse prior to doing so obtained verbal consent from the subject. None of the PIVCs studied were located in the inner aspect of the forearms. The data collected were numerically coded and then analyzed using SPSS (Norusis, 1993).

Separate one way ANOVAs were performed to measure the effect of IV site on time insitu, pain scores, self-care questionnaire scores and complications. Means and standard deviations for these variables by IV site are presented in Table 2.

Minimum time insitu for each PIVC was calculated in hours. Any fraction of an hour was rounded off to the nearest whole number. Time insitu was calculated for those participants whose PIVC was not discontinued as a result of a physician order to do so. The number of candidates whose PIVC was discontinued as a result of a complication or as per hospital policy (72 hours) was 90. The length of time insitu recorded for PIVCs ranged from a minimum of 2 hours to a maximum of 72 ($M = 56.59$, $SD = 22.25$).

A one way ANOVA was performed to measure a significant effect of IV site on time insitu. PIVCs in both dominant and non-dominant forearm locations remained in place longer than those PIVCs in the dominant hand and non-dominant hand locations, $F(3, 86) = 9.59$, $p < .001$ (see Table 2).

Table 1

Frequency and Percent of Participants by Gender and IV Site

<u>IV Site</u>	<u>Gender</u>	<u>n</u>	<u>Percent</u>
<u>DH</u>	Male	13	46.4
	Female	15	53.6
<u>NDH</u>	Male	21	65.6
	Female	11	34.4
<u>DFA</u>	Male	24	61.5
	Female	15	38.5
<u>NDFA</u>	Male	19	52.8
	Female	17	47.2

Note. DH (dominant hand), NDH (non-dominant hand), DFA (dominant forearm),

NDFA (non-dominant forearm).

Table 2

ANOVA Comparisons of IV Site by Time Insitu, Pain, Self-Care and Complications

Variables	DH		NDH		DFA		NDFA		F
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>	
<u>Time Insitu</u> (hours)	41.44 ^A	(25.37)	47.82 ^B	(23.53)	67.96 ^{ab}	(12.28)	66.0 ^{ab}	(15.95)	9.52 ***
<u>n</u>	16		28		28		18		
<u>Pain</u>	3.07	(3.73)	2.25	(2.58)	1.69	(2.03)	1.58	(2.61)	1.85 _{ns}
<u>n</u>	27		32		35		36		
<u>Self-Care</u>	1.47 ^C	(0.37)	1.74 ^c	(0.24)	1.89 ^c	(0.17)	1.90 ^c	(0.19)	19.63 ***
<u>n</u>	27		32		36		35		
<u>Complication</u> <u>s</u> (all)	1.39 ^D	(1.37)	2.16 ^E	(1.25)	0.56 ^{de}	(0.88)	0.29 ^{de}	(0.62)	21.85 ***
<u>n</u>	28		32		36		35		

Note. Means with small superscript letter are significantly different from means with capitalized superscript letter.

*** p < .001

ns denotes a non-significant result

The following results are reported according to each research question.

1. Is there a difference in the patient's perception of comfort level (defined by physical pain and ability to perform self-care activities) as determined by the anatomical site of a patient's PIVC?

Comfort was assessed by scores obtained from separate pain and self-care questionnaires completed by the subject. Scores recorded on an 11 point numerical rating scale (NRS) measured pain. A minimum score of zero indicated no pain and a maximum score of 10 indicated the worst pain imagined by the participant. The mean pain score for all participants was 2.08 ($SD = 2.78$). Means and standard deviations of the pain scale by IV site are included in Table 2.

The self-care questionnaire consisted of 10 items representing common activities of daily living scored on a three-point scale. The mean score of the 10 items was obtained and also evaluated using the same three-point score. A maximum score of two on this questionnaire indicated the ability to perform the stated activity without difficulty or interference from the PIVC. A score of one indicated the ability to perform the activity with some interference or difficulty from the PIVC. A minimum score of zero indicated that the PIVC did not interfere with the ability to perform the activity. The mean score for all participants who completed this questionnaire was 1.77 ($SD = .29$). The Cronbach alpha reliability of the self-care questionnaire was satisfactory (.82).

Separate one-way ANOVAs were performed to compare the effect of IV site on perceived pain level (measured by the NRS) as well as the effect of IV site on self-care activities (measured by the self-care questionnaire). IV site had no significant effect on pain as determined by scores obtained on the NRS, $F(3, 126) = 1.85$, $p > .05$.

However, there was a significant effect of IV site on self-care activities, $F(3, 126) = 19.63$, $p < .01$. Post hoc test (Scheffe) showed that subjects in the DH group scored significantly lower on the self-care questionnaire than those in the NDH, DFA, and NDFA groups (see Table 2).

A two-way ANOVA was conducted to determine interactions between the independent variables of dominance (dominant limb versus non-dominant limb) and anatomical location (hand versus forearm) on their effect on the dependent variables of pain and self-care. There was no significant interaction between the independent variables (dominance and anatomical location) on pain scores, $F(1, 126) = 0.55$, $p > .05$. There was a significant main effect of anatomical location on pain when comparing PIVCs located in the hands versus forearms. Pain scores for PIVCs were higher in the hands ($M = 2.63$, $SD = 3.17$, $n = 59$) than forearms ($M = 1.63$, $SD = 2.33$, $n = 71$), $F(1, 26) = 4.48$, $p < .05$ (see Table 3).

A two-way ANOVA conducted to assess the effect of the independent variables (dominance and anatomical location) on self-care showed a significant interaction $F(1, 126) = 8.76$, $p < .01$. When further explored with main effects, there were both significant effects of dominance on self-care, $F(1, 126) = 10.75$, $p < .01$ and of anatomical location on self-care, $F(1, 126) = 44.40$, $p < .001$ as shown in Table 4. Participants with a PIVC in the NDFA and DFA scored higher on the self-care questionnaire than subjects with a PIVC in the NDH and DH locations. Means and standard deviations are provided in Table 2.

The association of IV site with each of the ten items on the self-care questionnaire was examined. Self-care items were collapsed in order to obtain adequate numbers and

Table 3

Two-way ANOVA Testing the Interaction of Dominance and Anatomical Location on Pain Scale

Source	Sum of Squares	df	Mean Square	F
Dominance	6.89	1	6.89	0.91
Anatomical Location	33.88	1	33.88	4.48*
Dominance ¹ Anatomical Location	4.18	1	4.18	.55
Error	952.15	126	7.56	
Total	1559.00	130		

Note. ¹ Denotes interaction of independent variables

* $p < .05$

Table 4

Two-way ANOVA Testing the Interaction of Dominance and Anatomical Location on Self-care

Source	Sum of Squares	df	Mean Squares	F
Dominance	651	1	0.65	10.75 **
Anatomical Location	2.69	1	2.69	44.40 ***
Dominance ¹ Anatomical Location	.53	1	.53	8.76 **
Error	7.64	126	6.06	
Total	416.87	130		

Note. ¹ Denotes interaction of independent variables

** $p < .01$, *** $p < .001$

Chi-square analysis was done on the collapsed variables. The variables collapsed were those scored 0 (unable to perform activity / PIVC interfered completely) and 1 (able to perform activity with some difficulty / PIVC interfered somewhat) to equal a score of 0. The ability to perform the activity without difficulty or interference from the PIVC was changed from a score of 2 to equal a score of 1.

There was no significant association between IV site and the ability to eat, $\chi^2(3, n = 129) = 7.58, p > .05$; sleeping, $\chi^2(3, n = 129) = 4.53, p > .05$; and walking, $\chi^2(3, n = 116) = 3.94, p > .05$. There were significant associations between IV site and the ability to use washroom facilities, $\chi^2(3, n = 124) = 12.83, p < .05$, wash one's hands, $\chi^2(3, n = 129) = 62.70, p < .001$, care for own appearance, $\chi^2(3, n = 127) = 32.15, p < .001$, bathe oneself, $\chi^2(3, n = 126) = 38.04, p < .001$, reach for things, $\chi^2(3, n = 129) = 9.41, p < .05$, read, $\chi^2(3, n = 128) = 16.51, p < .01$, and write, $\chi^2(3, n = 129) = 23.53, p < .001$.

More participants with a PIVC in the DH reported greater difficulty using washroom facilities than those participants with a PIVC in the NDH, DFA, and NDFA (42.3% versus 34.5%, 14.3% and 8.8% respectively); and also reported more difficulty in washing their hands (92.6% versus 64.5%, 11.1% and 11.4% respectively). Those subjects with a PIVC in the DH (52%) had greater difficulty caring for their own appearance than subjects in the NDH, DFA and NDFA groups (12.9%, 5.6%, and 2.9% respectively). Those subjects with PIVCs in the DH (72%) also reported greater difficulty bathing versus 46.7% in the NDH, 8.3% DFA and 11.4% in the NDFA groups, and had greater difficulty reaching for things (57.7%) versus 34.4% in the NDH, 33.3% in the DFA and 20% in the NDFA groups. Participants with a PIVC in the DH had more difficulty reading (32%) versus 6.3%, 2.8% and 5.7% in the NDH, DFA and NDFA

groups respectively. They also had more difficulty writing (38.5%) than the NDH, DFA and NDFA groups (3.1%, 2.8% and 20% respectively).

2. Does the anatomical location of a PIVC influence the incidence of associated complications?

Complications were recorded for all participants ($N = 135$). The following complications were examined: phlebitis, dislodging of the PIVC, occlusion of the PIVC, leaking of IV fluid around the PIVC, disconnection of the IV system, extravasation of the IV fluid, and redressing of the PIVC. It was possible that each participant could experience one or more complications during the time the PIVC was in place. There were no complications recorded for 49.6% of all participants, while 18.3% had one complication, 14.5% had two complications, 12.2% had three complications, and 5.3% had four complications. Incidence of each specific complication by group is listed in Table 5. Re-taping frequencies are addressed separately in Table 6.

One-way ANOVA analyses and appropriate post hoc tests (Scheffe) were conducted which showed that the site of the PIVC had a significant effect on the number of total complications, $F(3, 127) = 21.85, p < .001$. There were more recorded complications in the NDH and DH groups than the DFA and NDFA groups (see means and standard deviations in Table 2).

Chi-square analyses were performed to determine the association of IV site and each complication. There were no significant associations between IV site and incidence of phlebitis, $\chi^2(3, n = 133) = 2.58, p > .05$; with occlusion of the PIVC, $\chi^2(3, n = 133) = 6.67, p > .05$; with extravasation of the PIVC, $\chi^2(3, n = 133) = 6.92, p > .05$ or with incidence of the PIVC being disconnected, $\chi^2(3, n = 131) = 5.0, p > .05$.

Table 5

Incidence of Specific Complications by IV Site

Complication	DH	NDH	DFA	N DFA
	n = 28	n = 32	n = 39	n = 36
Phlebitis	1	1	0	0
Dislodged	5	7	1	1
Occlusion	2	3	0	0
Interstitial	1	5	1	1
Leaking	6	12	3	1
Disconnected	6	7	4	2
Dressing Change	2	7	0	0
Other	3	5	1	0

Table 6

ANOVA for Effect of IV Site on Frequency of Re-taping (Complication)

<u>Variable</u>	<u>DH</u> <u>n = 28</u>		<u>NDH</u> <u>n = 32</u>		<u>DFA</u> <u>n = 36</u>		<u>NDFA</u> <u>n = 35</u>		<u>F</u>
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>	
<u>Frequency of Re-taping</u>	0.46	(0.88)	0.81 ^A	(1.15)	0.33 ^a	(0.63)	0.17 ^a	(0.51)	3.67 *

Note. Mean with small superscript letter is significantly different from mean with capitalized superscript letter

* $p < .05$

There were however, significant associations between IV site and incidence of PIVC being dislodged, $\chi^2 (3, n = 133) = 11.02, p < .05$; leaking of IV fluid, $\chi^2 (3, n = 133) = 17.81, p < .001$; and incidence of dressing change, $\chi^2 (3, n=131) = 16.50, p < .05$). Participants with a PIVC in the NDH and DH experienced more dislodging of PIVC (21.9% and 18.5% respectively) than those participants with a PIVC in the NDFA and DFA (2.8% and 2.6% respectively). Subjects with PIVCs in the NDH and DH also had a higher incidence of leaking (37.5% and 22.2% respectively) than those with a PIVC in the DFA and NDFA (7.9% and 2.8% respectively). There were no reported dressing changes required for those subjects with a PIVC in the DFA and NDFA groups compared to 21.9% for those in the NDH and 7.1% in the DH groups.

A one-way ANOVA was used to calculate the effect of IV site on the frequency of re-taping of the PIVC, $F (3, 130) = 3.67, p < .05$. Those subjects with a PIVC in the NDH were re-taped or re-secured more frequently than those in the, DFA and NDFA. Means and standard deviations are presented in Table 6.

There were nine incidents recorded under “other” complications, which consisted of events that resulted in the PIVC being discontinued prior to 72 hours. These events included three participants with a PIVC in the DH group and three participants with a PIVC in the NDH group who requested that their PIVC be discontinued and restarted in another location. Two other participants with PIVCs in the NDH group had unusual bleeding at the insertion site that required the PIVC discontinued. There were no such complications recorded for participants in the DFA and NDFA groups. One participant with a PIVC in the DFA had the PIVC discontinued because a larger catheter size was required for blood transfusion.

3. Is there a relationship between time insitu of a PIVC and rate of complications and perceived level of comfort defined as physical pain (NRS scores) and ability to perform self-care activities (self-care questionnaire scores)?

Pearson r coefficient was used to calculate selected correlations. There was a negative correlation between time insitu and participant scores on the NRS (pain) scale ($r = -0.37, p < .01$). As time insitu increased, scores on the NRS pain scale decreased indicating less physical pain experienced by patients. There was a positive correlation between time insitu and scores on the PIVC self-care questionnaire ($r = 0.41, p < .01$). As time insitu increased, scores on the PIVC self-care questionnaire increased, indicating more patient independence.

There was a significant negative correlation between time insitu and rate of complications ($r = -.41, p < .01$). This indicates that a PIVC that was in place for a longer time was subject to fewer complications. Correlations were also calculated between time insitu and each individual complication. There was no significant correlation between time insitu and incidence of phlebitis ($r = -.21, p > .05$), frequency of re-taping ($r = -.13, p > .05$), or incidence of re-dressing ($r = -.15, p > .05$). There was a significant negative correlation between time insitu and incidence of PIVC dislodgment ($r = -.44, p < .01$), occlusion ($r = -.24, p < .05$), interstitial ($r = -.34, p < .01$), and leaking of IV fluid ($r = -.46, p < .01$). The longer the PIVC was in place, fewer complications were recorded.

4. Is there a relationship between age and gender of the person and rate of complications and perceived level of comfort (as measured by self-care questionnaire and NRS scale)?

There was no significant correlation between age and rate of complications ($r = -0.01$, $p > .05$) and scores reported for both the NRS (pain) questionnaire ($r = -0.13$, $p > .05$). There was a significant positive correlation between age and scores recorded on the self-care questionnaire ($r = 0.20$, $p < .05$).

A two-way ANOVA was conducted to assess the effect of IV site and gender on pain, but revealed no significant interaction, $F(3, 129) = .069$, $p > .05$. There was no significant gender effect on frequency of complications, $F(1, 129) = .076$, $p > .05$, or on self-care, $F(1, 128) = 3.23$, $p > .05$. There was however a significant gender effect on pain scale scores, $F(1, 128) = 4.92$, $p < .05$). Females scored higher on the pain questionnaire ($M = 2.70$, $SD = 3.17$) than males ($M = 1.62$, $SD = 2.36$) indicating they experienced greater pain.

Supplementary Findings

IV type (saline lock and IV line) was believed to be a variable that would impact on the results of the study. Of 135 participants, 60 had a saline lock, 73 had an IV line and two participants were not recorded. Separate one-way ANOVAs were conducted to assess the effect of IV type on incidence of complications, pain, and self-care. There was no significant effect of IV type on pain, $F(1, 127) = 2.86$, $p > .05$, or on incidence of complications, $F(1, 131) = 3.27$, $p > .05$. There was a significant effect of IV type on self-care, $F(1, 128) = 11.56$, $p < .01$. Those participants with a saline lock reported higher self-care questionnaire scores than those with an IV line indicating they were able to perform self-care activities with less interference (see Table 7).

Separate two-way ANOVAs were conducted to further assess the effect of both IV type and IV site (DH, NDH, DFA and NDFA) on the incidence of complications,

Table 7

ANOVA Comparing Means of IV Type on Complications, Pain and Self-Care

<u>Variables</u>	<u>n</u>	<u>M</u>	<u>SD</u>	<u>F</u>
<u>Complications</u>				
saline lock	60	1.0	(1.58)	1.29
IV line	73	1.32	(1.60)	
<u>Pain</u>				
saline lock	59	1.59	(2.45)	2.86
IV line	70	2.40	(2.89)	
<u>Self-care</u>				
saline lock	59	1.86 ^A	(0.20)	11.56 **
IV line	71	1.69 ^a	(0.34)	

Note. Mean with small superscript is significantly different from mean capitalized superscript..

** $p < .01$.

pain, and self-care. There was no significant interaction between IV type and IV site on incidence of complications, $F(3, 123) = 0.18, p > .05$. There was also no significant interaction between IV type and IV site on pain, $F(3, 121) = 2.25, p > .05$.

There was however, significant interaction between IV type and IV site on self-care, $F(3, 122) = 4.79, p < .01$. When further explored with main effects, both IV type, $F(1, 122) = 24.28, p < .001$, and IV site, $F(3, 122) = 22.73, p < .001$, had significant effects on self-care scores. Those participants with an IV line in the DH scored lower on the self-care questionnaire than those with a saline lock in the DH, and scored lower overall when compared to those participants with either saline locks or IV lines in the other three groups (NDH, DFA, and NDFA) (see Table 8).

In summary, there was no difference in pain perception between participants with PIVCs in the four group sites (DH, NDH, DFA, and NDFA). Participants with PIVCs in the NDFA and DFA were able to perform self-care activities with less difficulty and less interference from their PIVC compared to those subjects with PIVCs in the DH and NDH groups. These self-care activities included: using washroom facilities, hand washing, caring for own appearance, bathing, reaching for things, reading and writing. There were no differences in the ability to eat, sleep or walk between participants with PIVCs in all four groups.

There was no significant difference in pain perception between participants with PIVCs in the four group sites (DH, NDH, DFA, and NDFA). However, when dominance and anatomical location were examined as to their effect on pain and self-care, those participants with PIVCs in the hands reported more pain and greater difficulty performing self-care activities than those with PIVCs in the forearms. Those subjects with PIVCs in

Table 8

Comparisons of Means and Standard Deviations for Complications, Pain and Self-care by IV Type and IV Site

		Complications		Pain		Self Care	
		<u>n</u> = 131		<u>n</u> = 129		<u>n</u> = 130	
<u>IV Site</u>	<u>IV Type</u>	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>
<u>DH</u>	Saline lock	1.08	(1.08)	1.83	(3.24)	1.72	(0.21)
	IV line	1.63	(1.54)	4.07	(3.95)	1.26	(0.35)
<u>NDH</u>	Saline lock	1.94	(1.34)	2.76	(2.68)	1.76	(0.22)
	IV line	2.4	(1.12)	1.67	(2.41)	1.71	(0.26)
<u>DFA</u>	Saline lock	0.2	(0.56)	0.87	(1.19)	1.97	(6.17)
	IV line	0.8	(0.98)	2.30	(2.32)	1.82	(0.21)
<u>NDFA</u>	Saline lock	0.13	(0.35)	0.80	(2.01)	1.97	(0.10)
	IV line	0.4	(0.75)	1.80	(2.48)	1.84	(0.23)

Note. The higher the score, the greater incidence of complications, perceived pain and ability to perform self-care.

the dominant limbs also reported greater difficulty performing self-care activities compared to those with PIVCs in the non-dominant limbs.

The incidence of complications was greater for subjects with PIVCs in the DH hands compared to those with PIVCs in the forearms. When each individual complication was examined, there were no differences in the occurrence of phlebitis, occlusion, extravasation or disconnection of a PIVC between subjects in the four groups. There was, however a higher incidence of leaking, catheter dislodgment, dressing changes, and re-taping for subjects with PIVC's located in the DH and NDH compared to those with a PIVC in the DFA and NDFA. A total of six participants specifically requested that the PIVCs located in their hands be discontinued and restarted in forearm locations. There were no such requests from subjects with PIVCs located in either forearm.

There was a negative correlation between time and pain perception and a positive correlation between time and self-care scores. As time insitu of a PIVC increased, pain perception decreased while the ability to perform self-care increased. Age was positively correlated with ability to perform self-care and females in general reported higher pain scores. There was no statistically significant correlation between age or gender and incidence or type of complications.

Participants with an IV line in the dominant hand experienced greater difficulty performing self-care activities compared to those participants with a saline lock or IV line in any of the other three remaining groups. There were no differences in pain perception or rate of complications between groups whether an IV line or saline lock was insitu.

Chapter 5

Discussion

The hypotheses that a patient with a PIVC in the non-dominant forearm (N DFA) would experience less pain, have less difficulty performing self-care activities and would experience fewer complications than those patient's whose PIVC was located in the dominant hand (DH), non-dominant hand (NDH) and dominant forearm (DFA), was only partially supported. The results of this study show that participants with PIVCs located in both the DFA and N DFA experience less pain, report less difficulty performing self-care activities and have fewer complications than those participants with a PIVC in either the DH or NDH.

The ideal PIVC would cause no pain, would not interfere with the patient's ability to perform self-care, would be free of complications, and would remain insitu for 72 hours (unless ordered discontinued per physician order). One needs only to examine mean time insitu to determine the superior location for a PIVC. Time insitu was positively correlated with self-care, and inversely correlated with pain and complication rate. PIVC's located in both DFA and N DFA locations were insitu significantly longer than those situated in DH and NDH locations.

That age was positively correlated with self-care indicates that older participants may not perceive themselves as dependent on help to perform self-care activities, as one would assume. The answers chosen on the self-care questionnaire were subject to an individual perception of what help or interference meant. A younger individual may consider independence differently than an older individual who has had to adapt to

various situations throughout his/her life or may have experienced previous hospitalization.

In this study, women reported greater pain from their PIVCs than men. Results from experimental pain studies suggest that gender differences in pain perception do exist. Women generally report lower pain thresholds and less tolerance to noxious stimuli than men (Berkley, 1997; Miaskowski, 1997). Researchers also found that men reported less pain in front of a female rather than male experimenter (Levine & Simone, 1991). These particular findings from other studies may explain why women reported higher pain scores than men in this study. Women may also be more willing to admit experiencing pain than men. Nurses need to be mindful of these gender differences in their assessment and planning of care for a man or woman. Further nursing research should include gender differences in pain perception and how this variable affects nursing practice.

There are several implications of the research findings. The first is the incorporation of nursing theory into research and nursing practice. Orem's Self-care Deficit Theory of Nursing was used as the structural framework for organization and design of this study. The study results primarily concern the concepts of self-care agency and nursing agency. Self-care agency is a person's ability to perform self-care. Nursing agency is exercised by legitimate nurses in order to enable patients to meet their self-care demands and regulate their self-care agency (Orem, 1995). Orem states that part of desirable nursing characteristics is the ability of the nurse to reduce a patient's physical discomfort and pain by manipulating conditions to increase their comfort and satisfaction

(1995). A PIVC is a type of basic conditioning factor (health care system, treatment factor).

The results show that a PIVC in a hospitalized person's dominant or non-dominant hand can adversely affect the patient's ability to perform certain self-care activities, cause greater pain and cause patients to be more prone to complications than when a PIVC is located in the dominant or non-dominant forearm. An awareness of this information can direct the nurse to insert the PIVC in a location that is less prone to complications, causes less pain and will least interfere with their ability to perform self-care while in hospital. Therefore, through nursing agency, the nurse can protect a patient's self-care agency.

A second implication of the study is the utilization of results supporting evidence-based practice. Rosswurm and Larrabee (1999) call for patient outcomes that must reflect discipline-specific and interdisciplinary accountabilities. These authors suggest that evidence-based practice will improve the quality of patient care and enhance clinical judgment. Data from clinically relevant research, clinical expertise, and patient preference are believed to produce the best evidence for ensuring effective individualized patient care (Mulhall, 1998, Sackett & Rosenberg, 1995).

Current guidelines and protocols for site selection for the insertion of PIVCs need to be reviewed. If PIVC insertion is required, the hand locations should be avoided provided that the patient has suitable veins available in the forearm locations. Nurses should be aware that patients with a PIVC in a hand location might require more assistance when performing self-care activities with particular attention to maintenance of personal hygiene especially hand washing and bathing. If the patient has an IV line, the

dominant hand location should be avoided as it significantly interferes with the patient's ability to perform self-care activities. For those patients with an existing IV line in the dominant hand, the nurse needs to be alert that this PIVC's location may interfere with the patient's ability to perform certain self-care activities and should be prepared to provide these patients with the necessary support.

Another implication of the study affects nursing practice and the health-care system. This study lends support for the utilization of an IV Team of nurses who are highly experienced in PIVC insertion and could locate and insert a PIVC with efficiency and minimal difficulty. Soifer et al. (1998) reported that IV nurses were more successful with difficult catheter insertions, and that staff levels of frustration decreased with issues concerning PIVC insertion. The decision to select a site for initiation of a PIVC should be based on that which benefits the patient rather than a site that is easy for the nurse to locate. Nurses who are required to insert PIVCs need to develop their techniques and skills for PIVC insertion.

The study also shows that hand locations are more prone to complications that result in more frequent re-starts and require more nursing care. These incidents impact on nursing hours, increased utilization of equipment, and can adversely affect patient satisfaction which all translate into increased health care costs. Nurses are in an advantageous position to evaluate current procedures and the utilization of products for cost effectiveness. Further studies should include these variables in their design.

Limitations of this study are related to those of a descriptive-correlational design and to the use of a convenience sample. The results can be generalized to hospitalized adult admitted in-patients who are coherent and can read, write and speak English.

Critical care areas and other specialties such as obstetrics and pediatric services were not examined. The effects of extraneous variables such as type of IV solution, infusion of medications and experiences with a previous PIVC were not controlled. Future research is required that examines the effect of PIVC location on self-care, pain and rate of complication in patients in critical care areas, emergency room, ambulatory care settings, community care settings, and long term facilities. Research is also needed that examines nurses' preferences when selecting a site for a PIVC as well as techniques to enhance successful insertion. Research tools need to be developed for accurate measurement of self-care activities of hospitalized patients, which are specific to area of clinical specialty and are based on nursing theory.

Conclusion

This study used a four-group correlational design that investigated the effect of site location of a peripheral intravenous catheter (PIVC) on patient comfort and incidence of complications. The anatomical site locations examined were dominant hand (DH), non-dominant hand (NDH), dominant forearm (DFA) and non-dominant forearm (N DFA). Orem's Self-care Deficit Theory of Nursing was used as the framework for the development and design of this research study.

A convenience sample of 139 hospitalized admitted in-patients was used. An IV Team of nurses was part of the research team that initiated all PIVC's studied. Complications recorded included incidence of phlebitis, leaking of IV fluid, re-taping, dressing changes, disconnection, extravasation, dislocation, and occlusion of the IV catheter. Comfort was evaluated by assessing how the location of the PIVC affected the participant's ability to perform certain self-care activities, and actual perceived pain. Self-care was measured by a self-care questionnaire. A score obtained on a numerical rating scale (NRS) measured perceived pain. Both these tools were administered to the patient after the PIVC was discontinued.

Results showed that participants with a PIVCs located in the dominant hand (DH) and non-dominant hand (NDH) experienced more frequent complications, and recorded higher pain scores on the NRS (indicating greater pain) than those with a PIVC in the dominant forearm (DFA), and non-dominant forearm (N DFA) locations. Patients with their PIVC in the DH and NDH locations also scored lower on the self-care questionnaire indicating that their PIVC caused greater interference when performing self-care activities. PIVCs placed in the DFA and N DFA remained insitu longer. There was a

positive correlation between time insitu and the ability to perform self-care. There was a negative correlation between time insitu and incidence of complications and pain scores. Females in general reported higher pain scores than males. There was also a positive correlation between age and self-care.

There are several implications of the study results. The information can be applied to protocols and guidelines for the insertion of a PIVC which supports evidenced-based practice to promote excellent nursing care. Data can also be utilized in performing a cost analysis to assess savings related to utilization of nursing time and equipment. Ultimately, increased patient satisfaction through patient-focused care will benefit all those involved in our health care system.

This study contributes to our understanding of the effects of PIVC site location on patient comfort and rate of complications. It is also an example of how nursing theory can be utilized as a framework for nursing research to enhance clinical nursing practice.

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Appendix A

Consent Form**Comfort Level and Rate of Complications Related to Location of Peripheral Intravenous Catheters in Hospital Patients**

Anne Marie Marsigliese, R.N. BScN, NP, is conducting a study of intravenous catheters (IV needles) and their location in a person's arm or hand. The purpose of this study is to gather information on how the location of an intravenous catheter affects comfort levels as well as rate of complications. The information gathered should help nurses and physicians in providing better care for patients requiring intravenous therapy.

You are asked to participate in this study by agreeing to keep a daily log/checklist of specific events during the study period and having a study nurse (member of the research team) examine your intravenous catheter a least once every 24 hours during the study period. You also agree to complete a questionnaire at the end of the study. The total length of time of the study will be no longer than 3 days (approximately 72 hours).

The information gathered for the study belongs to the investigators who have taken special precautions to protect your identity and to assure the complete privacy and confidentiality of the information you give. The information will be identified in the study files by code number only. Results of the study will be used only in scientific papers where confidentiality is fully protected and only shared with the management of the institution to improve client care.

Your willingness to participate in this study will in no way affect your medical or nursing care. You may withdraw from the study at any time.

By signing this consent form, you are indicating you understand what is being asked of you and agree to participate in the study as described. You are further indicating you have been given the opportunity to ask any questions of the investigator. You are also indicating you understand that your withdrawal from this study will in no way influence the medical or nursing care you receive.

This study has received clearance from the University of Windsor Ethics Committee. If you have any questions concerning this study, please contact the office of Research Services at 253-3000 ext. 3916, or Anne Marie Marsigliese at 973-4444 ext 2310 or Cpt. Barry Stride at 973-4444 ext 2132.

(A copy of this consent form is available to you on request.)

 Study Participant's Signature

 Date

Appendix B

Person Obtaining Consent
Code No. _____

Date

PIVC Questionnaire
(to be completed by the participant)

This questionnaire will measure how the intravenous needle affected your ability to perform independent routine activities.

Please place a **check mark** (✓) in the box next to the choice that best describes your answer.

While the intravenous (IV) needle was in place:

1. Could you eat...
 - without help (able to feed yourself completely with the IV in place),
 - with some help (need help with cutting, etc.),
 - unable to feed yourself?
 - Not answered

2. Could you use washroom facilities....
 - without help (IV did not interfere),
 - with some help (IV caused some interference)
 - unable to use these facilities alone (IV caused complete interference)?
 - Not answered

3. Could you wash your hands.....
 - without difficulty (IV did not interfere),
 - with some difficulty (IV caused some interference),
 - unable wash my hands at all (IV completely interfered)?
 - Not answered

4. Could you take care of your own appearance, for example combing your hair or brushing your teeth....
 - without help (IV did not interfere),
 - with some help (IV caused some interference),
 - completely unable to maintain your appearance yourself?
 - Not answered

5. Could you bathe yourself...
 - without help (IV did not interfere),
 - with some help (IV caused some interference),
 - unable to bathe yourself at all (IV completely interfered)?
 - Not answered

6. Could you sleep....
- without difficulty (IV needle did not interfere with my sleep),
 - with some difficulty (IV needle caused some difficulty),
 - could not sleep at all (could not sleep at all because of the IV needle)?
 - Not answered
7. Could you reach for things....
- without difficulty (IV needle did not interfere),
 - with some difficulty (IV needle caused some difficulty),
 - could not reach for things at all (IV needle interfered completely)?
 - Not answered
8. Could you walk....
- alone, without difficulty (IV needle did not interfere),
 - with some help from a person (IV needle caused some difficulty),
 - completely unable to walk (IV needle interfered completely)?
 - Not answered
9. Could you read and hold a book or paper...
- without difficulty (IV did not interfere with my ability to read)
 - with some difficulty (IV caused some interference),
 - could not read at all (IV prevented me from reading)?
 - Not answered
10. Could you write...
- without difficulty (IV did not interfere with my ability to write),
 - with some difficulty (IV caused some difficulty with writing),
 - could not write at all (IV prevented me from writing)?
 - Not answered

Code No. _____

Pain Scale
(to be completed by the participant)

Check (√) the number from 0 to 10 that best describes the worst pain you felt from your intravenous catheter while it was in place (do not include time of insertion).

0	1	2	3	4	5	6	7	8	9	10
----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	-----------

**no
pain**

**unbearable
pain**

Demographic Data and PIVC Complication Checklist

Appendix C

Demographic Data and PIVC Complication Checklist

(to be completed by IV Team Nurse)

Date _____

Code No. _____ IV _____ Hep Lock _____

Age _____ Date of Birth _____ Sex _____

Reported dominant arm (check one): Right arm _____

Left arm _____

PIVC Location (check one)		
	Hand	Forearm
Dominant		
Non-Dominant		

PIVC started: Date: _____ Time: _____

PIVC discontinued Date: _____ Time: _____

Check off complication as it is observed

Complication	Check
Phlebitis	
IV dislodged (catheter pulled out)	
Occlusion of catheter	
Interstitial / Extravasation of IV fluid	
Leaking of IV fluid around catheter	
Other (specify)	

Code No.: _____

Date and time catheter started: _____

Date and time catheter discontinued: _____

Check off a complication as it is observed. Mark a check for each time it occurs.

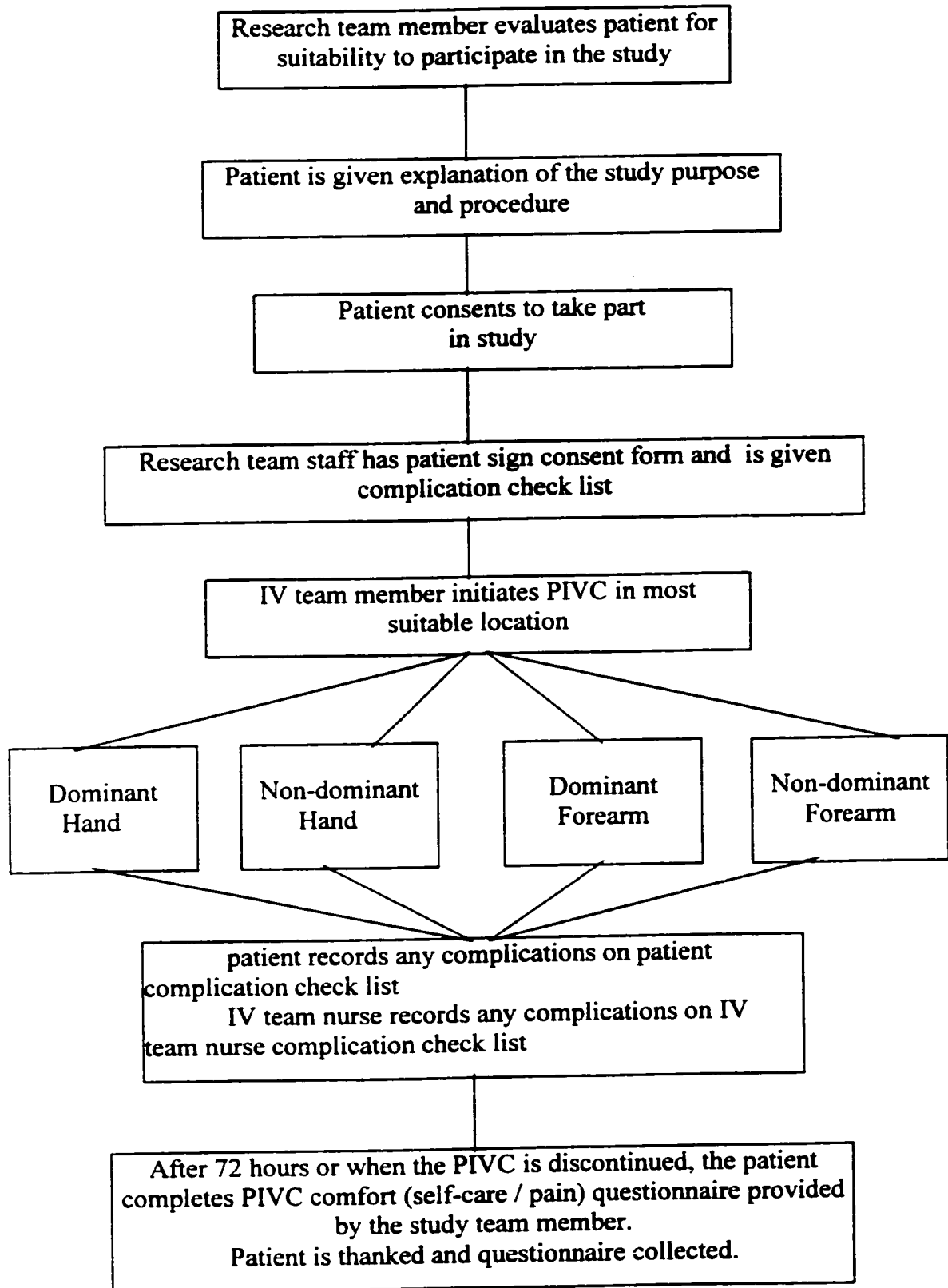
	Time & Date	Time & Date	Time & Date
1. Disconnection of IV tubing / IV lock.			
2. Re-taping / re-securing of intravenous catheter			
3. Transparent IV site dressing requires replacement.			
4. Other			

Once completed please return to Anne Marie Marsigliese RN

phone: 966-1095

Appendix D

PIVC Study Pathway



Vita Auctoris

Name Anne Marie Marsigliese

Date of Birth July 20, 1955

Place of Birth Windsor, Ontario

Education F. J. Brennan High School, Windsor, Ontario
1969 - 1973

St. Clair College, Windsor, Ontario
1973 - 1975 Diploma in Nursing

University of Windsor, Windsor, Ontario
1983 - 1992 B.Sc.N.

University of Windsor, Windsor, Ontario
1995 - 1997 Primary Healthcare Nurse Practitioner

University of Windsor, Windsor, Ontario
1997 - 2000 M.Sc.N.