

**KNOWLEDGE AND PRACTICE TOWARD  
PERIPHERAL INTRAVENOUS CATHETER CARE  
AMONG NURSES IN HOSPITAL PAKAR  
UNIVERSITI SAINS MALAYSIA**

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by

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**Dissertation submitted in partial fulfilment of the requirements  
for the degree of  
Bachelor in Nursing**

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## DECLARATION

I hereby declare that this dissertation is the result of my own investigations, except where otherwise stated and duly acknowledged. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at Universiti Sains Malaysia or other institutions. I grant Universiti Sains Malaysia the right to use the dissertation for teaching, research and promotional purposes.



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Noratirah Shafika Binti Mohd Shafizan

Date: 3 August 2025

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## LIST OF ABBREVIATIONS

BSI	Bloodstrem Infection
CDC	Centres For Disease Control
HBM	Health Belief Model
HPUSM	Hospital Pakar Universiti Sains Malaysia
HREC	Human Research Ethics Committee
PIVC	Peripheral Intravenous Catheter

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**PENGETAHUAN DAN AMALAN PENJAGAAN KATETER INTRAVENA  
PERIFERI (PIVC) DALAM KALANGAN JURURAWAT DI HOSPITAL  
PAKAR UNIVERSITI SAINS MALAYSIA**

**ABSTRAK**

Pemasangan kateter intravena periferi (PIVC) merupakan salah satu prosedur klinikal yang paling kerap dilakukan, dan walaupun penting untuk rawatan pesakit, penggunaan yang kerap boleh meningkatkan risiko komplikasi seperti flebitis. Kajian keratan rentas ini bertujuan untuk menilai tahap pengetahuan dan amalan terhadap penjagaan PIVC dalam kalangan jururawat serta meneliti faktor sosiodemografi yang berkaitan di wad perubatan-surgeri di Hospital Pakar Universiti Sains Malaysia (HPUSM). Seramai 154 orang jururawat telah mengambil bahagian melalui soal selidik sendiri. Keputusan menunjukkan bahawa 83.1% jururawat mempunyai pengetahuan yang baik dan 98.7% menunjukkan amalan yang baik dalam penjagaan PIVC. Terdapat hubungan signifikan antara keyakinan dalam menguruskan PIVC dengan tahap pengetahuan ( $p = 0.001$ ) dan amalan ( $p < 0.001$ ). Jantina ( $p = 0.013$ ), tahap pendidikan ( $p = 0.000$ ), dan tempoh pengalaman kerja ( $p = 0.034$ ) juga menunjukkan hubungan signifikan dengan tahap amalan. Namun, tiada hubungan signifikan ditemui antara tahap pengetahuan dengan pemboleh ubah demografi yang lain. Dapatan ini mencadangkan bahawa walaupun tahap penjagaan PIVC dalam kalangan jururawat adalah baik secara keseluruhan, latihan berterusan, pendedahan klinikal dan peningkatan keyakinan diri sangat penting untuk memperkukuhkan pengetahuan khusus dan mengekalkan mutu penjagaan yang tinggi.

**KNOWLEDGE AND PRACTICE OF PERIPHERAL INTRAVENOUS  
CATHETER (PIVC) CARE AMONG NURSES IN HOSPITAL PAKAR  
UNIVERSITI SAINS MALAYSIA**

**ABSTRACT**

Peripheral intravenous catheter (PIVC) insertion is one of the most frequently performed clinical procedures, and while essential for patient treatment, regular use can increase the risk of complications such as phlebitis. This cross-sectional study aimed to assess the level of knowledge and practice toward PIVC care among nurses and examine associated sociodemographic factors in the medical-surgical wards at Hospital Pakar Universiti Sains Malaysia (HPUSM). A total of 154 nurses participated using a self-administered questionnaire, which included sections on demographics, knowledge (12 items), and practice (10 items). The results showed that 83.1% of nurses had good knowledge and 98.7% demonstrated good practice in PIVC care. A significant association was found between confidence in managing PIVC and both knowledge ( $p = 0.001$ ) and practice ( $p < 0.001$ ). Gender ( $p = 0.013$ ), education level ( $p = 0.000$ ), and years of working experience ( $p = 0.034$ ) were also significantly associated with practice level. However, there were no significant associations between knowledge and other demographic variables. The findings suggest that while overall PIVC care among nurses was good, continuous training, clinical exposure, and confidence-building are important to strengthen specific knowledge areas and sustain high-quality care.

# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

This study intended to define the knowledge and practice toward peripheral intravenous catheter care among nurses in Hospital Pakar Universiti Sains Malaysia (HPUSM). This includes the study's rationale, aims, and objectives, as well as the anticipated outcomes, methodological approach, materials used, and the presentation and interpretation of the results. Ultimately, the importance of the study was explained, and the key terms used throughout the research were clearly defined.

### 1.2 Background of Study

A peripheral intravenous catheter (PIVC) is a flexible tube placed into a peripheral vein, which is done for several purposes, like the supply of fluids, medications, blood, or for diagnostic purposes (Matthews et al., 2023). It is kept for varying durations based on the patient's condition and may pose a risk of microbial growth (Osti et al., 2019). The preferred site for PIVC insertion is the upper limb, with the forearm, dorsum of the hand, and cubital fossa being the most frequently used areas (Hoskins et al., 2022). Regarding Peripherally Inserted Vascular Cannula (PIVC) Guidelines, lower limb superficial veins are avoided because of their high risk of infection and embolism.

Globally, more than a billion PIVC are inserted into patients (Alexandrou et al., 2015). This makes PIVC insertion one of the most often performed clinical procedures (Alexandrou et al., 2018). Although the use of PIVC is essential for patient treatment, regular usage may increase the risk of local and systemic complications (Hassan et al., 2022). Regarding Zingg et al. (2023), the majority of PIVC problems are non-infectious, including phlebitis (irritation or inflammation of the venous wall), infiltration (fluid

pouring into surrounding tissues), occlusion (blockage), leakage, and dislodgement. However, local site infections or bloodstream infections (BSI) can develop as well (Zingg et al., 2023). Consequently, these will lead to longer hospital stays, more diagnostics, and treatment, which can cause cost rises (Hassan et al., 2022).

Nurses have a crucial role in preventing, treating, and managing local and systemic complications following evidence-based practice guidance (Osti et al., 2019). Hospital Pakar Universiti Sains Malaysia (HPUSM) is a major healthcare provider in Kubang Kerian, Kelantan and nurses play an important role in patient care, particularly PIVC treatment. According to Hadaway (2012), nurses' lack of standardisation in knowledge and practice of PIVC care might negatively impact patient safety and satisfactory outcomes. Therefore, nursing management should prioritize equipping nurses with continuous education and ensure hands-on training is incorporated, as practical experience is equally important for improving care quality (Hassan et al., 2022). Understanding nurses' knowledge and practice patterns regarding PIVC care proves essential to achieve optimal patient outcomes and lower the incidence of complications.

### **1.3 Problem Statement**

The insertion of a PIVC has become the most frequent invasive operation done on patients, with 35 - 50% of the overall failure rate (Zingg et al., 2023). This generally fails before the completion of therapy due to several problems, including phlebitis (Daud, 2018). It has been verified by a study on incidence of phlebitis among adult patients undertaken in an East Coast Hospital Malaysia. As mentioned by Daud (2018), phlebitis was observed in 36.1% of patients with PIVCs. This made phlebitis the second most common reason for removing PIVCs, following reasons such as discharge, dislodgement, completion of treatment, leakage, or patient requests (Daud, 2018).

Although PIVCs are widely used in healthcare, many healthcare professionals, including nurses, may lack adequate knowledge or follow inconsistent practices in catheter management which can lead to serious complications. The evidence is, only 10% to 25% of catheters remained in place for more than 5 days, with just 3% continuing to function properly after 7 days. Among all the patients in the study, 40% of catheters failed due to issues such as infiltration, occlusion, accidental removal, phlebitis, and infection (Helm et al., 2019). Difficulties in obtaining and maintaining peripheral IV access frequently have a negative impact on a patient's overall hospital experience (Helm et al., 2019).

Aside from that, nurses who lack knowledge of infection prevention and adequate nursing care may struggle to follow evidence-based guidelines for reducing IV catheter related infections. Despite the recognised complications of PIVCs, some nurses still do not follow standard protocols for cannula insertion, removal, and maintenance (Osti et al., 2019). Previous studies also demonstrate that nurses are not engaging in proper practice. Although nurses have considerable knowledge and experience with PIVC care and maintenance, their practices still do not follow established guidelines (Qamar et al., 2017). To ensure high-quality care, public hospital administrations should emphasis training nurses to adhere strictly to established protocols. One way to improve their knowledge and skills is by attending specialised training or courses (Ali & Inayat, 2019).

Negative outcomes and patient problems are still quite likely if nurses' knowledge and practice gaps are not filled. Poor PIVC treatment has been repeatedly linked to greater rates of morbidity, longer hospital admissions, and higher healthcare expenses (Blanco-Mavillard et al., 2022). This proved that there was still a lack of knowledge about the care of PIVC. Nurses' understanding and proper practice of PIVC management, as well as their

ability to identify risk factors early, are crucial in preventing complications (Sultan et al., 2023). Therefore, the objective of this study is to assess the level of knowledge and practice of PIVC care among nurses at Hospital Pakar Universiti Sains Malaysia (HPUSM).

#### **1.4 Research Questions**

The research questions for this study are as follows:

1. What is the level of knowledge of peripheral intravenous catheter care among nurses in HPUSM?
2. What is the level of practice of peripheral intravenous catheter care among nurses in HPUSM?
3. Is there any association between selected demographic characteristics and the level of knowledge of peripheral intravenous catheter care among nurses in HPUSM?
4. Is there any association between selected demographic characteristics and the level of practice of peripheral intravenous catheter care among nurses in HPUSM?

#### **1.5 Research Objectives**

##### **1.5.1 General Objective**

The general objective of this study is to determine knowledge and practice toward peripheral intravenous catheter care among nurses in Hospital Pakar Universiti Sains Malaysia (HPUSM)

### **1.5.2 Specific Objectives**

The specific objectives for this study are as follows:

1. To identify the level of knowledge toward peripheral intravenous catheter care among nurses in HPUSM.
2. To identify the level of practice toward peripheral intravenous catheter care among nurses in HPUSM.
3. To determine the association between selected demographic characteristics and the level of knowledge of peripheral intravenous catheter care among nurses in HPUSM.
4. To determine the association between selected demographic characteristics and the level of practice of peripheral intravenous catheter care among nurses in HPUSM.

### **1.6 Research Hypothesis**

**Hypothesis 1 H0:** There is no significant association between selected demographic characteristics and their level of knowledge of PIVC care among nurses in HPUSM.

**H1:** There is a significant association between selected demographic characteristics and their level of knowledge of PIVC care among nurses in HPUSM.

**Hypothesis 2 H0:** There is no significant association between selected demographic characteristics and their level of practice of PIVC care among nurses in HPUSM.

**H1:** There is a significant association between selected demographic characteristics and their level of practice of PIVC care among nurses in HPUSM.

### 1.7 Significance of study

The findings from this study determined the level of knowledge and practice toward the care of PIVC among nurses in HPUSM. These findings were important, as PIVCs were widely used in clinical settings. Improving patient safety and clinical outcomes required an assessment of nurses' knowledge and adherence to best practices. By evaluating the existing levels of knowledge and practice, the results highlighted areas where additional training or education had been needed, helping to ensure that nurses had access to the most up-to-date information on PIVC care. Through this, HPUSM was able to enhance its overall quality of care, reduce the incidence of PIVC-related complications, and support better health outcomes for patients.

### 1.8 Definitions of Operational Terms

	Conceptual Definition	Operational Definition
Nurses	A somebody who works in a hospital or other healthcare facility providing medical treatment to patients (Cambridge Dictionary, 2020).	Nurses in medical and surgical wards are included in this study.
PIVC	PIVC is a tiny, flexible tube that is placed into a peripheral vein to provide blood, medications, fluids, or for diagnostic purposes (Matthews et al., 2023).	In this study, PIVC refers to intravenous catheters which is inserted by healthcare professionals into appropriate part of vein.
Knowledge	The state of understanding something with familiarity acquired by connection or experience (Merriam-Webster, 2024).	Knowledge in this study, referred to the respondents' understanding of PIVC care and was assessed using a self-adapted questionnaire from Qamar et al. (2017) and Arbaee and Mohd Ghazali (2016).

Practice	The technique of practicing something often or repeatedly to get better at it (Cambridge Dictionary, 2019).	Practice referred to how respondents implemented PIVC care in clinical settings, and this was assessed using a self-adapted questionnaire from Qamar et al. (2017) and Arbaee and Mohd Ghazali (2016).
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## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter provided a general review of the literature related to peripheral intravenous catheter (PIVC) care, including nurses' knowledge and practice regarding PIVC care. It also examined previous studies on the association between demographic characteristics and the level of knowledge, as well as the association between demographic characteristics and the level of practice toward PIVC care. The final section of the chapter described the theoretical and conceptual framework that guided this study.

#### **2.2 Definition and Purposes of PIVC**

Intravenous (IV) peripheral lines, catheters, or cannulas are indwelling, single-lumen plastic tubes that provide the direct injection of fluids, medicines, and other treatments, including blood products, into a peripheral vein (Beecham & Tackling, 2019). Peripheral line placement is the most often performed invasive treatment in acute care settings, with over 1 billion lines placed globally each year. Placing a PIVC is the most common way to enter the vascular compartment (Matthews et al., 2023). The upper limb is usually the preferred site for inserting an intravenous cannula because infusions in the lower limb carry a greater risk of thrombophlebitis and thrombosis (Guanche-Sicilia et al., 2021).

#### **2.3 Complications Related to PIVC Use**

Following arterial vascular cannulation and peripheral intravenous treatment, a number of problems may arise. Infection, phlebitis, thrombophlebitis, infiltration, hematoma, nerve injury, fluid overload, electrolyte imbalance, embolism, and

extravasations are a few of the significant side effects (Patidar, 2022). Patients inserted with PIVC were highly susceptible to having phlebitis, and the growing prevalence of phlebitis has grabbed particular attention compared to other problems (Daud et al., 2018). According to data from the Centres for Disease Control and Prevention (CDC), Malaysia (12.70%), the Philippines (10.10%), and Indonesia (9.80%) had the highest rates of phlebitis in Southeast Asia in 2017 (Nito & Wulandari, 2020). Other than that, a study regarding thrombophlebitis conducted by Tan et al. (2012) found, a 35.2% incidence of thrombophlebitis among PIVC patients in a tertiary hospital in Malaysia's central region.

#### **2.4 Care and Maintenance of PIVC**

It is generally agreed that optimal practices lessen the likelihood of such complications and might shorten hospital stays (Catarino et al., 2022). According to Ali & Inayat (2019), nurses need to receive education on cannula care and maintenance to mitigate potential risks or problems that could endanger the patient's life. First and foremost, provide patients with the necessary education and encourage them to inform the nurse about any changes at their catheter site or any new discomfort (Catarino et al., 2022). This includes reporting symptoms such as swelling, redness, tenderness, drainage, shoulder pain, or chest discomfort. Aside from that, Qamar et al. (2017) mentioned prioritising training nurses on appropriate documentation procedures for intravenous line maintenance is also essential for the safe treatment of patients with PIVC. Moreover, a study by Osti et al. (2019) found that 75.5% of nurses' awareness of the impact of environmental cleanliness on IV site infections, combined with their understanding of early risk factor detection for phlebitis, plays a vital role in preventing complications. This contributes to improved care quality, enhanced patient safety, higher patient satisfaction, reduced hospital stays, and decreased healthcare costs (Osti et al., 2019).

Along with that, apply a transparent dressing to the catheter insertion site to allow for continuous visual inspection for any signs of phlebitis (Guanche-Sicilia et al., 2021).

## **2.5 Nurses' Level of Knowledge Toward PIVC Care**

The key to building skills and shaping attitudes is knowledge. People are motivated to change their actions by knowledge Syam & Hastuti (2018). As key healthcare providers, nurses are responsible for delivering comprehensive, patient-centered care, and one of their duties as professionals is to fully understand how to prevent phlebitis (Aminullah et al., 2023). In nursing education, planning, inserting, maintaining, and handling the peripheral IV infusion line are fundamental skills. According to Patidar (2022), researcher revealed that 11% of staff nurses lacked enough understanding regarding the management and prevention of local problems resulting from peripheral intravenous therapy. Also, Lamsal & Shrestha (2019) reported findings, showing that less than half of the nurses (49.1%) had a good understanding of IV therapy, while more than half (50.9%) lacked adequate knowledge about the procedure.

In addition, a separate study has shown that in terms of overall understanding of the PIVCs, almost two-thirds, which is 68.7% of nurses, scored below satisfactory levels (Magdi El-Sayed et al., 2020). These findings are consistent with previous study, which showed that nurses in specialty units scored higher in both knowledge and practice compared to those in medical and surgical wards (Siew Eng, 2016). This indicates that not all nurses are adequately informed about PIVC care. Moreover, a study at Chitwan Medical College Teaching Hospital in Nepal assessed nurses' competence in the care and maintenance of peripheral IV cannulas. The results showed that 13.21% of nurses had incorrect knowledge, and 4.32% were unaware or had no knowledge of the proper care and handling of peripheral IV cannulas (Osti et al., 2019).

## **2.6 Nurses' Level of Practice Toward PIVC Care**

Despite having substantial knowledge and experience in PIVC care and maintenance, nurses' practices still fall short of following the established guidelines (Qamar et al., 2017). The study evaluated the knowledge and practices of nurses at Celal Bayar University Hospital regarding PIVC care and phlebitis interventions. While the findings showed that nurses had sufficient knowledge, their practices were lacking. As a result, 67.24% of patients developed signs of phlebitis, indicating poor practice standards (Qamar et al., 2017).

In addition, a study by Osti et al. (2019) in Nepal found that 14.22% of nurses did not follow proper practices in the care and maintenance of IV cannulas, and a small percentage (1.06%) lacked confidence in whether they were performing the procedures correctly. Similar findings were reported by Lamsal and Shrestha (2019), who found that around two thirds of nurses, which is 66.1% had unsatisfactory practices.

The use of transparent dressings aids in the early identification of signs and symptoms of infection (Khairunniza et al., 2019). According to Osti et al. (2019), transparent dressings provide constant device security, allow for visual assessment of the catheter site, allow patients to bathe and shower without soaking the dressing, and require fewer changes than tape dressings. However, a prior study found that 67% of nurses did not use transparent dressings in practice (Osti et al., 2019).

## **2.7 Association Between Selected Demographic Characteristics with The Level of Knowledge and Practice**

When examining nurses' knowledge and practice, demographic factors were taken into consideration. The knowledge and practice of nurses about PIVC care are greatly

influenced by demographic factors, such as years of experience and educational attainment.

### **2.7.1 Demographic Characteristics and Nurses' Level of Knowledge Toward PIVC Care**

#### **2.7.1(a) Level of Education**

Higher-educated nurses are thought to possess more theoretical knowledge, according to research, and this may result in better adherence to clinical recommendations. A study by Siew Eng (2016) suggested that nurses with a bachelor's degree in nursing reported higher knowledge and practice scores than nurses pursuing a diploma in nursing towards the care of PIC, even though the difference was statistically small.

#### **2.7.1(b) Years of Experience**

Aside from that, a study done by Arbaee & Mohd Ghazali (2016) found that nurses with the most extensive work experience had significantly better knowledge and practices in IV cannula care and maintenance. As supported by study conducted at a university hospital in Selangor, Malaysia, revealed that clinical experience significantly impacted nurses' knowledge of PIVC management and care practices. The findings indicated that as nurses gained more experience, their understanding of phlebitis risk factors and adherence to care guidelines improved (Nordin et al., 2023).

### **2.7.2 Demographic Characteristics and Nurses' Level of Practice Toward PIVC Care**

#### **2.7.2(a) Level of Education**

Higher educated nurses are more likely to provide high-quality treatment and ensure patient safety (Rahman & Don, 2015). Research conducted in South Korean hospitals revealed that nurses with higher educational qualifications had a stronger grasp

of evidence-based PIVC management, which contributed to better patient outcomes and a reduction in complication rates (Kim et al., 2024).

### **2.7.2(b) Years of Experience**

A study conducted in Indonesia by Indarwati et al. (2022) found that nurses with longer work experience reported higher levels of confidence in their PIVC skills compared to those with less work experience, suggesting that years of working experience may play an important role in caring and maintaining PIVC.

## **2.8 Theoretical and Conceptual Framework**

The Health Belief Model (HBM), developed in the early 1950s, was initially created as a thorough approach to understanding and forecasting preventive health behaviors. Anuar et al. (2020) mentioned it emphasised the connections between health behaviors, practices, and the utilisation of health services. It has been widely applied and has shown moderate success in predicting various health behaviors (Conner & Norman, 2017). Alyafei & Easton-Carr (2024) stated that there are the four main cognitive components that make up the HBM as a theoretical framework which is perceived susceptibility to illness, perceived severity of illness, perceived benefits of behavior change, and perceived barriers to action. The model explains health behaviours by considering individual beliefs and perceptions, which is critical in understanding how socio-demographic factors influence nurses' knowledge and practices.

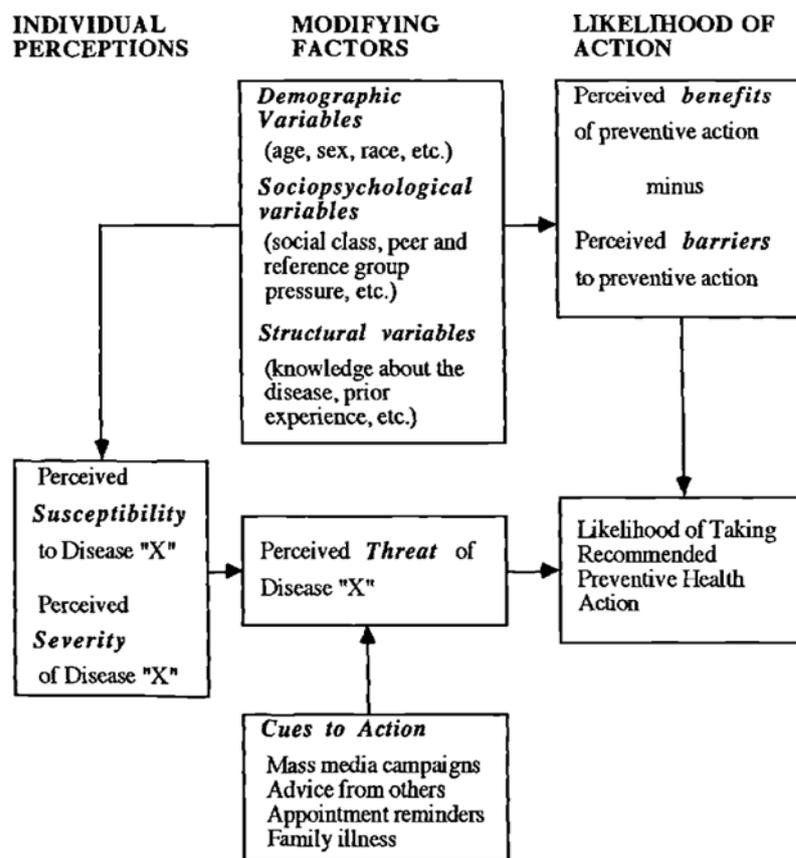


Figure 2.1 The Health Belief Model by Hochbaum, Rosenstock and Kegels (1950s)

Nurses' perceptions of their susceptibility to complications, such as infections from improper PIVC care, and how severe they believe these complications could be, play a significant role in shaping their behavior. Nurses who recognise that they or their patients are at risk due to poor PIVC care are more likely to seek out and apply the necessary knowledge. Their belief in the benefits of proper PIVC care, such as preventing complications and improving patient outcomes, also encourages adherence to best practices. The model also considers perceived barriers, such as insufficient training. This challenge may prevent nurses from practicing proper PIVC care, even when they have the required knowledge.

The Health Belief Model (HBM) helps analyse how socio-demographic factors influence nurses' perceptions, beliefs, and behaviours related to PIVC care. By using this model, the study can explore why some nurses have higher knowledge levels and better

adherence to PIVC care practices than others, providing valuable insights for developing targeted interventions to improve the quality of nursing care.

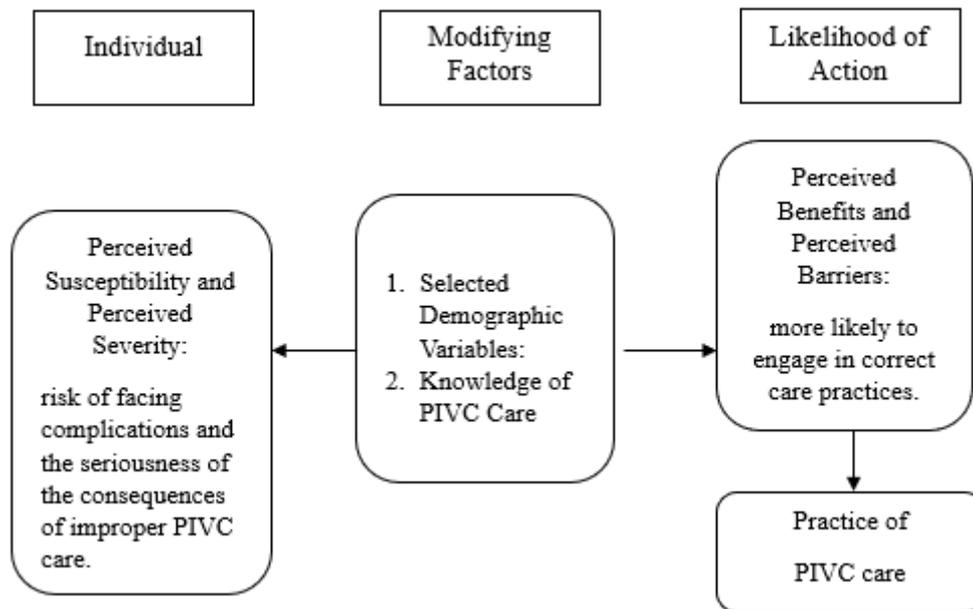


Figure 2.2 Conceptual framework of knowledge and practice toward PIVC care

## **CHAPTER 3**

### **METHODOLOGY**

#### **3.1 Introduction**

This chapter explained the approach and rationale used to support the chosen research methodology. Determining and understanding an appropriate research design was crucial for achieving the aims of the study. The chapter began with a description of a cross-sectional design and a justification for using this approach. The section was followed by a description of the study setting, population, participant selection criteria, sampling plan, sample size determination, and instrumentation, including ethical considerations right through data collection methods.

#### **3.2 Research Design**

A cross-sectional study design was applied in this study to assess the knowledge and practice of nurses regarding peripheral intravenous catheter (PIVC) care. Cross-sectional studies are those that evaluate health outcomes, determinants, and characteristics by analysing data from a population at a specific point in time (Wang & Cheng, 2020).

#### **3.3 Study Setting and Population**

The study was conducted among nurses in medical-surgical wards at Hospital Pakar Universiti Sains Malaysia (HPUSM). The medical-surgical wards included in the study were 2 Intan (male surgical), 3 Utara (female surgical), 3 Selatan (oncology), 7 Selatan and Timur (male medical), 7 Utara (female medical) and orthopedic wards (4 Selatan and Utara). PIVCs were commonly used in these wards to administer medications, fluids, and blood products to patients undergoing various treatments. In

addition, the oncology ward (3 Selatan) was included as it represented a critical area where PIVCs were frequently used for administering chemotherapy, blood transfusions, and supportive medications. Certain specialty wards under the medical-surgical category were excluded from this study, such as psychiatric wards (5 Selatan and Utara), and the pediatric ward (2 Selatan).

### **3.3.1 Sample criteria**

The sample was selected based on the nurses' direct involvement in peripheral intravenous catheter (PIVC) care as part of their routine clinical responsibilities. Inclusion and exclusion criteria were established to ensure that participants had relevant experience and exposure to PIVC procedures, allowing for the collection of accurate and meaningful data regarding their knowledge and practice.

#### **3.3.1(a) Inclusion criteria**

Eligible participants were those registered nurses who had been working in selected clinical areas at HPUSM, which included the following wards: 7 Selatan, 7 Timur, 7 Utara, 3 Selatan, 3 Utara, 2 Intan, 4 Selatan, and 4 Utara.

#### **3.3.1(b) Exclusion criteria**

Nurses were excluded from the study if they were on study leave or confinement leave during the data collection period, or if they had less than six months of working experience. Nurses who have been in clinical practice for six months or longer were deemed capable of directly caring for patients (Ying et al., 2020).

### **3.4 Sampling Plan**

A sampling plan is a comprehensive strategy that specifies the process for selecting individuals or groups (a sample) from a larger population. It outlines the

sampling method, determines the sample size, and describes the sampling procedure to ensure that the sample accurately reflects the target population.

### 3.4.1 Sample Size Estimation

The sample size was calculated for each study objective, after which the researcher compared the results and selected the largest sample size to ensure that all research objectives were thoroughly addressed.

#### Objective 1

The primary objective of this study is to identify the nurses' knowledge toward PIVC care was calculated by using a single proportion formula. The previous study reveals nurses' knowledge toward PIVC care is 2.0% (Patidar, 2022).

$$n = \left[ \frac{Z}{\Delta} \right]^2 p(1 - p)$$

Where,

n = Sample size

p = Anticipated population proportion = 0.02 (Patidar, 2022).

z = Value of standard normal distribution = 1.96

Δ = Precision = 0.05

**Calculation:**

$$n = \left[ \frac{1.96}{0.05} \right]^2 0.02(1 - 0.02)$$

$$n = 30.1$$

$$n = 30 \text{ participants}$$

After considering 10% drop out,

$$X = \frac{10}{100} \times 30$$

$$X = 3$$

$$n = 30 + 3$$

$$n = 33 \text{ participants}$$

Thus, the sample size needed for the first objective after considering a 10% drop out was 33 participants.

## Objective 2

The second objective in this study is to identify the level of practice of peripheral intravenous catheter care among nurses. The sample size for this objective was determined using a single proportion formula. According to the previous study, the nurses' level of practice toward care of PIVC access is 4.0 % (Kumar Jaiswal et al., 2024).

$$n = \left[ \frac{Z}{\Delta} \right]^2 p(1 - p)$$

Where,

n = Sample size

p = Anticipated population proportion = 0.04 (Kumar Jaiswal et al., 2024).

z = Value of standard normal distribution = 1.96

$\Delta$  = Precision = 0.05

**Calculation:**

$$n = \left[ \frac{1.96}{0.05} \right]^2 0.04(1 - 0.04)$$

$$n = 59.0$$

$$n = 59 \text{ participants}$$

After considering 10% drop out,

$$X = \frac{10}{100} \times 59$$

$$X = 5.9$$

$$X = 6$$

$$n = 6 + 59$$

$$n = 65 \text{ participants}$$

Thus, the sample size needed for the first objective after considering a 10% drop out was 65 participants.

**Objective 3**

For the third objective which is to determine the association between nurses' demographic characteristics and the level of knowledge toward PIVC care among nurses is determined by using a sample size calculator (Ariffin, 2024). A previous study by Lamsal & Shrestha (2019) found the nurses with more than 2 years of experience have adequate knowledge is 39.1% (0.39), while nurses with less than 2 years of experience have adequate knowledge is 63.5% (0.64).

**Calculation:**

**2 proportions - Hypothesis Testing**

Epidemiological study design:

Proportion of factor in non-diseased (without outcome) ( $p_0$ ):

Proportion of factor in diseased (with outcome) ( $p_1$ ):

Prevalence of disease (outcome) ( $p$ ):

Significance level ( $\alpha$ ):  Two-tailed

Power ( $1 - \beta$ ):  %

Expected dropout rate:  %

Sample size,  $n_1$  for diseased =

Sample size,  $n_0$  for non-diseased =

Sample size (with 10% dropout),  $n_{1\ drop}$  for diseased =

Sample size (with 10% dropout),  $n_{0\ drop}$  for non-diseased =

Total sample size,  $n$  =

Total sample size (with 10% dropout),  $n_{drop}$  =

Figure 3.1 Sample size calculation retrieved from (Ariffin, 2024).

Thus, the sample size needed for the third objective after considering a 10% drop out was 138 participants.

#### Objective 4

For the fourth objective which is to determine the association between nurses' demographic characteristics and the level of practice toward PIVC care among nurses is determined by using a sample size calculator (Ariffin, 2024). A previous study by Lamsal & Shrestha (2019) found the nurses with more than 2 years of experience have satisfactory experience was 57.0% (0.57), while nurses with less than 2 years of experience have satisfactory practice was 78.0% (0.78).

#### Calculation:

**2 proportions - Hypothesis Testing**

Epidemiological study design:	<input type="text" value="Cross-sectional"/>
Proportion of factor in non-diseased (without outcome) ( $p_0$ ):	<input type="text" value="0.57"/>
Proportion of factor in diseased (with outcome) ( $p_1$ ):	<input type="text" value="0.78"/>
Prevalence of disease (outcome) ( $p$ ):	<input type="text" value="0.5"/>
Significance level ( $\alpha$ ):	<input type="text" value="0.05"/> Two-tailed
Power ( $1 - \beta$ ):	<input type="text" value="75"/> %
Expected dropout rate:	<input type="text" value="10"/> %
<input type="button" value="Calculate"/> <input type="button" value="Reset"/>	
Sample size, $n_1$ for diseased =	<input type="text" value="69"/>
Sample size, $n_0$ for non-diseased =	<input type="text" value="69"/>
Sample size (with 10% dropout), $n_{1\ drop}$ for diseased =	<input type="text" value="77"/>
Sample size (with 10% dropout), $n_{0\ drop}$ for non-diseased =	<input type="text" value="77"/>
Total sample size, $n$ =	<input type="text" value="138"/>
Total sample size (with 10% dropout), $n_{drop}$ =	<input type="text" value="154"/>

Figure 3.2 Sample size calculation retrieved from (Ariffin, 2024).

Thus, the sample size needed for the fourth objective after considering a 10% dropout was 154 participants. Based on the calculations, the greatest sample size was selected in this study to ensure all the objectives could be achieved, which was 154 participants who fulfilled the inclusion and exclusion criteria for research.

### 3.4.2 Sampling Methods

The effectiveness of the sampling strategy was crucial for enhancing the representativeness of the sample and the generalizability of the study findings. This study used a convenience sampling method to recruit participants, which was a non-probability sampling technique that involved selecting individuals from the target population based on their accessibility (Golzar et al., 2022). Convenience sampling allowed for quick and simple participant recruitment, making it suitable for a busy medical setting with demanding nursing schedules. However, it may have introduced selection bias and might

not have fully represented the entire nursing population in the medical-surgical wards (Etikan et al., 2016).

### **3.5 Instrumentation**

This study utilised a self-administered questionnaire as the primary instrument for data collection. The questionnaire was adapted from existing literature and structured to align with the study objectives. It was developed to measure nurses' knowledge and practice related to peripheral intravenous catheter (PIVC) care.

#### **3.5.1 Instrument**

The instrument used in this study was a self-administered questionnaire. The knowledge and practice sections were adapted and modified from questionnaires developed by Qamar et al. (2017) and Arbaee and Mohd Ghazali (2016), with permission obtained via email. The questionnaire was revised to suit the local context and research objectives. The questionnaire focused on assessing nurses' knowledge and practice regarding peripheral intravenous catheter (PIVC) care. It was divided into three sections:

#### **Section A: Sociodemographic Information**

This section collected demographic and professional background information, including gender, level of education, and years of nursing experience. It also included the area of practice, confidence in managing PIVC care, and whether the participant had received formal training. These details helped to build a comprehensive profile of each respondent and supported the analysis of how background characteristics might influence knowledge and practice.

### **Section B: Knowledge of PIVC Care**

This section consisted of 12 items in a True/False/Don't Know format designed to assess the respondents' knowledge of PIVC care. All items were unidirectional, with "True" considered the correct answer for scoring purposes.

### **Section C: Practice of PIVC Care**

This section contained 10 items assessing nurses' self-reported practice regarding PIVC care in the medical-surgical wards of HPUSM. Responses were rated on a 5-point Likert scale ranging from "Never" to "Always," reflecting the frequency with which each practice was performed.

#### **3.5.2 Translation of instrument – if necessary**

The original version of the questionnaire was written in English. Since the research sample was made up of highly educated nurses who could converse and understand English, the questionnaire was kept in its original English language.

#### **3.5.3 Validation and reliability of instrument**

According to Ahmed and Ishtiaq (2021), reliability and validity are essential elements in evaluating the quality of any data collection method in research. Validity refers to how well the information gathered reflects the actual area of investigation, while reliability refers to the extent to which a measurement yields stable and consistent results (Taherdoost, 2016).

Prior to data collection, the questionnaire was reviewed by three experts in the field of nursing and PIVC care to ensure content validity. The reviewers were experienced nursing lecturers who evaluated the questionnaire to determine whether the items were relevant, clear, and aligned with the study objectives.