PRESSURE INJURY PREVENTION BARRIERS AND ITS ASSOCIATED FACTORS AMONG CRITICAL CARE NURSES AT TERTIARY HOSPITALS IN PERAK

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by

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LIST OF ABBREVIATIONS

CCU	Coronary Intensive Care Unit
HDU	High Dependency Unit
HRPB	Hospital Raja Permaisuri Bainun
HSM	Hospital Seri Manjung
HTPG	Hospital Taiping
ICU	Intensive Care Unit
NICU	Neonatal Intensive Care Unit
PICU	Paediatric Intensive Care Unit
PIs	Pressure Injuries
SPSS	Statistical Package for Social Sciences
USM	Universiti Sains Malaysia

LIST OF APPENDICES

HALANGAN PENCEGAHAN KECEDERAAN TEKANAN DAN FAKTOR-FAKTOR BERKAITANNYA DALAM KALANGAN JURURAWAT PENJAGAAN KRITIKAL DI HOSPITAL TERTIER DI PERAK

ABSTRAK

Pengenalan: Kecederaan tekanan *(Pressure Injuries, PI)* tetap menjadi cabaran ketara dalam persekitaran penjagaan kritikal, di mana tahap keterukan keadaan pesakit dan beban kerja adalah tinggi. Pencegahan kecedearaan tekanan merupakan tanggungjawab pelbagai disiplin, dan jururawat memainkan peranan penting di barisan hadapan. Memahami halangan dalam pencegahan PI adalah penting untuk merangka intervensi yang berkesan. Kajian ini bertujuan mengenal pasti halangan-halangan yang dirasakan dalam pencegahan kecederaan tekanan serta faktor-faktor yang berkaitan dalam kalangan jururawat penjagaan kritikal di hospital tertier di Perak, Malaysia.

Kaedah: Satu kajian keratan rentas telah dijalankan melibatkan jururawat yang bertugas di ICU, NICU, HDU, dan CCU di tiga buah hospital tertier di Perak. Data dikumpul menggunakan soal selidik yang diisi sendiri oleh responden dan telah disahkan kesahihannya. Soal selidik ini menilai halangan-halangan yang dirasakan dalam aspek seperti pengetahuan dan sikap, faktor organisasi, serta latihan. Statistik deskriptif, analisis bivariat, dan regresi logistik multivariat dijalankan menggunakan SPSS Versi 29.

Keputusan: Kajian mendapati bahawa halangan yang dirasakan adalah amat lazim. Tiga halangan utama dikenal pasti, iaitu kadar pertukaran kakitangan yang tinggi, kekurangan kerjasama daripada keluarga atau penjaga, dan ketiadaan peralatan pencegahan. Jururawat yang tidak mempunyai akses kepada garis panduan

pencegahan kecederaan tekanan melaporkan tahap halangan yang lebih tinggi secara signifikan. Selain itu, jururawat yang bertugas di unit ICU umum menghadapi bilangan halangan yang lebih tinggi berbanding jururawat di NICU, HDU dan CCU.

Kesimpulan: Usaha pencegahan kecederaan tekanan di unit penjagaan kritikal dihalang oleh pelbagai faktor sistemik dan individu. Menangani cabaran ini memerlukan strategi yang disasarkan, termasuk akses kepada garis panduan pencegahan kecederaan tekanan, dasar pengekalan kakitangan, pengukuhan latihan, serta penglibatan keluarga. Penemuan ini menekankan keperluan intervensi di peringkat institusi dan dasar untuk meningkatkan amalan pencegahan dan memperbaiki hasil keselamatan pesakit.

Kata kunci: Kecederaan tekanan; Halangan; Jururawat penjagaan kritikal. Perak

PRESSURE INJURY PREVENTION BARRIERS AND ITS ASSOCIATED FACTORS AMONG CRITICAL CARE NURSES AT TERTIARY HOSPITALS IN PERAK

ABSTRACT

Introduction: Pressure injuries (PIs) remain a significant challenge in critical care settings, where patient acuity and workload are high. Preventing PIs is a multidisciplinary responsibility, with nurses playing a crucial frontline role. Understanding the barriers to PIs prevention is vital for designing effective interventions. This study aimed to identify the perceived barriers to pressure injury prevention and their associated factors among critical care nurses at tertiary hospitals in Perak, Malaysia.

Methods: A cross-sectional study was conducted among nurses working in the critical care units of three tertiary hospitals in Perak. Data were collected using a validated self-administered questionnaire assessing perceived barriers across domains such as knowledge and attitude, organizational factors, and training. Descriptive statistics, univariate analysis, and multiple logistic regression were employed using SPSS Version 29.

Results: The study revealed that perceived barriers were highly prevalent. The top three barriers were high in-service turnover, lack of family/caregiver cooperation, and unavailability of preventive devices. Nurses who had no access to pressure injury prevention guidelines reported significantly higher barriers. Furthermore, nurses working in general ICUs perceived more barriers than those in NICU, HDU, and CCU.

Conclusion: Pressure injury prevention in critical care units is hindered by multiple systemic and individual factors. Addressing these challenges requires targeted strategies, including guideline accessibility, staff retention policies, training reinforcement, and family engagement. These findings highlight the need for institutional and policy-level interventions to enhance preventive practices and improve patient safety outcomes.

Keywords: Pressure Injury, Barriers, Critical Care Nurses, Perak

CHAPTER 1

INTRODUCTION

1.1 Understanding Pressure Injuries

1.1.1 Definition and Pathophysiology

Pressure injuries typically occur in areas where bones are close to the skin, such as the sacrum, hips, and heels. The most common site according to Ohiaeri et al*et al*., (2022) is the sacral area (61%) followed by the trochanteric area (22%). According to a systematic review by Li et al*et al*., (2020), the global prevalence of pressure injuries in hospitalized adult patients is estimated at 12.8%, with rates varying significantly by geographic region, facility type, and patient population. The same study found that among the most common injury sites were the sacrum (Oliveira et al*et al*., 2024) (Ramalho et al*et al*., 2023) and heels, which are vulnerable due to frequent contact with hospital beds or wheelchairs. Some notable injuries are categorized as Stage I or II, where skin damage remains relatively superficial. However, they can progress to Stage III or IV without timely intervention, where extensive tissue damage becomes evident.

Research has demonstrated that prolonged immobility, moisture, friction, and shear are primary contributing factors to pressure injuries. Certain patient groups, such as the elderly, those with chronic illnesses, or those recovering from surgery, are particularly at risk due to extended bed rest or limited mobility. These physical factors are compounded by individual patient vulnerabilities, such as nutritional deficiencies and impaired blood flow, which hinder the body's ability to recover from minor injuries, thus making them more susceptible to ulcer development (Otieno et al*et al*., 2023) (Karahan et al*et al*., 2018). In tropical climates, additional environmental factors

like high humidity exacerbate these risks, as moisture increases skin friction and susceptibility to breakdown.

1.1.2 Pressure injuries as patient safety issues in critical settings.

Locally, pressure injuries are a recognized patient safety issue, particularly in critical care settings where patients are at higher risk due to immobility and other factors. Although some research (Sham ~~et al~~*et al*., 2020) had been conducted on pressure injury prevalence and prevention strategies, the focus has often been limited in scope, with critical care settings frequently being neglected. These settings, including intensive care units (ICUs), are crucial due to the high vulnerability of patients, yet the number of studies dedicated to this area remains insufficient. The available research tends to concentrate on general hospital environments, which, while valuable, do not fully address the unique challenges posed by critical care patients, such as those with limited mobility, comorbidities, or prolonged periods of immobility. A report by the Malaysian Registry of Intensive Care Report (2018) shows that the incidence of pressure ulcers in Intensive Care Units in all hospitals in Malaysia was 4.0 per 1000 ICU days (Li Ling, 2018).

Moreover, prevention strategies discussed in many studies lack comprehensive insights into ICU-specific practices, where the risk of pressure injuries is higher. The high workload and limited resources in critical care settings often contribute to the occurrence of pressure injuries, making it essential to examine and address the prevention practices tailored to such environments. To ensure better patient outcomes, future research should emphasize targeted interventions in ICUs and assess their effectiveness in reducing pressure injury prevalence. This gap in research highlights

the need for more robust and specific investigations to understand and mitigate the unique risks present in critical care environments.

1.1.3 Critical Care Nurses and Barriers in Pressure Injury Prevention

Effective pressure injury prevention is hampered by some institutional, cultural, and personal variables. Healthcare professionals commonly point to institutional constraints, such as a lack of equipment and insufficient staffing as major roadblocks. These restrictions are especially noticeable in intensive care units, where patients are most vulnerable to pressure injuries, but resources are frequently overburdened. Insufficient staffing and time were identified by intensive care unit nurses as the main obstacles to adhering to pressure injury prevention guidelines (Song ~~et al~~*et al*., 2024). Although most nurses understand the value of preventative care, the pressures of critical care settings frequently lead them to put more urgent patient needs first, making pressure injury prevention a secondary concern, according to the same study.

The prevention of pressure injuries is also influenced by cultural variables in healthcare institutions. For example, preventive treatment may unintentionally become less important in healthcare systems that place a higher priority on outcomes like patient throughput and turnover. Because caregivers prioritize short-term therapeutic needs above long-term preventative efforts, this emphasis on speedy discharge may create a culture where preventive activities are disregarded. According to research by Sham ~~et al~~*et al*., (2020), nurses may be less motivated to rigorously follow preventative guidelines even in public hospitals where preventing pressure injuries is a well-known goal due to the perceived lack of support from management and administrative staff.

1.2 Problem Statement

Pressure ulcers represent a major global health challenge, affecting more than three million adults and placing a significant burden on society (Mervis and Phillips, 2019). Alarmingly, their prevalence has changed little since the 20th century, as highlighted in studies by Mervis and Phillips, (2019) and Nuru ~~et al~~*et al*., (2015). This persistent or increasing prevalence emphasizes the critical need to address the issue of pressure ulcers with the highest level of seriousness.

Malaysia is not exempt from facing this issue. Malaysian Registry of Intensive Care Report (2018) reported that, despite efforts made by the Ministry of Health to reduce the number of patients who develop hospital-acquired PIs, the number is still on the high side.

Data from the Malaysian Registry of Intensive Care (MRIC) reported a PIs incidence of 3.4 to 6.8 per 1,000 ICU days in 2017, with local variability across hospitals. This implies that pressure injuries among patients are quite common, especially in critical care settings (Cox ~~et al~~*et al*., 2022). However, these figures may be underestimated due to inconsistent documentation and reporting practices. More concerning is the lack of structured follow-up or audit mechanisms to ensure adherence to prevention protocols. In tertiary hospitals across Perak, anecdotal and institutional reports continue to flag high incidence rates, coupled with staff shortages, equipment limitations, and training inconsistencies. In critical care settings, nurses bear primary responsibility for the early identification and prevention of pressure injuries. Yet, studies in Malaysia rarely examine the perceived barriers from the nurses' perspective, particularly in intensive care units where patient acuity and workload are exceptionally high. Factors such as staff turnover, limited access to evidence-based guidelines, and competing care priorities often hinder consistent implementation of prevention

strategies (Wan ~~et al~~*et al*., 2023). The availability of care bundles for guiding critical care nurses also does not guarantee that preventive care is done adequately (Chaboyer ~~et al~~*et al*., 2016). These realities create a care gap, where the presence of protocols does not necessarily translate into practice.

1.3 Research Gap

Despite international recognition of pressure injury prevention as a patient safety priority, there is a paucity of context-specific research in Malaysia addressing the barriers faced by critical care nurses. While international studies have extensively documented the influence of organizational support, workload, and training on PI prevention practices, local evidence remains scarce, often generalized to broader hospital settings without disaggregating the challenges unique to ICUs, NICUs, HDUs, or CCUs.

Furthermore, existing Malaysian studies often focus on prevalence or knowledge-attitude-practice (KAP) assessments, but few explore the intersection between individual (experience, education) and systemic (access to resources, leadership) barriers in tertiary critical care settings. The absence of such insights makes it difficult for hospital administrators and policymakers to tailor interventions effectively.

1.4 Rationale of the study

Pressure injuries remain a persistent patient safety concern in critical care environments, both globally and in Malaysia. Despite various preventive strategies implemented by healthcare institutions, the prevalence of pressure injuries continues to burden healthcare systems, indicating underlying challenges in their prevention. In

Malaysian tertiary hospitals, especially in Perak, critical care nurses are frequently confronted with high-acuity patients, staffing constraints, and limited resources—all of which may hinder effective prevention. Prior studies have focused predominantly on general hospital settings, overlooking the unique challenges in ICUs, HDUs, and specialized units. Furthermore, limited attention has been paid to understanding the perceived barriers from the perspective of nurses and how organizational, educational, and operational factors contribute to these barriers. Identifying and analyzing these factors is essential to inform targeted interventions and institutional policies that can strengthen pressure injury prevention efforts and ultimately improve patient outcomes in critical care settings.

1.5 Research Question

1. What are the barriers that have been faced by the critical care nurses in preventing pressure injuries while working in critical care wards in tertiary hospitals in Perak?
2. How do factors such as sociodemographic factors, management and organizational structures, training and their impact contribute to these barriers?

1.6 Research Objectives

1.5.1 General Objective

To study the prevention barriers of pressure injury and its associated factors among critical care nurses in tertiary hospitals in Perak.

1.5.2 Specific Objectives

1. To determine the barriers to pressure injury prevention perceived by critical care nurses in tertiary hospitals in Perak.
2. To determine the factors associated with the high perceived barriers of PIs prevention (sociodemographic and working characteristics) among critical care nurses in tertiary hospitals in Perak.

1.7 Research Hypothesis

There are significant associated factors (sociodemographic and working characteristics) with high barriers to pressure injury prevention at tertiary hospitals among critical care nurses in Perak.

CHAPTER 2

LITERATURE REVIEW

2.1 Prevalence and Incidence of Pressure Injury

Recent systematic reviews and meta-analyses have highlighted alarming rates of pressure injuries (PIs) among hospitalized patients. A systematic review by (Michelle Barakat-Johnson et al*et al*., 2019) reported that hospital-acquired pressure injuries ranged from 5% to 53.85% in prevalence. Li et al*et al*., (2020) determined the global prevalence in hospitalized adults to be approximately 18%. This underscores the urgency of implementing effective prevention strategies. Graves et al*et al*., (2020), focusing on tropical regions, reported an incidence rate of 25%, emphasizing the influence of climatic and infrastructural variations. Besides that, the usage of medical devices was seen as a risk of developing pressure injuries (da Silva Galetto et al*et al*., 2021).

Region-specific data further supports this concern. In Malaysia, the Malaysian Registry for Intensive Care (2018) documented pressure injury rates ranging from 3.4 to 6.8 per 1000 ICU days. The prevalence of device-related PIs has also increased, particularly in ICUs where invasive monitoring is routine (da Silva Galetto et al*et al*., 2021). Similar patterns were noted in Saudi Arabia (Alshahrani et al*et al*., 2024), where longer patient stays and immobility contribute to device-related injuries. There was also a specific study done for Coronary Care Unit in South Korea where 24% of patient suffer from PIs with more than half already at stage II (Ko and Choi, 2022).

Studies in emergency departments further reflect the scope of the issue. Sardo et al*et al*., (2023) highlighted the presence of PIs in high-throughput settings such as Emergency Departments. Meanwhile, Borojeny et al*et al*., (2020) found wide incidence variability across wards, suggesting that PIs risk must be addressed based on unit-

specific needs. Paediatric studies (Marufu et alet al., 2021) revealed that up to 3.4% of patients experienced device-related pressure injuries, particularly from nasal cannulae and endotracheal tubes, underscoring the need for age-specific protocols.

In lower and middle-income countries (LMICs), limited staffing and equipment shortages contribute to under-reporting and under-recognition of PIs (Benayew, 2022). Global comparison reveals disparity in prevention resources, with high-income countries reporting better prevention compliance due to stronger infrastructure and availability of pressure-relieving devices.

2.2 Role of Critical Care Nursing in Prevention of Pressure Injuries

Critical care nurses are central to PI prevention, serving as the primary agents of monitoring and intervention in high-risk settings. In ICUs, where patients often require sedation and are immobile, nurses are responsible for early detection of skin compromise, executing repositioning schedules, and utilizing support surfaces. According to Al-Qudimat et alet al., (2024) the use of bundled care protocols significantly improves outcomes when consistently implemented. Despite their awareness, gaps in knowledge and inconsistent practice remain problematic. (Li et alet al., 2023) found nurses performed below expectations in assessments on skin care, PIs staging, and risk evaluation tools. This was also seen in a study in Thailand where ICU nurses had low knowledge score in PIs prevention (Hu et alet al., 2021). In Singapore, a qualitative study in 2024 revealed that even highly trained nurses were unable to perform preventive procedures when institutional workflows did not support it (Sim et alet al., 2024). Similar sentiments were observed in Qatar, where nurses reported lacking time and support despite formal training (Mostafa et alet al., 2024).

The role of nurses also varies based on ICU type. For example, NICU nurses often have specialized training in handling neonatal skin integrity, while CCU nurses focus more on hemodynamic stability. In NICUs, studies have shown lower perceived barriers due to structured neonatal care bundles (Mostafa et al*et al*., 2024). Conversely, general ICUs often face unpredictable acuity levels and higher nurse-to-patient ratios, limiting consistent prevention efforts (Coyer et al*et al*., 2019). International guidelines recommend interdisciplinary approaches, yet in many institutions, the burden of prevention still falls heavily on nursing staff. This reality calls for clearer delegation and institutional accountability for PIs prevention. A review Castelino et al*et al*., (2024) suggests that nurses play an important role in applying multiple approaches for the prevention of pressure ulcers.

2.3 Associated Factors of Barriers to PIs Prevention: Sociodemographic of Nursing Staff

Nurses' demographic and professional characteristics influence how they perceive and manage barriers to PI prevention. Studies consistently show that older, more experienced nurses tend to report lower barriers due to accumulated knowledge and clinical familiarity. Jiang et al*et al*., (2020), Benayew, (2022) and Liang et al*et al*., 2024) confirmed that clinical exposure correlates positively with preventive performance.

Education level also plays a role. In Turkey, Aydin et al*et al*., (2019) observed that nurses with postgraduate qualifications exhibited greater confidence and better adherence to evidence-based practices. Similar findings were echoed in Klang Valley(Sham et al*et al*., 2020) and Ethiopia (Nuru et al*et al*., 2015), where diploma

holders reported difficulties in understanding and implementing clinical guidelines without supervision. Besides that, nurses with higher education level will have better adherence to protocol or guideline (Alalawneh ~~et al~~*et al*., 2025).

Research on the influence of gender in pressure injury prevention among nurses has yielded mixed findings, though many studies indicate gender is not a major determinant of practice quality. Several studies found no statistically significant association between gender and nurses' knowledge, attitude, or performance in PIs prevention. For example, a study in China by Liu ~~et al~~*et al*., (2024) concluded that gender did not influence knowledge or practice scores among ICU nurses, suggesting that other factors such as training and experience were more predictive. Similarly, in a Malaysian study by Sham ~~et al~~*et al*., (2020), gender was not significantly associated with perceived barriers to PIs prevention. The authors emphasized that workplace training, experience level, and unit type were more influential.

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2.4 Associated Factors of Barriers to PI Prevention (Working Characteristics) : Organization and Management.

Organizational structure has a significant impact on PI prevention. Studies have identified staff shortages, inconsistent policy enforcement, and equipment unavailability as dominant barriers. According to Cesca ~~et al~~*et al*., (2024) lack of institutional leadership and inconsistent workflow integration impede sustainable prevention practices.

Availability of equipment plays a critical role in pressure injury prevention, particularly in high-risk hospital units such as intensive care. Numerous studies have highlighted how the lack of pressure-relieving devices, such as specialized mattresses,

cushions, and skin care products, significantly hinders the effective implementation of PIs prevention strategies. Studies in Austria and Hungary, where national survey reported that inconsistent access to essential devices and inadequate budg~~et al~~*et al*location for pressure ulcer-related infrastructure negatively affected clinical outcomes (Coventry ~~et al~~*et al*., 2024), (Cseh ~~et al~~*et al*., 2024). Similar findings were echoed in Canada, where organizational support for evidence-based PIs prevention was closely tied to the availability and accessibility of equipment, suggesting that even with motivated staff, outcomes could not improve without structural resources (Suva ~~et al~~*et al*., 2018). These studies collectively reinforce that without the proper tools, even well-trained and dedicated staff are unable to implement best practices effectively. Therefore, improving equipment availability should be seen not merely as a logistical issue but as a central pillar of any hospital-based PIs prevention strategy.

Years of nursing experience can significantly influence pressure injury prevention outcomes. Nuru ~~et al~~*et al*., (2015) found Ethiopian nurses with over a decade of experience had significantly greater prevention knowledge than those with fewer years, aligning with observations in Turkey(Aydin ~~et al~~*et al*., 2019). Similarly, Benayew, (2022) identified longer work experience as an independent predictor of nurses' PIs prevention. Azhar ~~et al~~*et al*., (2022) reported that Malaysian critical care nurses with more experience exhibited more confident, positive attitudes toward pressure injury prevention. Conversely, limited experience is associated with gaps in prevention: in India, Sawant and Shinde, (2015) noted, 84% of nurses surveyed had under five years' experience, and a lack of clinical experience has been cited as a barrier to effective PIs prevention implementation, as novice nurses may lack practical knowledge, decision-making, and confidence compared to senior nurses. In Malaysia, family members are often involved in bedside care, and nurses' ability to collaborate

with caregivers varies with their interpersonal skills and experience level. Studies in Indonesia and Ethiopia support this, identifying family resistance as a perceived barrier among less experienced nurses (Dilie and Mengistu, 2015), (Sari ~~et al~~*et al*., 2023).

Adult ICUs often feature high-acuity patients and heavy nursing workloads, which can make skin integrity care a lower priority (Coyer ~~et al~~*et al*., 2019) and create time pressures that hinder timely interventions (Tayyib ~~et al~~*et al*., 2016). CCU nurses likewise face resource and time constraints, where an Iraqi study found generally adequate prevention practices but significant perceived barriers limiting care (Majeed ~~et al~~*et al*., 2024). NICU/PICU nurses care for fragile patients with multiple medical devices, requiring specialized vigilance, where a Saudi paediatric ICU survey reported that while ~75% of nurses performed regular risk assessments and developed prevention plans, 76% also cited staffing shortages and time pressures as major barriers. Education and support are critical, where frequent training improved Chinese ICU nurses' PIs prevention knowledge and attitudes (Jiang ~~et al~~*et al*., 2020), and Malaysian data identified heavy workload and understaffing as key obstacles despite high nurse knowledge levels (Sham ~~et al~~*et al*., 2020). Collectively, these studies show that factors like patient acuity, time availability, and targeted training markedly influence nurses' PIs prevention practices across ICU, CCU, NICU, and PICU settings.

Research has quantitatively linked long weekly hours and overtime with factors that undermine pressure injury prevention. Fatigue and performance decrements set in when nurses exceed safe work hour limits. In a cross-sectional study of hospital nurses in South Korea, most nurses worked over 40 hours per week, and the study found that working overtime had the strongest association with adverse nurse outcomes (β=0.202, p<0.001)(Son ~~et al~~*et al*., 2019). Notably, excessive overtime was associated with higher incidences of patient safety events, including pressure ulcers. When nurses are stretched

beyond normal hours, they may not be able to consistently perform preventive interventions, leading to more pressure injuries. In practical terms, a fatigued nurse near the end of a 12–16 hour shift may skip or delay repositioning a patient due to exhaustion or lack of time. Over a week of >50 hours, these small lapses can accumulate, creating a perception that preventive protocols are difficult to adhere to under current workloads. These findings suggest that working beyond roughly 40–50 hours per week (or >12-hour shifts) can significantly impair nurses' ability to prevent pressure injuries, likely because of fatigue and reduced vigilance.

A cross-sectional survey in Addis Ababa found that an inadequate nurse-to-patient ratio was a significant barrier to pressure ulcer prevention. 67.9% of nurses identified a "disproportionate" nurse–patient ratio as a hindrance to prevention efforts (Dilie and Mengistu, 2015). A recent study of neonatal and paediatric ICU nurses in Saudi Arabia noted that heavy workload and high nurse-to-patient ratios were major hindrances to pressure ulcer prevention (Mostafa ~~et al~~*et al*., 2024). In a recent Egyptian study, the average nurse-to-patient ratio across ICU shifts was found to be approximately 2.10 ± 0.59, indicating that ICU nurses were typically responsible for caring for more than two patients per shift. The researchers suggested that such staffing levels could compromise nurses' ability to effectively manage critically unstable or ventilated patients. Moreover, this workload may contribute to increased job dissatisfaction, higher burnout levels, and a greater intention among nurses to leave their positions.(Adel ~~et al~~*et al*., 2024)

Effective leadership is also vital. In a Canadian study, nurses felt empowered when supported by supervisors who actively monitored preventive care. Conversely, where leadership was passive, prevention efforts were sporadic (Cesca ~~et al~~*et al*., 2024). A systematic review by Suva ~~et al~~*et al*., (2018) found a strong correlation between

certification and better practice of PIs prevention. Hence, leadership training in nursing administration could indirectly reduce PIs prevalence by improving staff morale and adherence.

2.5 Associated Factors of Barriers to PI Prevention (Working Characteristics) : Training and its impact

Training is crucial in preparing nurses to overcome barriers. Yet, the type, frequency, and relevance of training all influence its effectiveness. Sardari et al*et al*., (2019) found that ongoing in-service education improved knowledge retention and practical application. Similarly, Aydin et al*et al*., (2019) and Kurtgöz and Koç, (2024)showed that regularly updating knowledge through training can help reduce barriers among the nurses. Lack of hands-on practical sessions was also a barrier to the prevention of pressure injury (Team et al*et al*., 2024). Besides that awareness on the availability of specific guideline also is a factor that play a role in the practice of pressure injury prevention among critical care nurses.

In Hungary (Cseh et al*et al*., 2024) and Singapore(Sim et al*et al*., 2024) research emphasized the need for visible and user-friendly guidelines that are easily accessible at the bedside. Aydogan and Caliskan, (2019) conclude that hospitals must bolster nurse education and administrative support to overcome these barriers, implementing ongoing training, clear prevention protocols, adequate staffing, and better resource allocation. In many developing countries, even where guidelines exist, nurses report not using them due to workload or lack of awareness. Lopez-Franco et al*et al*., (2020) proposed a tool to assess these organizational gaps, aiding in planning targeted interventions. A study

in Brazil (Souza ~~et al~~*et al*., 2020) reported that there was difficulty in sustaining continuous education for the nurses, as it was costly.

Previous experience in managing patients with pressure injuries can influence how nurses perceive barriers to prevention, though the direction of this relationship varies across studies. In Indonesia, nurses who had more than five years of experience or prior exposure to PIs management were nearly twice as likely to report high perceived barriers, possibly due to increased awareness of practice gaps and institutional limitations (Sari ~~et al~~*et al*., 2023). This suggests that familiarity with clinical challenges may heighten sensitivity to systemic constraints, such as a lack of equipment or staffing. Conversely, findings from a study in Iraq indicated that nurses with more experience managing PIs cases perceived fewer barriers, as their exposure contributed to higher confidence, skill proficiency, and better integration of preventive measures into routine practice (Majeed ~~et al~~*et al*., 2024). Similarly, research in Klang, Malaysia, reported that nurses with more experience handling pressure injury patients exhibited better attitudes and stronger motivation toward prevention, implying that direct experience may foster practical readiness and reduce perceived challenges (Sham ~~et al~~*et al*., 2020). These variations indicate that the effect of prior PIs experience on perceived barriers may depend on contextual factors such as institutional support, training reinforcement, and workload intensity.

Globally, institutions that achieved sustained prevention success, such as in Australia (Wan ~~et al~~*et al*., 2023) and Qatar (Al-Qudimat ~~et al~~*et al*., 2024), combined training with clear protocols, feedback loops, and leadership accountability. This comprehensive model represents best practice and should be adopted where feasible. In this modern era, utilizing the online platform as a learning platform had been a choice for gaining new and updated knowledge. However, a study by Bredesen ~~et al~~*et al*.,

(2016) regarding the impact of e-learning on the practice of pressure ulcer evaluation does not show long-term positive outcome toward the knowledge and practice among the nurses.

2.6 Theoretical and Conceptual Framework

2.6.1 Theoretical Framework

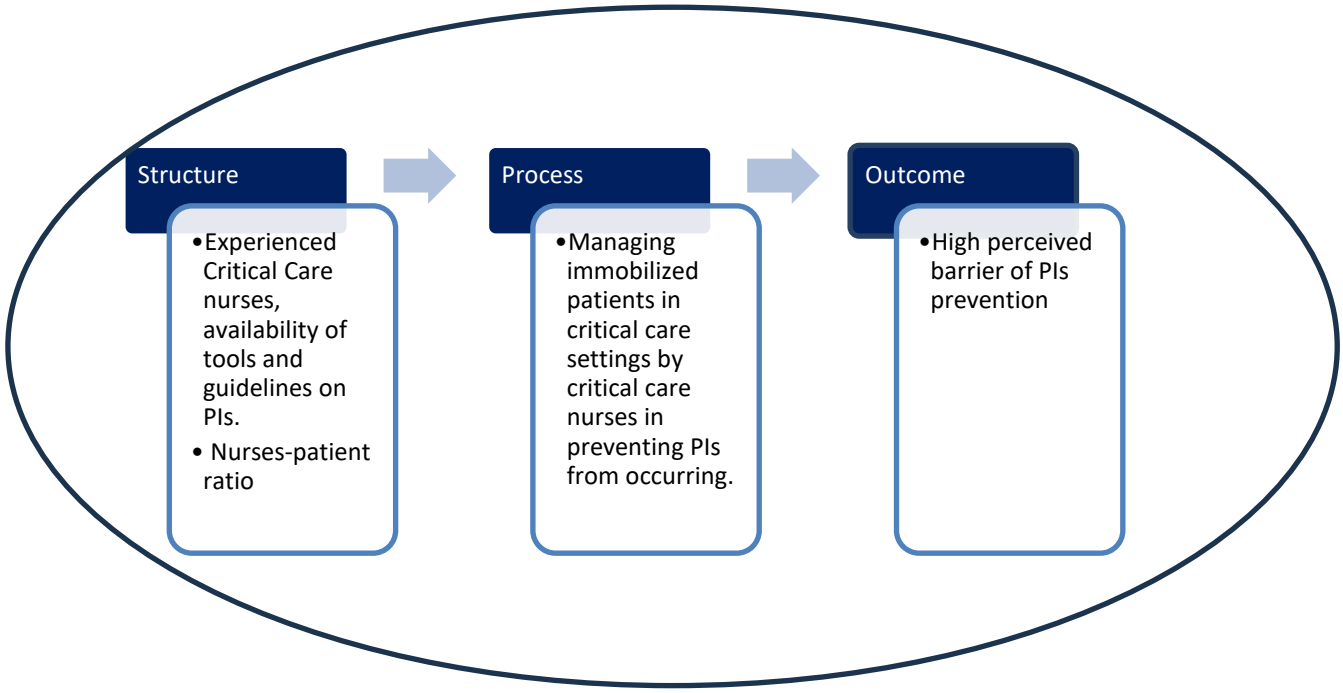

Figure 2.11 Theoretical Framework - Donabedian's Quality of Care Model

According to the Donabedian's Quality of Care Model (Figure 2.1), this theory provides a solid framework for understanding the intricate nature of the challenges influencing the use of pressure injury prevention strategies in critical care settings. Donabedian's model, a widely used paradigm for assessing healthcare quality, separates quality treatment into three primary categories: method, result, and structure. In terms of the occurrence of pressure injuries, this model will be used as a reference for examining how clinical practices (like nurse training and the use of preventative strategies) and institutional structures (like staffing levels, management support, and resource availability) affect patient outcomes.

2.6.2 Conceptual Framework

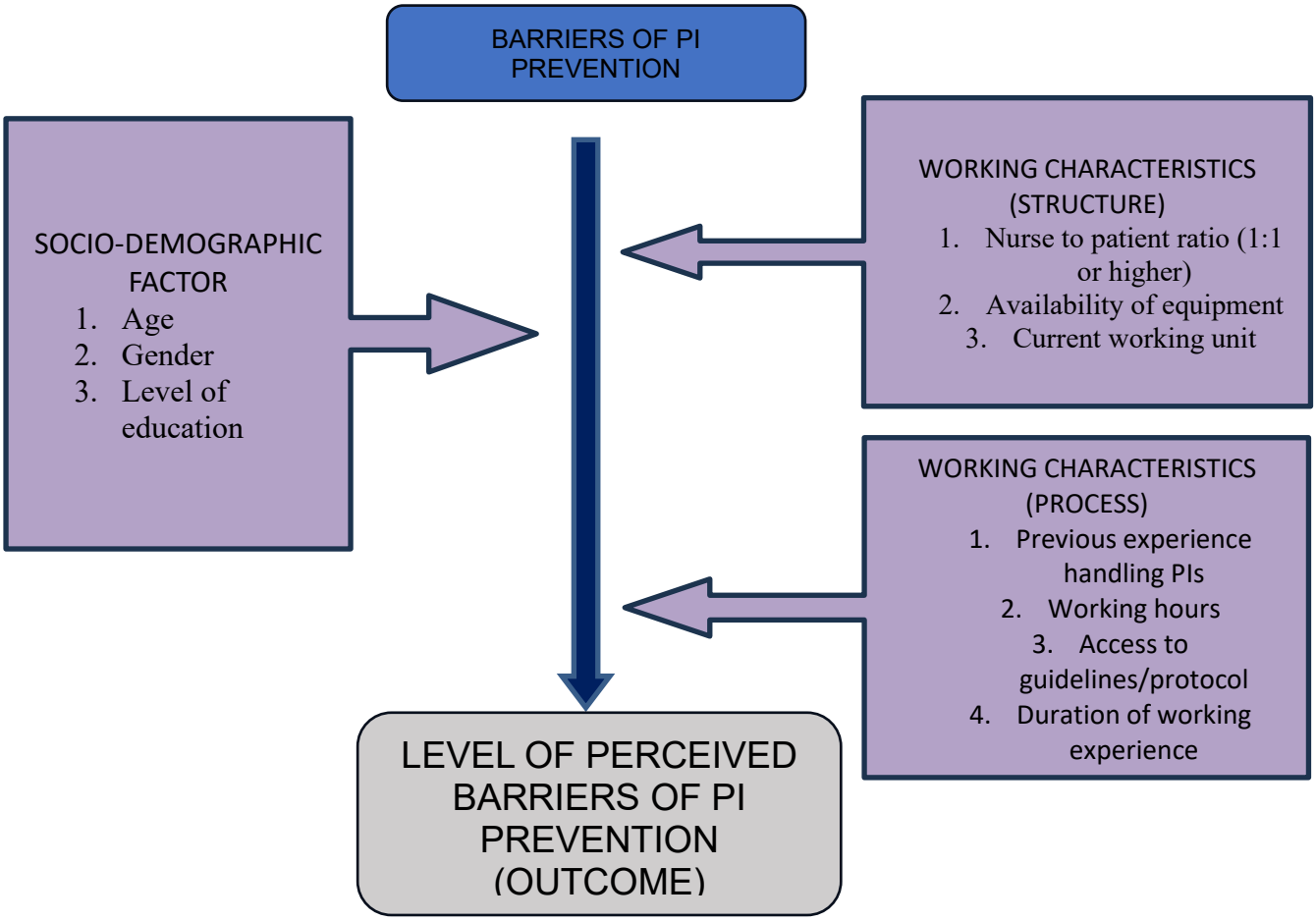

Figure 222.2 The conceptual framework of pressure injury prevention barriers among critical care nurses at tertiary hospitals in Perak

The elements affecting healthcare practitioners' perceptions of obstacles to pressure injury (PI) prevention are depicted in this conceptual framework. These components are divided into two primary categories under the framework: work-related factors and sociodemographic factors. Age, gender, and educational attainment are examples of sociodemographic characteristics. These factors influence how healthcare professionals view and handle PI prevention, indicating that specific demographic traits may influence how they view and apply preventive measures.

Conversely, work-related factors cover a range of elements of the healthcare workplace, including length of experience, and equipment availability. The nurse-patient ratio (either 1:1 or higher), weekly hours spent, and prior experience with PIs patients are also seen as significant factors. These elements work together to influence how hurdles to PIs prevention are viewed, and when deficiencies or difficulties exist in these areas, the impression of barriers is elevated. In order to successfully lower perceived barriers and improve PIs prevention initiatives among healthcare workers, this paradigm emphasizes the necessity of focused interventions that address both personal and work-related factors.

CHAPTER 3

METHODOLOGY

3.1 Study design

A cross-sectional study was conducted using primary data among critical care nurses in tertiary hospitals in Perak.

3.2 Study area

The study was conducted at three tertiary hospitals in Perak, namely:

i. Hospital Raja Permaisuri Bainun, Ipoh, Perak

ii. Hospital Taiping, Perak.

iii. Hospital Seri Manjung, Perak.

3.3 Study population

3.3.1 Reference population

The reference population was registered critical care nurses in Perak.

3.3.2 Source population

The source population for the study was the registered critical care nurses working at tertiary hospitals in Perak.

3.3.3 Sampling population

The sampling population for the study was the registered critical care nurses working at tertiary hospitals in Perak who fulfilled the study criteria.

3.4 Subject criteria

Registered nurses that fulfilled the study criteria.

Inclusion criteria:

i. Working in ICU/HDU/CCU/PICU/NICU

ii. At least one month experience working in either of those ward

iii. Malaysian Citizen

Exclusion criteria:

i. Nurses on long leave and not available during survey.

ii. Non permanent posting such as nursing students.

3.5 Sample size estimation

The sample size calculation based on the study objectives as follow:

3.5.1 Sample Size Calculation (Objective 1)

For specific objective 1, a formula was used to compute the sample size for prevention barriers of pressure injury among critical care nurses in tertiary government hospitals in Perak. The study's power was established at 80% and Zα = 1.96, for d = 0.05 (95% CI), whereas the standard deviation (SD) for a perceived barrier for prevention of pressure injury from a study by Sari ~~et al~~*et al*., (2023). The sample size was determined as follows:

$$n = \frac{Z^2 \times p \times (1-p)}{d^2}$$

Where:

- **n** = required sample size.
- **Z** = Z-value (standard normal distribution value that corresponds to the desired confidence level :1.96 for 95% confidence).
- **p** = estimated prevalence or proportion of nurses who face a specific barrier
- **d** = margin of error or precision

Table 3.11 Sample Size Calculation (Objective 1)

Variable	P*	d	n	n + 10% dropout	Literature Review
Perceived Barriers of PI prevention	**0.48**	**0.06**	**266**	**295**	**Sari et al., 2023***
P = According to the study, the most significant barriers of PIs prevention is lack of preventive devices (such as special mattresses, cushions, and skin care products) = 48.2% **d = Estimate the precision of the study = 6%** **Total n = 266/ (1-0.1) = 295**					

Hence, the calculated sample size needed for objective 1 is 295.

3.5.2 Sample Size Calculation (Objective 2)

For objective 2, PS Software was was used to estimate the sample size using two proportions formula with:

- **m** = ratio unexposed/exposed = 1
- **α** = 0.05
- **Power** = 0.80

Table 3.222 Sample Size Calculation (Objective 2)

Variables	**α**	**Power**	**m**	**P0**	**P1***	**n**	**Sample Size (2n+10% dropout)**	**Literature**
Access to literature	0.05	0.8	1	0.4	0.55	173	384	Benayew. M., 2022*
P0 = Estimates proportion of nurses who have good access to literature that have a high perceived barrier to pressure injury prevention P1 = Proportion of nurses who have poor access to literature leads to high perceived barriers for PI prevention (Benayew, 2022)								
Duration of Working experience	0.05	0.8	1	0.45	0.65	96	213	Azhar ~~et al~~*et al.*, 2023
P0 = Estimates proportion of nurses who have longer duration of work experience that have a high perceived barrier to pressure injury prevention P1 = Proportion of nurses who have shorter duration of work experience leads to high perceived barriers for PI prevention (Azhar ~~et al~~*et al.*, 2022)								
Access to equipment	0.05	0.8	1	0.35	0.54	106	235	Dilie ~~et al~~*et al.*, 2015
P0 = Estimates proportion of nurses who have good access to equipment that have a high perceived barrier to pressure injury prevention P1 = Proportion of nurses who have poor access to equipment leads to high perceived barriers for PI prevention (Dilie and Mengistu, 2015)								

In conclusion, based on the above calculation, the largest sample size needed to accomplish the objectives of the study was obtained from the calculation in objective 2, which was 173, with the additional assumption of a 10% dropout rate, the final total number of samples required was 384. A sample size of 384 patients is considered optimum to be able to answer all research questions.