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AWARENESS OF STANDARD OPERATING PROCEDURE COMPLIANCE AND NEEDLESTICK INJURIES PREVENTIVE PRACTICES AMONG PARAMEDIC TRAINEES

MOHD SHAHRUL AZWA BIN RAMLI

Universiti Utara Malaysia

MASTER OF SCIENCE

(OCCUPATIONAL SAFETY AND HEALTH MANAGEMENT)

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MOHD SHAHRUL AZWA BIN RAMLI

Universiti Utara Malaysia

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Universiti Utara Malaysia

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ABSTRACT

Needle stick injuries (NSIs) represent a significant occupational hazard for paramedic trainees, increasing the risk of blood-borne infections. This study investigated the occurrence of NSIs and the impact of, compliance to standard operating procedures (SOPs), and preventive practices on the occurrence of NSIs among final- year paramedic trainees at public health institutions in Perak. The research employs a quantitative approach using structured questionnaires distributed to 151 trainees, with a 100% response rate. The study cohort comprised 68 Medical Assistant trainees and 83 Nursing trainees. Inferential statistical tests, including Chi-Square, Binary Logistic Regression, and Pearson correlation, were conducted using SPSS 27.0. Descriptive analysis revealed variations in NSI occurrence between programs, with the Medical Assistant Program reporting a slightly higher mean occurrence (1.85) than the Nursing Program (1.76). Standard deviation analysis indicated greater variability in NSI experiences among nursing trainees (0.430) than medical assistant trainees (0.357). The inferential statistical tests demonstrated compliance to SOP exhibited a strong correlation with NSI incidence ($p = 0.000$), underscoring its critical role in risk reduction. Additionally, prevention practices significantly influenced the occurrence of NSIs ($p = 0.001$), highlighting the importance of preventive measures. These results emphasize the need to enhance compliance to SOP and foster a robust safety culture to minimize NSI risks. The findings provide valuable insights for training institutions and healthcare policymakers to develop targeted interventions aimed at reducing NSIs among paramedic trainees. Future research should explore intervention strategies to mitigate risks and improve compliance with safety protocols.

Keywords: Needle stick injuries, Preventive practices, Public health education institutions, Standard operating procedures

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ABSTRAK

Kecederaan akibat tusukan jarum (NSI) merupakan bahaya pekerjaan yang signifikan bagi pelatih paramedik, meningkatkan risiko jangkitan bawaan darah. Kajian ini menyiasat kejadian NSI serta kesan pematuhan terhadap Prosedur Operasi Standard (SOP) dan amalan pencegahan terhadap kejadian NSI dalam kalangan pelatih paramedik tahun akhir di institusi kesihatan awam di Perak. Penyelidikan ini menggunakan pendekatan kuantitatif dengan soal selidik berstruktur yang diedarkan kepada 151 pelatih, mencapai kadar respons 100%. Kohort kajian terdiri daripada 68 pelatih Pembantu Perubatan dan 83 pelatih Kejururawatan. Ujian statistik inferens seperti Chi-Square, Regresi Logistik Binari, dan korelasi Pearson dijalankan menggunakan SPSS 27.0. Analisis deskriptif menunjukkan variasi dalam kejadian NSI antara program, dengan Program Pembantu Perubatan mencatatkan purata kejadian yang sedikit lebih tinggi (1.85) berbanding Program Kejururawatan (1.76). Analisis sisihan piawai menunjukkan variabiliti yang lebih besar dalam pengalaman NSI dalam kalangan pelatih kejururawatan (0.430) berbanding pelatih pembantu perubatan (0.357). Ujian statistik inferens menunjukkan pematuhan terhadap SOP mempunyai korelasi yang kuat dengan kejadian NSI ($p = 0.000$), menekankan peranannya yang penting dalam pengurangan risiko. Selain itu, amalan keselamatan memberi pengaruh yang signifikan terhadap kejadian NSI ($p = 0.001$), menyoroti kepentingan langkah-langkah pencegahan. Hasil kajian ini menekankan keperluan untuk meningkatkan pematuhan terhadap SOP dan memupuk budaya keselamatan yang kukuh bagi meminimumkan risiko NSI. Penemuan ini memberikan pandangan yang berharga kepada institusi latihan dan pembuat dasar kesihatan untuk membangunkan intervensi yang disasarkan bagi mengurangkan NSI dalam kalangan pelatih paramedik. Penyelidikan masa depan perlu meneroka strategi intervensi untuk mengurangkan risiko dan meningkatkan pematuhan terhadap protokol keselamatan.

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Kata kunci: Amalan pencegahan, Institusi pendidikan kesihatan awam, Kecederaan akibat tercucuk jarum, Prosedur operasi standard.

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LIST OF ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
CDC	Centers for Disease Control and Prevention
HCW	Healthcare Workers
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HIV	Human Immunodeficiency Virus
IV	Intravenous
KKM	Ministry of Health Malaysia
NSI	Needle Stick Injury
OHS	Occupational Health and Safety
PPE	Personal Protective Equipment
SPA	Public Service Commission
SOP	Standard Operating Procedure
WHO	World Health Organization

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The implementation of occupational safety and health management in the hospital environment is manly to prevent the occurrence of accidents. As the number of patients increase, the number of hazardous conditions also rises, and the lack of adequate awareness and experience, makes coordinating occupational safety more challenging. As a result, safety within healthcare is crucial in high-risk areas of the healthcare industry to reduce the rising death rate in the country. Therefore, it is essential to develop more effective strategies for accident prevention within healthcare and to improve standard operating procedures. Thus, this chapter provides an overview of the study's background, problem statement, research questions, research objectives, significance of the study, scope, definitions of key terms, limitations of the study and dissertation structure.

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1.2 BACKGROUND OF THE STUDY

Healthcare workers (HCWs) are frequently exposed to various occupational

hazards, with needlestick injuries (NSIs) being one of the most significant and prevalent risks they face. The National Institute for Occupational Safety and Health (NIOSH) of the United States stated that needles used for hypodermics, blood collection, and connecting parts of intravenous (IV) delivery systems are the most common causes of NSIs. These injuries significantly play a significant role in the transmission of serious bloodborne diseases among healthcare professionals. (Alfulayw et al., 2021).

Some of the diseases that can be transmitted through blood include malaria, infectious mononucleosis, diphtheria, herpes, tuberculosis (TB), syphilis, and spotted fever (Yazie et al. 2019). According to the World Health Organisation (WHO), NSIs are responsible for 4.4% of HIV/AIDS infections, 39% of HCV infections, and 36.7% of HBV infections worldwide (Hosseinipalangi et al., 2022). Thus, NSIs serve as a vector for the transmission of viral infections and other organisms that cause bloodborne illnesses. Given their serious implications, it is essential to implement and enforce rigorous safety measures to minimize the occurrence of NSIs and protect healthcare workers from the risks of such infections.

The reported rate of NSIs may not accurately reflect the true incidence, and reporting such exposures are sometimes difficult for HCWs. NSIs can affect not only HCWs but also trainees during their clinical placements (Fičko et al., 2020), Despite precautions and SOPs been implemented to prevent occurrences of these injuries, NSIs continue to be prevalent, predominantly in training environments where these paramedics are required to handle sharp instruments. In Johor Bahru, for instance, the number of reported NSI cases at public health education

institutions increased from one in 2023 to two in 2024.

While the absolute number of incidents remains relatively low, this upward trend highlights a growing concern regarding occupational safety among paramedic trainees. Their training involves the use of sharp tools in emergency situations or under highly stress conditions. According to Assen (2020), suggests that the environmental context significantly influences the incidence of NSIs among medical personnel in high-acuity healthcare settings, including operating theatres (OT), emergency departments, and intensive care unit (ICU). These particular work environments are associated with a higher frequency of injuries. Furthermore, studies have shown that various factors contribute to an elevated risk of injury in these settings, including heavy workloads, understaffing, the complexity of invasive medical procedures, patients in critical condition, and high-stress levels (King & Strony, 2022).

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A study conducted by Alfulayw et al. (2021), found a high occurrence of NSIs among trainees, though they acknowledged that existing measures to minimize such injuries have not fully eliminated the risks. In Malaysia, the growing number of paramedic trainees exposed to these risks highlights the need for further research into the factors contributing to the occurrence of NSIs and the effectiveness of current safety protocols.

Building on this context, a study was conducted at public health education institutions in Perak involving paramedic trainees, including nurses and medical

assistants. The information discussed above serves as the foundation for this study, which aims to identify the factors contributing to the occurrence of NSIs among trainees.

1.3 PROBLEM STATEMENT

NSIs pose a significant occupational hazard globally, affecting millions of healthcare workers annually. The Centers for Disease Control and Prevention (1989) estimate that between 600,000 and one million needlestick injuries occur worldwide each year. These injuries are a major health concern because of the risk of transmitting infections such as hepatitis B, hepatitis C, and HIV. Various factors contribute to NSIs, including demographic characteristics, compliance to SOPs, and adherence to preventive practices. While numerous studies have examined the incidence of NSIs among HCWs, there is a notable lack of empirical research focusing on healthcare trainees, such as medical assistant and nursing students, who are also actively involved in clinical procedures (Khoshnood, Z. (2015).

Trainees may face heightened risks owing to their limited clinical experience, underdeveloped procedural skills, and inadequate familiarity with safety protocols. (Shokuhi et al., 2012). This underrepresentation creates an empirical gap, particularly within the Malaysian training context, where data on NSI prevalence among trainees remain scarce. Another crucial factor is adherence to SOPs, which are designed to guide HCWs in the safe handling of needles and sharps. Fičko et al. (2020) noted that healthcare trainees who do not follow SOPs due to reasons such as inadequate

training, time constraints, or insufficient oversight face a higher risk of NSIs. Although training institutions emphasize compliance to SOP, there is a lack of empirical evidence evaluating how well trainees adhere to these procedures during their clinical practice, especially within Malaysian institutions.

Healthcare trainees may possess a positive attitude toward prevention, but they still struggle to adhere to safety practices. Datar et al. (2022) emphasized that attitude alone does not guarantee compliance with preventive behaviors. Additionally, Keri et al. (2021) noted that excessive or improper use of personal protective equipment (PPE), such as face masks or loose gloves, can hinder safe needle handling. These findings indicate that knowledge and awareness do not always translate into safe practices. Moreover, there is a practical gap in how effectively PPE and other preventive strategies are implemented by students in real-life clinical scenarios. This gap underscores the disconnection between theoretical instruction and its application in actual practice settings (Ibrahim et al., 2021).

The persistent occurrence of NSIs highlights dangerous practices and negligence, even with the availability of safely engineered devices (SED). King and Strony (2021) identified key contributors to NSIs, such as failure to observe universal precautions and performing high-risk procedures without protection. Activities such as recapping needles, improper sharps disposal, and patient-related movements during procedures are known causes (Papadopoli et al., 2019). These risky behaviors are frequently reported by trainees who lack sufficient hands-on supervision or are exposed to high-risk procedures. This indicates a practical gap in

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implementing safe work practices among trainees who are still learning in complex clinical environments.

Supervision is another factor that affects the safety of healthcare trainees. Al Qadire et al. (2021) emphasized that inadequate supervision, poor instructor-to-student ratios, and limited clinical competence among supervisors contribute to NSIs. Insufficient oversight can lead to deviations from safety protocols, especially among students who are yet to fully develop their practical skills. Therefore, there is a gap in the quality of clinical instruction, effectiveness of supervision, and availability of institutional support to ensure the safe handling of sharps during training.

Another major concern is the underreporting of NSIs among healthcare trainees. According to Bagnasco et al. (2020), reporting rates among nursing students vary widely, from 13.1% to 62.1%. The reasons for this include fear of punishment, lack of awareness about reporting procedures, and poorly designed reporting systems. This underreporting poses a significant threat to both individual and public health, as unreported injuries may go unmanaged. This underscores the gap in reporting culture and system design within clinical training settings.

Despite the relatively low number of documented NSIs among trainees, this issue remains significant and warrants further investigation. Many students may perceive NSIs as non-critical events, failing to understand the long-term consequences, such as bloodborne infections or psychological stress. Omolara et al. (2024) emphasized that effective occupational health and safety systems are crucial for protecting healthcare workers and promoting a safe working environment.

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However, there is a theoretical and practical gap in integrating OHS. principles into student training and evaluating how these systems function at the trainee level. Therefore, this study aimed to investigate the factors contributing to the incidence of NSIs among final-year paramedic trainees at public health education institutions in Perak. It also seeks to identify the primary causes and emerging issues that can inform the development of more effective preventive strategies and safety protocols in healthcare training environments.

1.4 RESEARCH QUESTION

Below is the research question proposed for this study:

1. Is there any relationship between compliance to standard of operating procedures (SOP) and the occurrence of needle stick injuries among final-year paramedic trainees?
2. Is there any relationship between prevention practices and the occurrence of needles stick injuries among final-year paramedic trainees?

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1.5 RESEARCH OBJECTIVES

The following is a list of the study's specific objectives:

1. To determine the relationship between compliance to standard of operating procedures (SOP) and occurrence of needle stick injuries among final-year paramedic trainees.
2. To determine the relationship between the prevention practices and occurrence of needle stick injuries and among final-year paramedic trainees.

1.6 SCOPE OF THE STUDY

This study was carried out at public health education institutions in Perak. While Institute of Health Training Malaysia trains healthcare professionals in fields such as radiology, occupational therapy, pharmacy assistant, environmental health and medical laboratory technology, this focuses on nursing and medical assistant trainees. This is because these two programs use procedures involving objects like sharps or needles, such as in the administration of medications, blood sampling as well as attending directly to patients that in a risk of carrying bloodborne disease such as HIV, HBV and HCV.

The program at public health education institutions in Perak provides a diploma in collaboration with Ministry of Health Malaysia (KKM). The program allocates three years to complete six semesters to qualify as HCW. In regard to the periods of the clinical postings for each program, the period will depend on the job description on the career profession based on the training program provided. Nursing trainees in the program do clinical placements for two months every semester and medical assistant trainees do clinical placements for one and a half years. The number of trainees per semester depends on the intake from the Public Service Commission (SPA). Out of the total trainee population of 151 in final academic year of 2025, 68 are doing medical assistant training while 83 are doing nursing training.

Moreover, final semester medical assistant trainees will have more clinic hours compared to other semesters to ensure they are exposed to various specialties,

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including emergency trauma, maternity, and surgical care. Consequently, this study selects final-year trainees from the nursing and medical assistant training programs as respondents. This group is at a higher risk of exposure to NSIs.

1.7 SIGNIFICANCE OF THE STUDY

The results of this study have the potential to reduce the incidence of occupational health diseases in the KKM, particularly in the training field. The creation and enforcement of policies on NSI can shape trainees' perceptions of NSI risk throughout their careers. The Infection Control and Epidemiology Unit in the academic division of each training institution under the Ministry of Health Malaysia has responsibility for establishing guidance to prevent and manage NSIs. This is crucial for preventing complications that may result from bloodborne pathogens that are transmitted and for the treatment of psychological effects.

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Health promotion and awareness program should involve all the students in the field and not limited to nursing and medical assistant trainees who directly come into contact with the patient. Thus, the strategy for reporting NSIs incidents should be more comprehensive than previously discussed.

The outcomes of this study will contribute to a better understanding of the factors associated with NSIs among paramedic trainees. By identifying the key causes and risk factors, this study will help raise awareness among trainees about the preventive measures necessary to reduce the risk of such injuries and the potential transmission of infections.

The results of this study can be utilized to improve the existing training curriculum by incorporating evidence-based materials for preventing NSIs. This will aid in fostering safer clinical practice and reinforcing compliance with safety protocols during practical training. The ultimate goal of this study is to cultivate future healthcare professionals who are more informed and conscious of safety. Furthermore, this study establishes the groundwork for enhancing institutional policies and identifies areas where clinical supervision, safety practices, and reporting systems can be bolstered. These insights are crucial for decreasing the incidence of NSIs and ensuring a safe learning environment for healthcare trainees.

Although a significant number of NSIs involve uncontaminated needles or individuals with unknown serological status, it is alarming that many contaminated needles have tested positive for human HIV, HBV, and HCV (Yazie et al., 2019). Despite this evidence, many trainees were apprehensive to seek preventive treatment or undergo a post-exposure diagnosis. According to Bagnasco et al. (2020), between 10% and 85% of students who experienced NSIs underwent diagnostic testing, whereas the percentage of those receiving preventative treatment increased from 0% to 58%. This highlights the importance of implementing health education programs aimed at reducing NSIs and encouraging prompt actions in response to injuries.

The knowledge obtained from this research will be important in determining the frequency of NSIs and compliance to SOPs. This will allow healthcare training institutions to develop focused interventions and training programs that improve SOP among paramedic trainees.

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Long-term prevention requires a culture change in work practice, enhancing general safety knowledge and practice concerning occupational safety and health in relation to needlestick hazards and their potential psychological effects. In order to prevent further loss of lives, other factor that can lead to these kinds of injuries must be managed.

1.8 DEFINITION OF TERMS

The definition of the terminologies may provide a better understanding of the overall intention of this study and therefore described in the following sub-sections.

1.8.1 Needlestick injury

Needlestick injury is defined as a puncture wound caused by contact with a contaminated needle or sharp objects, which can lead to the transmission of infectious diseases (CDC 1997).

1.8.2 Standard operating procedure (SOP)

Standard Operating Procedure is a written protocol that outlines how a particular task must be performed within an organization (WHO 2010).

1.8.3 Preventive Practice

Prevention encompasses interventions designed to mitigate the risk of illness, decelerate its progression, and minimize resultant disability (CDC 1998).

1.9 THE ORGANISATION OF THE DISSERTATION

This dissertation is organized into five chapters. Chapter one introduces the study, covering the background, problem statement, research questions, objectives,

scope, key terms, and structure of the thesis.

Chapter two presents a literature review on the occurrence of NSIs and compliance to standard operating procedures and the relationship between the related variables and theories.

Next, chapter three outlines used to achieve the study objectives and answer the research questions detailing processes such as initial planning, data collection, and data analysis.

Chapter four reports the findings from the survey, analyzed both descriptively and inferentially. These results are presented using graphs, diagrams, and tables to clearly present the most important information.

Finally, chapter five summarizes the overall findings and discusses the results of the study, including conclusions and contributions to the field. Suggestions for future research and recommendations for improving SOP are also discussed.

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CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter provides a comprehensive review of the literature on the occurrence of NSIs and compliance to SOPs among paramedic trainees. In addition, it examined compliance to SOP, and preventive practices. Furthermore, this chapter discusses the influencing factors by exploring the relationships between variables and the theoretical frameworks that underpin these associations. These aspects were analysed in detail to provide a deeper understanding of the study's context and findings.

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2.2 OCCURRENCE OF NEEDLE STICK INJURIES

Needlestick injuries (NSIs) remain a significant occupational hazard in healthcare environments, affecting numerous healthcare workers (HCWs) worldwide. According to the Centers for Disease Control and Prevention (CDC, 2019), an estimated 600,000 to one million NSIs occur annually. These injuries can

occur when the skin is inadvertently punctured by sharp objects such as needles or through contact with blood or other bodily fluids. Such incidents not only increase the risk of infection, but also expose HCWs to dangerous bloodborne diseases, including hepatitis B (HBV), hepatitis C (HCV), and human immunodeficiency virus (HIV) (Bouya et al., 2020).

Several factors influence the risk of NSIs including demographic characteristics, job roles, and clinical experience. Al Qadire et al. (2021) emphasize that age, gender, and the extent of clinical exposure significantly affect the likelihood and severity of NSIs. Nurses, owing to their direct and frequent interactions with patients and sharp instruments, are often more exposed than doctors (Alfulayw et al., 2021). Singh et al. (2024) discovered that female HCWs were more frequently affected, representing 59.2% of the reported cases. These patterns underscore the importance of considering demographic factors when developing effective preventive strategies.

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Healthcare program trainees encounter heightened risks, particularly during clinical placement. Their limited experience, lack of confidence, and unfamiliarity with safety practices can lead to hazardous errors. Common causes of NSIs include unsafe needle handling, recapping needles, carrying exposed syringes, and improper use of personal protective equipment (PPE) (Papadopoli et al., 2019). Often, insufficient supervision and unclear guidance in real clinical settings exacerbate this risk (Al Qadire et al., 2021).

The underreporting of NSIs is a pervasive issue. Research indicates that

reporting rates vary significantly, ranging from 13.1% to 62.1%. Many students and workers opt not to report incidents because of fear, lack of knowledge, or unclear reporting systems (Bagnasco et al., 2020). These underreporting obscures the true extent of the problem and delays necessary follow-up actions or changes in practice.

Despite ongoing prevention efforts, NSIs remain a prevalent and often overlooked risk in healthcare settings. According to the European Agency for Safety and Health at Work (EU-OSHA) and CDC, hospitals in the United States report over 385,000 NSI cases annually. However, other sources suggest the number ranges from 600,000 to 800,000 each year, highlighting that many cases may go unnoticed or unreported (Öztürk 2024).

The impact of NSIs extends far beyond immediate injury. In addition, Saadeh et al. (2020), NSIs are responsible for an estimated 16,000 new cases of HCV, 66,000 of HBV, and 1,000 of HIV infection among healthcare workers. Additionally, these infections result in approximately 1,100 deaths or cases of permanent disability, underscoring the gravity of this issue and the urgent need for effective preventive measures.

Research from various countries has revealed a significant variation in the prevalence of NSIs. In Iran, Akhuleh et al. (2019) found that 81.7% of healthcare workers had encountered at least one NSI during their career. Another study from the same country indicated that 95.36% of participants had experienced NSIs, although only approximately half of them reported these incidents. These findings highlight substantial deficiencies in safety practices and reporting mechanisms, with similar

patterns observed in Saudi Arabia. Fadil et al. (2021) discovered that 19.8% of emergency department reported experiencing sharp injuries, a notably higher percentage than those in surgical or intensive care units. Other studies within the country reported NSI rates ranging from 11.57% to 22.2% (Abalkhail et al. 2022). In other regions, significant NSI rates have been recorded, such as Ghana (74%), South Korea (70.4%), and India (68.3%) (Obirikorang et al., 2019).

Nurses face the greatest risks globally. Xu et al. (2022) reported that 35% of nurses experienced NSIs, with Asia showing the highest rate at 39.7%. Gupta et al. (2019) reported the following yearly NSI rates among nurses: 69% in India, 44% in Iran, 34.8% in Saudi Arabia, and 36.9% in Pakistan. These numbers reflect nurses' everyday exposure to needles and sharp tools in their work. According to Mengistu et al. (2020), past studies have shown NSI rates ranging from 19.9% to 54.0% in a single year, with a lifetime prevalence of 64.1%. In one study involving 95 nursing professionals, 29% of the participants reported experiencing more than one NSI during their careers.

The tools most frequently associated with NSIs include syringe needles, lancets, surgical scalpels, cutting needles, broken vials, razors, and scissors (Fadil et al. 2021). These items are regularly employed in everyday medical procedures, thereby increasing the risk of accidental injury. Clinical students are particularly susceptible because of their eagerness to acquire practical skills, which sometimes prompts them to take unnecessary risks (Nawafleh et al., 2019).

Exposure to blood and other bodily fluids through sharp injuries can easily

occur during clinical practice. For instance, Ahmed et al. (2020) reported that 25.2% of healthcare students experienced at least one NSI, indicating that one in four students faced this risk during their training (Datar et al., 2022). Despite advancements in equipment and procedures, NSIs continue to be a significant concern for both HCWs and students (Yazie et al., 2019). For paramedic trainees, clinical placements offer educational opportunities, but also present real risks. Injuries sustained during training not only threaten the health of students but may also compromise patient safety (García-Gámez et al., 2020).

2.3 COMPLIANCE TO STANDARD OF PROCEDURES

A Standard Operating Procedure (SOP) is a documented set of instructions that outline how specific tasks or processes should be consistently and safely executed, adhering to professional standards. In healthcare settings, SOPs are vital for ensuring that clinical tasks, such as drug administration, needle usage, and infectious material management, are performed uniformly and safely by all staff members (WHO, 2019). The primary aim of SOPs is to promote consistency and standardisation by providing clear, step-by-step guidance that reduces variability and human errors (Shestopalova et al., 2018). Additionally, SOPs are crucial for enhancing safety, particularly in high-risk situations such as handling sharps, where non-compliance can lead to occupational injuries such as needlestick incidents (Fičko et al., 2020).

Moreover, SOPs are invaluable for training and developing competencies, especially for new staff and healthcare trainees, because they offer structured reference materials that help establish and maintain safe clinical practices.

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Furthermore, SOPs strengthen accountability and compliance by clearly defining roles and responsibilities and ensuring that healthcare workers adhere to legal, ethical, and professional standards (Rao et al., 2011). SOPs also enhance efficiency in clinical operations by minimising confusion and delays, enabling healthcare professionals to perform their duties more effectively and confidently (WHO 2010).

The Malaysian Ministry of Health released detailed guidelines to address injuries caused by needlesticks or sharp objects among healthcare workers. These guidelines are designed to minimise the risk of occupational exposure to infectious diseases, such as HIV, Hepatitis B, and Hepatitis C. The *Garis Panduan Kawalan Infeksi di Fasiliti Kesihatan Primer* details crucial first aid steps such as cleaning the affected area with soap and water and applying a waterproof dressing to the wound. It also includes flowcharts for managing incidents, emphasises the necessity of Hepatitis B vaccination for healthcare staff, and describes procedures for timely and accurate incident reporting (MOH, 2019).

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In addition, Manual Sharps Injury Surveillance offers a standardised framework for monitoring, documenting, and reporting needlestick and sharpen-related injuries. It emphasises the importance of timely reporting, structured follow-up, and use of surveillance data to guide institutional safety practices (MOH, 2020). Meanwhile, *Garis Panduan Pencegahan Kecederaan Cucuk Jarum* focuses on preventive measures such as using gloves during procedures, immediate disposal of used needles into designated sharp containers without recapping, and disinfection of contaminated areas (MOH, 2017).

Following a NSIs, HCWs are advised to allow the wound to bleed gently, wash the area with soap and water, and report the incident immediately to their supervisor or the OSH Unit. A formal risk assessment should be conducted, including screening for bloodborne infections, such as HIV, HBV, and HCV. Continued health monitoring and psychosocial support are also recommended as part of the follow-up care. These guidelines are intended to promote a safe working environment and minimise health risks by ensuring that standardised protocols are followed consistently and effectively.

While adherence to these guidelines is critical, NSIs continue to pose a substantial occupational risk, particularly for paramedic trainees. In this context, the prevention of NSIs is heavily dependent on knowledge, with research indicating that a lack of understanding regarding NSI prevention is directly linked to increased injury rates. For example, Meilawati et al. (2019) found that insufficient training in proper needle-handling techniques contributes to the continuation of unsafe practices, including needle recapping. This finding emphasises the importance of providing continuous professional education and skill enhancement to medical personnel, ensuring they have the necessary expertise to perform their duties safely.

This concern is not limited to trainees alone. Research conducted in Indonesia has demonstrated that nurses continue to experience high rates of NSIs due to poor compliance to preventive measures, particularly the practice of recapping needles using both hands (Motulo et al., 2022). Moreover, nurses are often at risk of NSIs while performing tasks such as phlebotomy, wound suturing, and intravenous therapy administration. These findings underscore the need for strict compliance to

safety protocols to minimise injury risks during medical procedures.

One of the most significant causes of these injuries is the practice of needle recapping. Assen et al. (2020) reported that syringes are the most frequently implicated instruments in NSIs, especially when HCWs use their fingers to manipulate needles during procedures like suturing and IV-line insertion. This observation highlights the necessity for enhanced training in needle-handling techniques and the development of safer needle disposal methods.

Despite these known risks, underreporting of NSIs remains a major challenge. Research indicates that 50.8% of NSIs go unreported. Recent data highlight that many NSIs occurred in ambulances (45.9%), primarily during emergency procedures (76.3%), with hollow-bore needles being the primary cause (60.7%). In 66.1% of these cases, the devices used lacked safety features. Additional risk factors were identified including the fact that over half of paramedics (52.6%) did not utilise safety-engineered devices (SEDs), 52.2% had engaged in needle recapping within the past year, 5.5% had inconsistent glove usage, and 3.4% had never undergone infection control training. Notably, the absence of infection control training significantly increased the likelihood of NSIs. While a substantial proportion of the study participants (95.6%) had been immunised against HBV, anti-HBc antibodies were detected in 7.3% of the paramedics (Gańczak et al., 2020).

Among nursing students, needle recapping is the primary cause of NSIs. However, Al Qadire et al. (2021) observed that students often sustain NSIs during routine clinical activities such as medication preparation, venipuncture, and drug

administration. Consequently, this suggests that clinical supervisors should ensure strict adherence to safety protocols among students to reduce injury risks. Additionally, nursing education programs should incorporate comprehensive safety training, with a focus on the dangers associated with needle recapping.

Cross-country comparisons further illustrate the global burden of NSIs, Alimohamadi et al. (2020) highlighted that NSIs affected 50.8% of Iranian HCWs, a figure exceeding Qatar's 20.9%, but falling short of Pakistan's 94%. The elevated rate in Iran could be partially attributed to the inclusion of less-experienced medical students in teaching hospitals, where training might be insufficient. The investigation identified three crucial factors associated with NSIs is engineering devices, organisational elements (concerning incident reporting procedures), and behavioural factors (including needle recapping and disposal methods). Among these, behavioural practices, especially recapping were found to be the most significant contributors.

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NSIs commonly occur during routine medical procedures, including drug preparation, administration, and blood collection. In support of this, Bagnasco et al. (2020) found that many NSI incidents occur from improper syringe handling, particularly when removing needle caps and disposing needles. This emphasises the need for improved procedural guidelines and consistent availability of sharps disposal containers in healthcare settings to minimise the risk of accidental injuries.

A significant obstacle in addressing NSIs is the extensive under-reporting of incidents. Xu et al. (2022) discovered that numerous HCWs, particularly students,

neglected to report NSIs because of concerns about blame or disciplinary action. These underreporting compromises the accuracy of the existing NSIs occurrence data and may prevent the implementation of effective preventive strategies. To address this issue, healthcare institutions must foster a culture of transparency that promotes the reporting of all NSI incidents, without fear of disciplinary consequences.

This focus on less-experienced individuals aligns with findings related to student populations, who are also significantly affected by NSIs. In terms of occurrence, NSIs affected 14.1% of the student population. In the preceding year, the majority (65.1%) reported a single incident, whereas 24.4% experienced two such occurrences. Notably, students displayed a relatively high level of knowledge about NSIs, achieving an average score of 64%, and generally maintained positive attitudes. However, their practices for preventing these injuries were insufficient, with a low mean score of 56.4%. A substantial proportion of students (77.4%) did not report their injuries, primarily because of concerns about potential consequences (Al-Mugheed et al., 2023).

Expanding on these contributing factors, Alimohamadi et al. (2020) highlighted that NSIs affected 50.8% of Iranian HCWs, a rate higher than Qatar's 20.9%, but falling short than Pakistan's at 94%. The elevated rate in Iran could be partially attributed to the inclusion of less-experienced medical students in teaching hospitals, where training might be insufficient. The investigation identified three crucial factors associated with NSIs which are engineering devices, organisational elements such as concerning incident reporting procedures, and behavioural factors: including needle recapping and disposal methods. Notably, behavioural aspects, particularly the

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practice of recapping needles were found to be the primary cause of these incidents.

These gaps in safe practices among students reflect broader trends observed in healthcare settings, where NSIs commonly occur during routine medical procedures. These includes drug preparation, administration, and blood collection. In support of this, Bagnasco et al. (2020) found that many NSI incidents occur from improper syringe handling, particularly when removing needle caps and disposing needles. This emphasises the need for improved procedural guidelines and consistent availability of sharps disposal containers in healthcare settings to minimise the risk of accidental injuries.

Furthermore, improper disposal of needles is also another factor that contributes to NSIs. Ishak et al. (2019) revealed that 7% of NSIs in Malaysia were linked to needles discovered in unsuitable places, such as trays or beds. This finding underscores the need for policy amendments that require sharp disposal containers to be placed near nursing stations and medical trolleys. The implementation of such policies could significantly reduce NSIs resulting from incorrect needle disposal.

Significant behavioural risk factors for NSIs have been identified as the recapping of needles, incorrect usage of PPE, and non-compliance with SOPs. These practices lead to an increased exposure to sharp objects and potential injuries. Data show that nurses are the most vulnerable group, comprising 62% of the NSIs. Blood collection accounted for the highest proportion of NSIs (26.5 %), followed by waste collection (18.3 %) (Mubarak et al., 2023).

2.4 PREVENTION PRACTISE

The Ministry of Health Malaysia (2017), describes prevention practices as a comprehensive set of infection prevention and control strategies aimed at minimising the risk of healthcare-associated infections in both patients and HCWs. These practices are outlined in 'Policies and Procedures on Infection Prevention and Control' (IPC) (KKM 2019), which promotes a layered approach that includes standard precautions, transmission-based precautions, and a hierarchy of controls. Standard precautions form the core of IPC are implemented universally in all patient care regardless of infection status. These include crucial practices, such as hand hygiene, appropriate use of PPE, safe injection techniques, proper handling and disposal of sharps, and thorough environmental cleaning.

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When standard precautions are insufficient, transmission-based precautions are used, focusing on specific modes of pathogen transmission, such as contact, droplet, or airborne transmission. These precautions may include patient isolation and enhanced PPE measures. Additionally, the hierarchy of controls recommended by the KKM encompasses environmental controls (e.g. improved ventilation and isolation rooms), administrative controls (e.g. staff training, vaccination programs, and policy enforcement), and the proper use of PPE.

According to the WHO (2023) definition of prevention, these practices are designed to lower the likelihood of disease occurrence and slow disease progression. The WHO (2023) divides prevention into two levels: primary and secondary. Primary prevention includes proactive actions to avert the onset of infection, such as

vaccinations, maintaining hygiene, and the proper use of PPE, all of which are essential to the KKM strategy. Secondary prevention emphasises early detection and intervention, with the aim of limiting the progression of infection through activities such as surveillance, prompt reporting, and strict compliance with IPC protocols. By integrating these approaches, both KKM's IPC practices and WHO's preventive strategies work towards the common objective of minimising healthcare-associated risks and ensuring a safe environment for HCWs and patients alike.

When focusing on healthcare professionals, the occurrence of infectious diseases resulting from NSIs among HCWs is a complex issue influenced by numerous factors. These include HCW immunisation rates, accessibility of protective equipment, compliance to post-exposure prophylaxis (PEP) protocols, and adherence to infection control measures. Therefore, minimising the risk of infection transmission is largely dependent on the adequate resources and the promotion of safe practices (King & Strony, 2019).

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The financial implications of NSIs further underscore the need for effective prevention. In China, the overall economic burden of NSIs among HCWs is estimated at 750 billion euros, with nurses representing approximately half of this sum at 384 billion euros. Moreover, the costs associated with NSIs can be divided into direct and indirect expenses (Zhang et al., 2020). For instance, a study conducted in Northern India revealed that each NSIs incurs costs related to subsequent laboratory testing and treatment. Notably, the initial expense per NSIs ranges from €55.17 to €122.76 (RM273.09 to RM607.66), depending on the recommended tests (Jaggi et al., 2020).

In developed countries, the decline in NSIs occurrence can be attributed to more thorough hospital-based preventative measures. These programs typically include NSIs management education, policies that discourage hazardous practices such as needle recapping, and the adoption of safer medical equipment. Additionally, support systems offering psychological and financial support to individuals affected by NSIs, along with clear PEP and post-injury care protocols, are crucial elements of these preventive strategies (Bouya, S et al. 2020).

In contrast developing regions face significant barriers to implementing these measures. For instance, a study in Sana'a, Yemen reported that 55% of laboratory staff had sustained injuries. reflecting poor adherence to CDC guidelines for preventing bloodborne pathogen transmission (CDC, 1989). In resource-limited settings, the lack of consistent guideline implementation exacerbates HCWs' vulnerability to infection

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Another significant barrier to effective prevention is the underreporting of NSIs. In particular, studies have shown that a considerable proportion of HCWs, including students, fail to report their injuries, with non-reporting rates as high as 63% to 77.4% in some cases (Xu et al., 2022). This finding highlights the need for streamlined and accessible reporting systems within health care institutions to ensure timely PEP administration and risk assessment.

The problem of underreporting extends to healthcare students. One study reported that only 31.6% reported NSIs, while 68.4% did not. Furthermore, only 43.4% of students recognised the psychological distress associated with such

incidents. This lack of knowledge is particularly worrying given the vital role of safety devices in NSI prevention practices. The low reporting rate of 31.6% among injured students suggests a widespread lack of comprehension regarding the importance of reporting NSIs, implying that many fail to understand the necessity of such reports for personal and collective safety. This misunderstanding may have led students to undervalue the gravity of NSIs and further decrease their likelihood of reporting (Janjua, S et al., 2022).

In addition to reporting systems, the implementation of safer devices and pre-exposure measures, such as HBV vaccination and PEP, significantly reduces the incidence of NSIs and is highly cost-effective (CDC 2025). However, inadequate post-exposure treatment remains a major concern, particularly in clinical settings where such protocols are not strictly compliance to unsafe practices (Kwanzaa et al., 2020).

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Adding to this challenge is the gap between theoretical knowledge and practical application Vardhini et al. (2020) reported that although 65.4% of participants had good PEP knowledge particularly among nurses (71.1%) and only 23% of nurses and 14.3% of medical assistants actually applied this knowledge in practice. This disparity reflects a critical weakness in training and institutional support.

Low reporting rates are also a critical issue, with only 10% of incidents reported to authorities. This problem is particularly severe in developing countries, where the prevalence of bloodborne diseases, such as HBV, HCV, and HIV is higher, exposing HCWs to greater risk (Gupta et al., 2019). Prompt administration of PEP

for HIV, HBV, and HCV is vital, particularly when the source is serology positive. For HIV exposure, antiretroviral treatment must be initiated within hours to minimise the risk of infection (Rahman et al., 2024).

Lastly, Mohsen et al. (2009) found that approximately half of the students demonstrated only moderate knowledge (49%) and practice (52%) concerning NSIs and infection control guidelines. This indicates that students may not fully adhere to recommended procedures, thereby increasing the risk of NSIs, which remains a significant concern. The investigation indicated that approximately two-thirds of students experienced NSIs during their clinical training, highlighting a lack of effective practices. Inadequate compliance to SOPs not only compromises students' well-being but also poses risks to patient safety, as insufficient training and poor infection control can result in the transmission of blood-borne pathogens. Ensuring that training is thorough and that safety protocols are consistently applied is essential for protecting both healthcare students and patients.

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In conclusion, the prevention practices of NSIs requires a comprehensive approach. Healthcare facilities must not only provide HCWs with essential resources, education and training, while fostering a culture that prioritises incident reporting and post-exposure management. Implementation such measures can significantly reduce the risks associated with NSIs (Alsabaani et al. 2022).

2.5 HYPOTHESES

Understanding the hypotheses concerning SOPs and prevention practices is

crucial for understanding how adherence to these protocols can lead to a reduction in the occurrence of NSI.

2.5.1 Relationship between compliance to SOPs and occurrence of needle stick injuries

A significant of paramedics (52.2%) admitted to recapping needles, a practice linked to sharp-related injuries. Approximately one in five paramedics (19.6%) experienced at least one such injury, with an average of six injuries per affected individual (range, 1:100). These incidents occurred most frequently in ambulances (45.9%) and during emergency procedures (76.3%). Hollow-bore needles were implicated in 60.7% of the injuries. Notably, 66.1% of the devices used lacked safety features. Key risk factors identified included the absence of safely engineered devices (52.6%), needle recapping (52.2%), and inconsistent glove use (5.5%). Importantly, half of all incidents (50.8%) were not reported, indicating a substantial underreporting issue (Grimmond 2019).

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Research has shown that certain medical activities, including assisting with procedures, suturing, and blood collection, pose a high risk of NSIs. Notably, 18.8% of these incidents were unreported. The main reasons for not reporting, included fear of repercussions, perceiving the injury as minor, and believing that reporting was unnecessary (Keicher et al., 2024).

Among healthcare students, underreporting also presents a significant challenge. Only 62.1% of students who experienced an NSIs documented the incident, suggesting a lack of understanding of the importance of reporting. This

inadequate documentation sustains risks and limits awareness of NSIs. Out of the 642 surveyed students, 95 (14.8%) reported having experienced an NSIs during their training, but only 59 of these incidents were reported to occupational health services, highlighting a significant problem in accurate assessment of NSIs occurrence and evaluation of the effectiveness of existing safety measures (Papadopoli et al., 2019).

In the healthcare sector, nurses (28.9%) and technicians (27.1%) were identified as the most vulnerable to NSIs. The primary cause of these incidents was improper disposal methods, accounting for 56% of the cases, while accidental injuries were responsible for 36%. Public healthcare facilities demonstrated poor disposal practices in 61.9% of the instances, compared to 48.6% in private institutions. Notably, approximately 81% of the HCWs did not report their NSIs. This underreporting trend aligns with other studies, indicating a widespread issue in documenting such incidents in the healthcare industry (Rajpal et al,2021).

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Overall, high-risk medical procedures including assisting with operations, stitching wounds, and drawing blood, frequently result in NSIs, especially when safety protocols are not followed. This underscores how non-compliance with SOPs, including the use of safety-engineered equipment and consistent glove usage, significantly increases the risk of injury. In summary, the underreporting and occurrence of NSIs among paramedics, students, and HCWs are critical issues that need addressing to enhance safety and adherence to protective measures.

2.5.2 Relationship between prevention practices and occurrence of needles stick injuries.

From February 2017 to June 2022, a study documented 136 HCWs who experienced occupational exposure due to needlestick and sharp injuries. A significant proportion (82.3%) of these incidents were considered high-risk for HIV transmission. Notably, the overall completion rate for the recommended 28 days HIV PEP regimen was remarkably low, with only 26% of HCWs finishing the course (Osoo et al., 2023).

While safety-engineered devices (SEDs) are intended to mitigate the risk of NSIs, evidence suggests that they are not entirely foolproof. SEDs were implicated in 35.0% of reported NSIs, indicating that a substantial proportion of incidents still occur despite the implementation of safety features. Sharp disposal accounted for 29.2% of all NSIs, with SEDs involved in 36.1% of these cases. This study identified several common causes of SED-related NSIs, including device malfunction, sudden patient movements during procedures, and complications during sharp disposal. Although SEDs are designed to reduce NSI risk, their effectiveness can be compromised when HCWs are distracted by unexpected patient movements. Such situations may result in improper activation of the safety devices, thereby increasing the risk of injury (Dulon et al., 2020).

A review of observational studies revealed common risk factors for NSIs among healthcare professionals. The findings suggested that many HCWs lacked adequate training in proper sharp instrument handling, which increased their risk of

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injury. Moreover, insufficient provision of PPE was frequently mentioned as a factor elevating the risk of such incidents (Nashmi et al., 2023).

These risk factors are compounded by gaps in training, as highlighted by Shirreff et al. (2019), deficiencies in educational institutions. An investigation of Canadian universities revealed that 53% of undergraduate medical education institutions lack formal training in NSI prevention practices. Furthermore, 35% of those surveyed were uncertain about the existence of protocols for reporting NSIs at their respective institutions. Research indicates that when students fail to report NSIs, they may overlook crucial early prophylaxis or treatment, which is essential for safeguarding their health and well-being (Shirreff et al. 2019).

Although most HCWs recognised the importance of starting PEP within 72 hours of exposure, a concerning 37.5% were unaware of the crucial ‘golden hour’ for initiating treatment, indicating a knowledge gap regarding optimal intervention timing. More than a third were unfamiliar with the PEP "golden hour", which is vital for preventing infection post-exposure. Despite acknowledging the importance of initiating PEP within 72 hours, unsafe practices continued, with 38.9% applying pressure or disinfectants to exposed areas and 31.6% persisting with the dangerous practice of recapping needles. Concerningly, 20% of the surveyed HCWs had not received Hepatitis B immunisation, highlighting a deficiency in preventative measures and substantial risks to both themselves and patients (Cresswell et al., 2022).

Differences in the understanding of HIV, HBV, and HCV transmission were

observed throughout different HCW categories. While medical professionals generally showed better comprehension than paramedics, HBV vaccination rates were comparable across groups (Anuradha et al., 2022). These gaps in training and adherence to best practices contribute to the broader issue of incomplete PEP compliance and knowledge deficits.

In conclusion, a strong correlation exists between the implementation of preventive measures and the incidence of NSIs among paramedics. Several crucial factors have been identified, including incomplete adherence PEP protocols, substantial gaps in understanding regarding prompt intervention, and gaps in Hepatitis B immunisation. The risk of NSIs is further worsened by hazardous practices and insufficient training in the proper handling of sharp medical instruments.

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2.6 Theory of Study

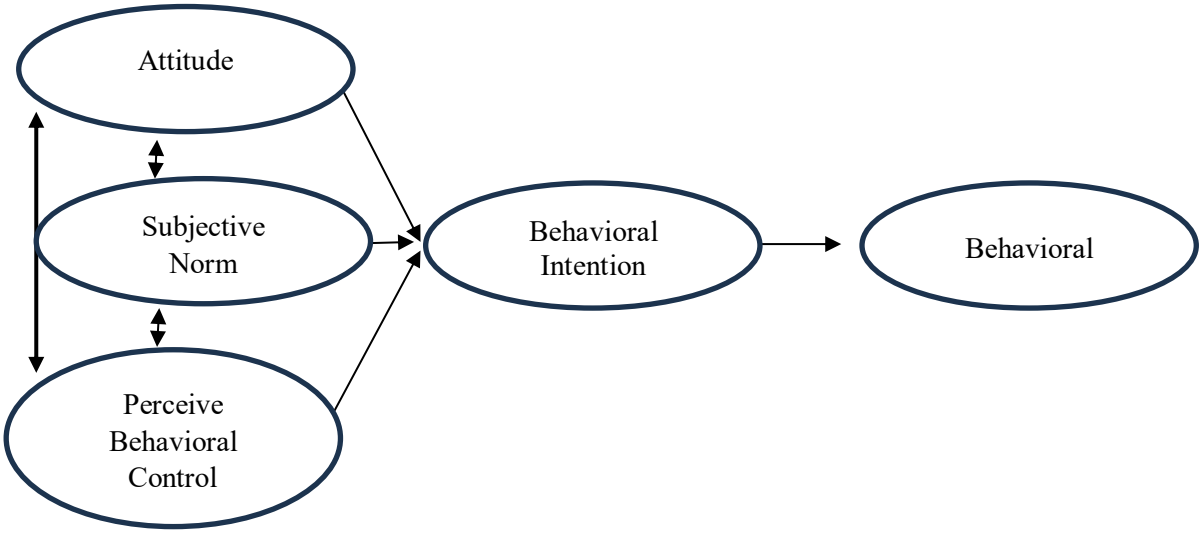

Figure 2.1:
The Theoretical Framework of study by Theory of Planned Behaviour

This study's conceptual framework, shown in Figure 2.1, is based on the Theory of Planned Behaviour (TPB). This model was selected for its ability to clarify the relationships between the research's independent variables specifically compliance to SOP, and preventive measures and also the dependent variable, which is the prevalence of NSIs. TPB provides a strong basis for understanding these interrelationships and their impact on healthcare safety (Guerin et al., 2021).

The TPB explains how healthcare practitioners' intentions and behaviours are shaped by attitudes, subjective norms, and perceived behavioural control (Ajzen, 1991). Positive attitudes towards actions, such as compliance to SOPs, increase the probability of their implementation. Perceived social and environmental pressures also affected compliance intention. Practitioners' self-assessment of their capability to perform an action, including available resources and support plays a crucial role for stronger intentions and behavioural modifications. Interventions based on TPB can address specific beliefs and barriers, such as training programs to enhance skills or modify attitudes and norms towards best practices in relation to NSIs prevention (Rollon, R. 2020).

TPB's application extends beyond individual behaviours to inform public health interventions. For example, TPB has demonstrated effectiveness in promoting preventative measures against infectious diseases, demonstrating its significance in health promotion and behavioural change initiatives. The components of TPB to identify factors that influence individuals' adoption of preventive behaviours, thereby facilitating the design of future disease prevention campaigns.

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By identifying barriers to behavioural control, such as limited access to resources or information, TPB functions as a critical instrument in public health planning and policy formulation. Policy makers can address these barriers by facilitating the provision of hand sanitisers, face masks, wearing PPE, using kidney dishes during blood specimen collection, and adhering to workplace accident standards such as NSIs. Insights obtained from TPB inform the development of proactive strategies that promote preventive behaviours prior to an outbreak, potentially mitigating its impact (Prasetya et al., 2024).

Consequently, TPB is a psychological framework that clarifies the factors influencing individuals' intentions to engage in specific actions. When applied to the study of NSIs among healthcare trainees, TPB aids in identifying elements that affect their likelihood of reporting incidents such as attitudes, social influence, and perceived control. Research shows that positive attitudes and supportive environments can significantly impact reporting behaviour (Ditching et al., 2020).

TPB was also utilised to examine NSIs at Savelugu Hospital South Africa, showing that attitudes towards safety protocols substantially influence their behaviour. When a strong safety culture and peer support are present, HCWs are more inclined to adopt appropriate techniques to prevent NSIs. However, challenges including insufficient supplies and unclear procedures may diminish their confidence in managing NSI risks (Alaru et al., 2023).

The TPB framework emphasises the necessity of addressing both psychological and institutional aspects. By focusing on compliance to SOPs, and preventative

practices, healthcare institutions can develop targeted strategies that improve NSIs reporting and prevention practices. Comprehensive education, effective policy implementation, and strategic resource allocation are vital for enhancing safety and well-being in healthcare settings.

2.7 CONCLUSION

This section outlines the fundamental information that forms the basis of the researcher's investigation. It clarifies how compliance to SOPs, and preventative practices, affect the occurrences of NSIs. Understanding these connections is crucial for identifying high risk groups and implementing targeted interventions to decrease injury rates. Moreover, the researcher included the TPB as the framework guiding this study. TPB explain that an individual's behavioural intentions are shaped by their attitudes, subjective norms, and perceived behavioural control.

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This theoretical structure significant to understanding compliance to SOP and the effectiveness of preventive strategies for reducing such injuries. This understanding is crucial for developing effective measures to enhance workplace safety and protect paramedic students and the future HCWs from preventable harm.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter outlines the research methodology and design, structured into three main sections. The first section presents the study's conceptual framework, hypotheses, and overall research design. The second section elaborates on the instruments used in the study, along with the operational definitions and sampling methods employed. The final section provides a detailed explanation of the procedures for data management and data analysis.

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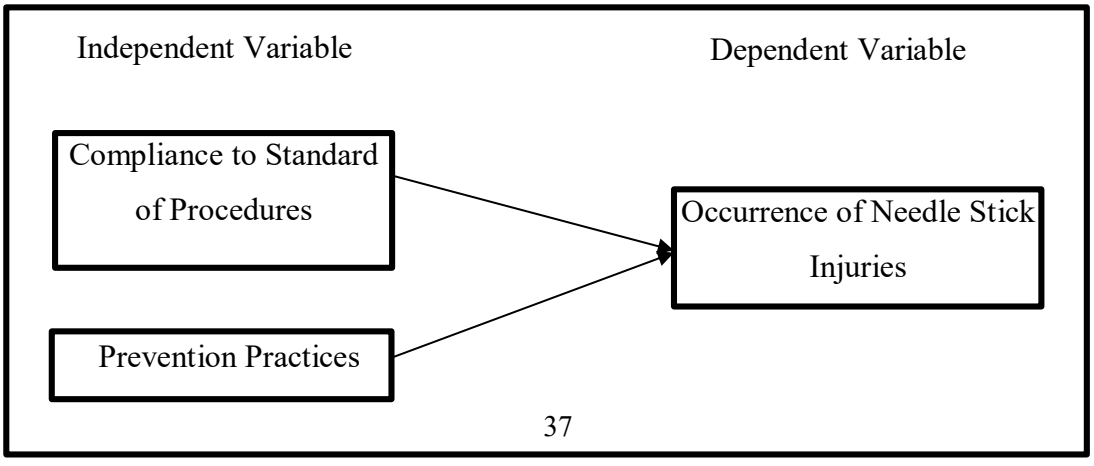
3.2 RESEARCH FRAMEWORK

Figure 3.1: *Research framework of the study.*



Based on the literature review and established research framework, it is essential to examine and analyse the relationships between these independent variables and the prevalence of NSIs among paramedic trainees. The research framework is illustrated in Figure 3.1.

According to Sekaran (2013), research design refers to a comprehensive plan that outlines the methods and procedures for collecting and analysing data. The objective of this design is to ensure that all acquired data are relevant to addressing the research problem. The research framework shown in figure 3.1 examines the relationships between the independent and dependent variables in this investigation. The independent variables included compliance to SOPs, and prevention practices. The dependent variable was the occurrence of NSIs among paramedic trainees. This framework aimed to elucidate the extent to which each independent variable interacts with and influences the occurrence of NSIs, thereby identifying the critical conditions necessary to mitigate these injuries and promote safer practices within the trainee population.

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3.2.1 Type of Research

This research followed a correlational studies approach to explore the connections between independent variables and a dependent variable. The independent variables included compliance to SOP and preventative practice. The dependent variable was the occurrence of NSIs among paramedic trainees at public health education institution in Perak. The primary objective of this study is to investigate the factors linked and potentially influence the occurrence of NSIs within

a specific group of trainees.

3.3 RESEARCH HYPOTHESIS

A hypothesis is formulated to examine the relationship between variables, constructed based on the research framework developed by the investigator or adapted from existing research. The hypothesis is also formulated to address the research questions that arise. Based on this research framework, the following hypothesis was developed:

H1: There is a significant association between compliance to standard operating procedures (SOP) and the occurrence of needlestick injuries among paramedic trainees.

H2: There is a significant association between prevention practices and the occurrence of needlestick injuries among paramedic trainees.

3.4 RESEARCH DESIGN

The research framework provides the essential structure for this study, encompassing both the dependent and independent variables. In this investigation, the dependent variable was the prevalence of NSI, while the independent variables is compliance to SOP, and preventive practices.

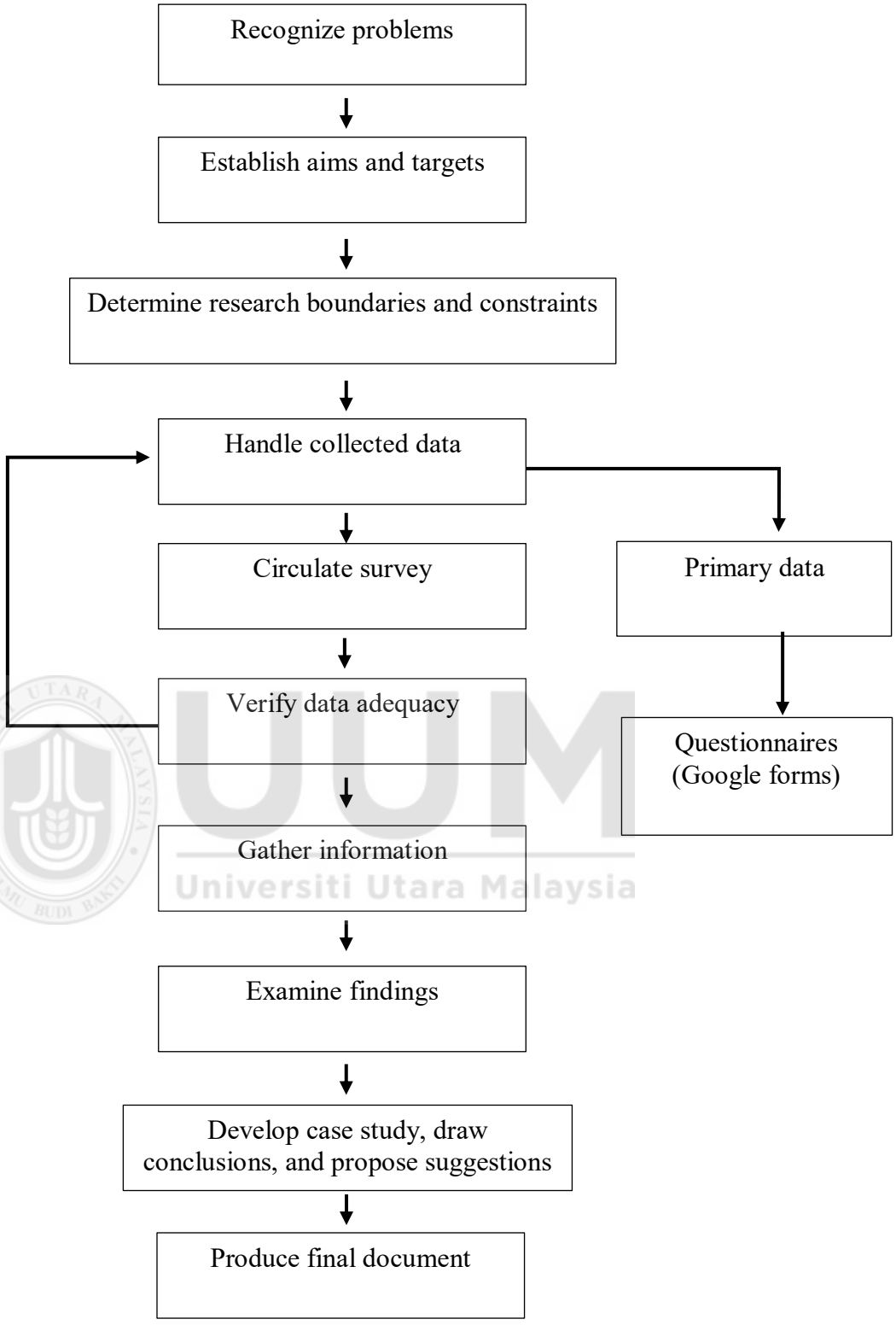

Figure 3.2*: Flowchart of the data collection process for this study*

Figure 3.2 illustrates a detailed 10-step method for gathering and analysing data aimed at fulfilling the research goals. The process begins by pinpointing the main issue of the study, which lays the groundwork for developing pertinent research questions and objectives. The subsequent step involves establishing clear research aims to steer the enquiry and determine necessary information. The scope and limitations of this study are outlined to keep the research focused and achievable within a given time and resources.

A data management system was established to maintain confidentiality and ensure the reliability of the collected information. Next, the survey tool was distributed to the participants, and questionnaires were administered online to streamline data collection. Once responses were collected, the analysis phase commenced, where the data were examined and interpreted to uncover patterns and insights relevant to the study's objectives. Based on these findings, conclusions were drawn, and suitable recommendations were made.

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The final step involved compiling the results into a comprehensive report that clearly and systematically presented the findings and implications. This organised approach ensures that each stage contributes to a deeper understanding of the factors associated with needlestick injuries and supports evidence-based conclusions.

3.5 RESEARCH INSTRUMENTS AND MEASUREMENTS

3.5.1 Research Instruments

The literature review serves as a crucial methodology for assessing the content

validity of research instruments (Creswell 2014). To establish content validity, researchers have employed thorough planning and comprehensive evaluation in the development of measurement tools. The research conducted an extensive literature review to select only validated and reliable instruments, thereby ensuring the integrity of the research methodology. The research instrument utilized in this study was a questionnaire using google forms distribute to final-year paramedic trainees at public health education institution in Perak.

The questionnaire was structured into four sections, with all items adapted from previous research studies. Section A, collected information on participants' socio-demographic details. Section B, evaluated the respondents' compliance to SOP while, section C, focused on the preventive practices implemented following the injury. Lastly, section D explores various factors related to NSIs.

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Section A:

Table 1.0: *Sociodemographic characteristics*

No	Items
1	Faculty of program:
	Faculty of Medical Assistant
	Faculty of Nursing
2	Ethnic:
	Malay
	Chinese
	Indian

		Others
3	Gender:	
		Male
		Female
4	Age:	
		20-22 years
		23-25 years
		26 years and above
5	Hepatitis B vaccination:	
		Yes
		No
6	Immunization status:	
		Complete (3 doses)
		Not complete

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Table 2.0: *Incidence of exposure according to exposure to blood and any body fluids.*

No	Items	Sources
1	Needle Stick Injury	
2	Injury caused by other sharp objects	Norsayani & Ismail
3	Mucocutaneous exposure	Nor (2003)
4	Contact through non intact skin	

Source: Norsayani & Ismail Nor (2003)

Table 3.0: *Incidence of episodes of needle stick injury according to clinical posting.*

No.	Items	Sources
1	Accident & Emergency	
2	Paediatric	
3	Medicine	Norsayani & Ismail
4	Surgical	Nor (2003)
5	Orthopaedic	
6	Obstetrics & Gynaecology	

Source: Norsayani & Ismail Nor (2003)

Section B: *Compliance to Standard Operating Procedures (SOP).*

No	Items	Sources
1	I am concerned that needle stick injuries pose a significant health risk.	
2	I am interested in learning about needle stick injury prevention and management.	
3	I think working in environments with high exposure to sharp instruments increases the risk of NSIs.	
4	I feel confident in using PPE to prevent NSIs.	Lin et al.
5	I believe that failure to comply with SOPs during procedures can negatively impact my work performance and safety.	(2022)
6	I am ready to comply with SOPs to prevent NSIs.	
7	I always ensure the proper use of personal protective equipment (PPE) when handling needles or sharps.	

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8	I believe vaccination and post exposure prophylaxis are important to reduce NSI related risk.	
9	I think that certain medical procedures involving needles pose a risk if SOPs are not strictly followed.	

Source: Lin et al. (2022)

Section C: *Prevention practices following NSIs*

No	Items	Sources
1	I am aware about post exposure prophylaxis (PEP) for HIV/AIDS.	
2	I was taught about PEP before entering hospital/ clinic.	
3	Should more emphasis be given to teaching about PEP in curriculum.	
4	All students should undergo mandatory HIV test.	
5	We can get HIV infection while working in hospital.	
6	All patients undergoing surgical procedures should be asked for mandatory HIV test.	Bakshi et al.
7	Patients with HIV infection should be treated separately.	(2015).
8	I am willing to treat HIV infected patients.	
9	PEP can reduce the chances of HIV infection among HCWs.	
10	Post exposure prophylaxis medication is available in government hospital.	

Source: Bakshi et al. (2015).

3.5.2 Variable Measurement

Chapter 2 of the literature review guided the researcher in creating multiple questionnaire items related to NSIs among paramedic trainees. Participants were requested to express their agreement level for all variables examined in the research as illustrated in Table 3.1.

A five-point Likert scale was employed to ensure the quality and reliability of the responses. This scale ranges from 1 (strongly disagree) to 5 (strongly agree), a methodology frequently used in social science research to enhance response quality and mitigate participant discomfort. The validity of the survey instrument was established through content and face validity, ensuring that the questions were clear, relevant, and aligned with the objectives of the study (Tanujaya et al., (2022)).

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Table 3.1: *Scoring scale for independent and dependent variables*

Rating	**Strongly Disagree**	**Disagree**	**Uncertain**	**Agree**	**Strongly Agree**
Score	1	2	3	4	5

This study adapts measurement items from previous research as necessary. To simplify data collection and improve participants' understanding of the terminology, all questions were written in English.

3.5.3 Instrument Development, Validity, And Reliability

The validity of the questionnaire is crucial to ensure that it accurately measures

the intended variables, thereby producing meaningful and relevant results that are aligned with the research objectives. In this study, validity refers to the questionnaire reflects the research goals and effectively captures the information required to address the research questions. As noted by Sulaiman (2005), validity is essential for accurately assessing the variables being studied and for ensuring that the instrument provides reliable data.

To ensure the content validity of the questionnaire, a comprehensive review was conducted by two expert's person, Mr. Abdullah bin Othman and Mr. Irwan bin Ismail, an educator in the Diploma in Medical and Health Sciences program at ILKKM Johor. Their feedback was instrumental in refining the questionnaire to enhance its relevance and clarity and ensure its accurate alignment with the objectives of the study. Based on their recommendations, several modifications were implemented to improve the overall quality of the questionnaire and to ensure its contextual relevance.

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Expert	Feedback	Researcher's Action
Expert 1	The instructions were explicit and precise, presenting individual tasks sequentially to maintain focus and mitigate potential confusion. Participants could readily comprehend the requirements as there were no compound questions	Include a concise definition or explanation of PEP n the survey to eliminate confusion and ensure all participants, regardless of their background knowledge, have a clear understanding.

	combining multiple inquiries. These directives are concise and avoid unnecessary language or excessively complex wording. They were meticulously crafted to adequately address the study's research problem, answer research questions, and fulfil the overall research objectives.	Rephrase the question "*I have received adequate training in using personal protective equipment (PPE) to prevent NSIs*" to "*I feel sufficiently prepared in the use of personal protective equipment (PPE) for preventing NSIs*" to enhance participant connection and involvement.
Expert 2	The questionnaire demonstrated clarity and appropriateness for utilization within the scope of the researcher's study. Overall, the question demonstrated no significant issues in capturing aspects of the research topic.	No modifications have been made.

Table 3.2: *Summary of feedback on the validity of the questionnaire*

One of the modifications included the addition of a section addressing Hepatitis B vaccination status, which provided response options such as "*Fully vaccinated (3 doses)*," "*Partially vaccinated (1–2 doses),"* and "*Not vaccinated*." These changes were used to gather more specific and relevant data. In addition, some of the languages used in the questionnaire were modified for clarity and precision. For instance, the phrase "*Feeling lazy*" was replaced with "*Perceived lack of necessity*" to employ a more formal and appropriate language. The statement "*I feel confident in*

using PPE to prevent NSIs" was revised to "*I have received adequate training in using personal protective equipment (PPE) to prevent NSIs*," reflecting a more precise and relevant expression of the intended meaning.

Further modifications were implemented in Section C, "*Compliance to Standard Operating Procedures (SOP),*" to ensure that the questions more accurately captured the participants' understanding and compliance with safety protocols. For example, the statement "*I feel confident in using PPE to prevent NSIs*" was changed to "*I believe that failure to follow SOPs during procedures can negatively affect my work performance and safety*." Similarly, "*I am aware of the SOPs for handling sharps to reduce NSI risk*" was updated to "*I always ensure the proper use of personal protective equipment (PPE) when handling needles or sharps*," and "*I think improper handling of sharps is a major contributor to NSIs*" was revised to "*I think that certain medical procedures involving needles pose a risk if SOPs are not strictly followed*."

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These modifications were implemented to enhance the clarity of the questionnaire and to ensure that it effectively captured the intended information. The alterations, guided by expert input, reinforced the validity of the instrument, ensuring that it was appropriate for the study's goals and was aligned with the specific context of the research.

3.5.4 Unit Analysis

In this study, the unit of analysis was an individual paramedic trainee. These

trainees were the primary subjects observed and analysed to understand the characteristics, behaviours, and factors influencing the occurrence of NSIs. The analysis specifically targeted final-year paramedic trainees at public health education institutions in Perak, examining how compliance to SOPs and prevention practices affects the likelihood of experiencing NSIs. The data collected from these individuals offers insights into the prevalence and factors associated with NSIs within this specific group.

3.5.5 Pilot Study

Prior to conducting the main research, a pilot study was conducted to identify and address potential issues with the questionnaire, ensuring its effectiveness in formal data collection. Pilot studies are small-scale tests that help refine research instruments and methods prior to full-scale implementation (Bujang et al., 2024). The primary objective of this pilot study was to identify any problems with the questionnaire, such as its length, readability, format, and language, and evaluate its validity and reliability. Thirty respondents were selected from a health publication institution in Johor to participate in this pilot study, as show in Table 3.3.

Table 3.3: *Instruments and Respondents for the Pilot Study*

Instruments	**Respondents**
Questionnaires (Pilot Study)	30 paramedic trainers at public health education institution in Johor

During the pilot phase, participants were requested to complete the questionnaire and provide feedback on various aspects including the time required

for completion, clarity of language, and overall structure of the survey. On average, the respondents took 20–30 minutes to complete the questionnaire. Based on their feedback, several adjustments were made to the demographic section and other parts of the questionnaire to enhance clarity and relevance. These modifications helped refine the final version of the questionnaire, ensuring better alignment with the research objectives.

Table 3.4: *Results of the Reliability Test using Cronbach's Alpha for each variable*

Variables	**Cronbach's Alpha Values**	**N**
Compliance to Standard Operating Procedures	0.807	9
Prevention practices.	0.735	7

Table 3.5: *Cronbach Alpha Coefficient Size and Strength of Relationship*

Cronbach Alpha Coefficient	**Strength of Relationship**
< 0.6	Weak
0.6 < 0.7	Moderate
0.7 < 0.8	Good
0.8 < 0.9	Very Good
0.9	Excellent

The reliability of the questionnaire was assessed using Cronbach's Alpha, which was calculated only for constructs measured with multiple items. As shown in Table 3.3, the compliance to SOP variable yielded a Cronbach's Alpha value of

0.807, indicating good internal consistency for the 9 items used. Similarly, the Prevention Practices variable achieved a Cronbach's Alpha value of 0.735, which is considered acceptable, based on the 7 items included. According to Hair et al. (2017), a Cronbach's alpha value of 0.7 or higher is generally considered acceptable, while values below 0.6 suggest poor reliability. These results confirm that the questionnaire was reliable and suitable for the main study. After the pilot study, finalized questionnaires were collected directly by the researcher to ensure a systematic process for further analysis.

This table 3.5 shows the interpretation of Cronbach Alpha coefficients, indicating the strength of the relationship based on the value of the coefficient. The reliability of the questionnaire was evaluated through a pilot study, which tested the consistency and stability of the measurements obtained from the sample (Fauzi et al., 2014). Cronbach's alpha was used to measure reliability, as shown in Table 3.5. Kerlinger (1979) states that a Cronbach's alpha value above 0.60 at a significance level of 0.05 is considered to indicate reliable measurements.

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3.6 POPULATION AND SAMPLING OF THE STUDY

3.6.1 Population

Table 3.6: *The total of participants in public health education institution in Perak was 151.*

Program	The number of trainees
Medical assistant trainees	68
Nursing trainees	83

Sources: Human Resources Unit at public health education institutions in Perak.

The population refers to the total number of objects, subjects, or members that share one or more characteristics from which data can be collected and analysed. It also represents the entire group of individuals or items that a researcher plans to investigate (Awais et al., 2015). In this study, the population consisted of final-year paramedic trainees at public health education institution in Perak. The total number of participants in this study was 151, including 68 medical assistant trainees and 83 nursing trainees.

Participants were students in their fifth and sixth semesters. This selection was made because these students are involved in clinical posting at hospitals and clinic where they encounter a higher likelihood of NSIs. In contrast, students in the first three semesters were only exposed to theoretical learning and did not expose such risks. Furthermore, hospital based clinical postings involve rotations in high-risk departments, such as emergency department, operating theatre, psychiatry ward, medical ward, and surgery ward which exposes the trainees further to the risk of NSI.

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3.6.2 Sampling of the study

Quota sampling non-probability was employed to obtain a sample from the final-year paramedic trainees a public health education institution in Perak. This technique ensured that each paramedic trainee had an equal probability of selection as a respondent to complete the questionnaire during the data collection process.

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970

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Table 3.7: *Total sample size by population*

According to Krejcie and Morgan (1970), a minimum of 148 study samples is required to represent a population of 240 individuals. The sample in this study consisted of final-year paramedic trainees in public health education institution in Perak. Through the implementation of probability quota sampling, ensuring that the sample accurately represented the target population and fulfilled the necessary criteria.

The use of non- probability quota sampling in this study offers several key benefits that enhance the research quality and credibility. First, it ensures adequate

representation of key subgroups within the population, based on predetermined characteristics. Although this non-probability method does not provide equal selection chances for all individuals, it remains a practical and effective approach when time, accessibility, or population lists are limited. Secondly, the results from the selected sample can be applied to the entire population of final-year paramedic trainees, improving the external validity of the study and allowing for broader implications regarding paramedic training and safety protocols in healthcare settings.

In addition, non- probability quota sampling is easy to implement, which is especially helpful in educational environments where a complete list of trainees is readily available. Finally, this sampling method supports various statistical analyses, strengthening the validity of the findings of the study. Together, these advantages highlight the suitability of simple random sampling for this study, enabling the generation of reliable and valid conclusions that can inform improvements in training practices and safety standards for paramedic trainees.

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3.7 DATA COLLECTION PROCEDURES

Data collection procedures are crucial for ensuring efficient analysis. Prior to data collection, it was essential to obtain approval from the director of the public health education institution in Perak to distribute the questionnaires. The researcher will provide a brief overview of the study's objective to the Medical Assistants and Nursing program, along with the director's approval letter.

The researcher lists paramedic trainees based on information from Human

Resources Unit at public health education institutions in Perak. A total of 151 final year paramedic trainees were selected, those chosen will receive a questionnaire with a unique numerical code to ensure confidentiality and assists with data analysis. The coding method not only eliminated duplicate records but also facilitated the retrieval of questionnaires. Participants provided written consent and were given the option to declining participation.

The questionnaire takes approximately 20 min to complete using google forms as the platform, with the researcher available to address queries. Data collection was scheduled from 21 January 2025 until 22 January 2025. Finally, each questionnaire will be screened to ensure that only fully completed forms are processed. The data were reviewed for adequacy, identifying any potential gaps or inconsistencies. If required, additional information may be collected to enhance the understanding of the primary data and provide a more comprehensive view of the research topic.

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The analysis phase follows, in which the collected data are examined to extract meaningful findings and look for patterns and trends that address the research questions. Based on this analysis, case studies may be developed, conclusions drawn, and recommendations proposed to address the identified issues. The process concludes with the preparation of a final report, consolidating all the findings, analyses, and recommendations into a cohesive document.

3.8 TECHNIQUES OF DATA ANALYSIS

3.8.1 Data Analysis Techniques

This section presents the data collected from the survey questionnaire. SPSS 27.0 was used as the statistical tool for data analysis. Prior to survey administration, the collected data were coded into numerical values corresponding to the majority of the questions, as required for SPSS analysis. Descriptive statistical analyses, specifically frequency and percentage calculations, were used to analyse the demographic characteristics of the respondents.

The goal of this analysis is to systematically evaluate the data in order to identify significant patterns and relationships that contribute to the occurrence of NSIs among final-year paramedic trainees. To examine the relationships between the independent and dependent variables, statistical analysis methods were applied. The statistical tests used to explore the relationships included the Chi- Square, Binary Logistic Regression, and Pearson correlation. Statistical analyses, including Chi-Square, Binary Logistic Regression, and Pearson correlation, were employed to examine the relationships between the independent and dependent variables.

3.8.2 Descriptive Analysis

Table 3.8: *Mean Scores and Levels*

Mean Score	Corresponding Consistency Levels
3.68-5.00	High
2.34-3.67	Moderate
1.00-2.33	Low

Source: Davies (1971)

This study uses descriptive analysis to analyse demographic factors among study respondents. It presents a comprehensive overview of variables such as program (medical assistant and nursing), age, gender, ethnicity, hepatitis B vaccination, and immunization status. The analysis employed statistical measures, including the mean, mode, median, and percentage distributions, which collectively provided a thorough understanding of the demographic characteristics of respondents. The goal of this descriptive analysis was to provide a foundational understanding of the respondents' profiles and identify baseline patterns or characteristics that may influence the occurrence of NSIs.

Furthermore, the range of mean scores reflects the level associated with each measured item, offering insights into the consistency of respondents' attitudes and behaviours. These mean score levels, as illustrated in Table 3.8, aid in classifying the intensity or frequency of responses, thus supporting the meaningful interpretation of the data.

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According to Davies (1971), mean scores can be divided into three levels to show the degree of consistency or agreement of the measured variables. A low level was characterized by mean scores between 1.00 and 2.33, indicating minimal consistency. Mean scores between 2.34 and 3.67 represent a moderate level, meaning average consistency. High levels of consistency were reflected by mean scores between 3.68 and 5.00. This classification system is a valuable tool for evaluating and interpreting mean values across various variables, allowing researchers to assess the level of the consistency or variability in their data.

3.8.3 Chi-square test

Franke et al. (2012) describe the chi-square test as a statistical technique employed to evaluate the existence of a correlation between two categorical variables or to determine if a sample aligns to the distribution of a known population. This test is implemented in two distinct forms: the independence test and goodness of fit test. The goal of applying the chi-square test in this study was to determine whether a statistically significant association exists between selected categorical variables, particularly the occurrence of NSIs, compliance to SOPs and prevention practices. The researcher will employ the chi-square test of independence to analyse the relationship between occurrence of NSI and compliance to SOPs.

3.8.4 Binary Logistic Regression

Binary logistic regression is a statistical technique used to examine the relationship between a binary dependent variable (e.g., yes/no, true/false) and one or more independent variables. In this study, it was applied to assess how compliance to SOPs and prevention practices influence the likelihood of experiencing a NSI (Beacom, 2023).

This method is appropriate for categorical outcomes, unlike multiple linear regression, which is suited for continuous variables such as income or blood pressure. Logistic regression is preferred in such contexts because it does not require assumptions of normality or homoscedasticity. Instead, it estimates the probability of an event occurring based on predictor variables and expresses the influence of each through odds ratios. For instance, it can determine whether compliance to SOP

significantly reduces the odds of experiencing an NSI.

3.8.5 Pearson Correlation Analysis

Table 3.9: *Interpretation of Correlation Coefficient Strength*

Correlation Coefficient (r)	***Strength of Relationship***
0.5.-1.00	Strong Correlation
0.30-0.49	Moderate Correlation
0.10-0.29	Weak Correlation

Source: Cohen (1988).

Correlation analysis was conducted to examine the relationship between the independent and dependent variables. The Pearson correlation coefficient was used to determine the strength and direction of the linear relationship between these variables. The correlation coefficient symbolized as "r", range from -1.00 to 1.00.

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The correlation coefficient provides two key insights into the relationship between the two variables: the direction of the relationship and its magnitude. A value closer to 1.00 indicates a stronger relationship, suggesting a higher likelihood of a statistically significant relationship. The interpretation of the strength of the correlation, as outlined by Cohen (1988), is presented in Table 3.9.

3.8.6 Regression Analysis

Regression analysis, as described by Awais et al. (2015), is a statistical method used to explore the relationship between a dependent variable and one or more independent variables. This technique requires variables to be at least on an interval

scale. There are two main types of regression: simple linear regression and multiple regression.

For this study, the researcher employed multiple regression analysis to assess the collective impact of various independent variables (compliance to SOPs and preventive practices) on the dependent variable (occurrence of NSI). When the dependent variable is categorical, such as the presence or absence of injuries, a logistic regression may be more appropriate. The main primary goal of this analysis was to determine the independent variables that significantly influenced the dependent variables.

3.10 CONCLUSION

This chapter outlines and explains the research methodology, including the conceptual framework, research hypotheses, research design, operational definitions, sampling methods, and data analyses. The study employed a quantitative approach, utilizing a survey strategy with a questionnaire as the primary instrument. The sampling method used was quota sampling non- probability. The study sample included 151 final-year paramedic trainees enrolled in medical assistant programs and nursing programs at public health education institutions in Perak.

For data analysis, the researcher employed descriptive and inferential statistical techniques using SPSS 27.0 to analyse the collected data. The statistical methods used chi- square test, Binary logistic regression, Pearson correlation and regression analysis to examine the research hypotheses.

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CHAPTER 4

RESULTS AND DISCUSSION

4.1 INTRODUCTION

The primary objective of this chapter is to present the findings of this study. This study investigated the correlation between compliance to SOPs and prevention practices in relation to the occurrence of NSIs. This chapter presents the research findings, which are based on data obtained from respondents who were paramedic trainees at a public health education institution in Perak. This chapter is divided into two parts. The first part explains the summary of data collection, while the second part describes the results of descriptive and inferential analysis.

4.2 RESPONSE RATE

Table 4.1: *Response Rate*

Questions	Number	Percentage
Distributed Questionnaires	151	100
Returned Questionnaires	151	100
Usable Questionnaire	151	100
Unusable Questionnaire	0	0

In this study, as shown in table 4.1, the researcher used Krejcie and Morgan's sample size table, which suggests a sample size of 148 for a population of 240. However, given that the total number of final-year paramedic trainees was 151, questionnaires were distributed to all participants. Remarkably, 151 questionnaires were returned, achieving a 100% response rate. This not only surpassed the minimum recommended sample size but also enhanced the accuracy and reliability of the study's findings.

4.3 NORMALITY TEST

Table 4.2**:** *Reliability test for total of variables*

Variables	Cronbach's Alpha	N
Total	0.854	16

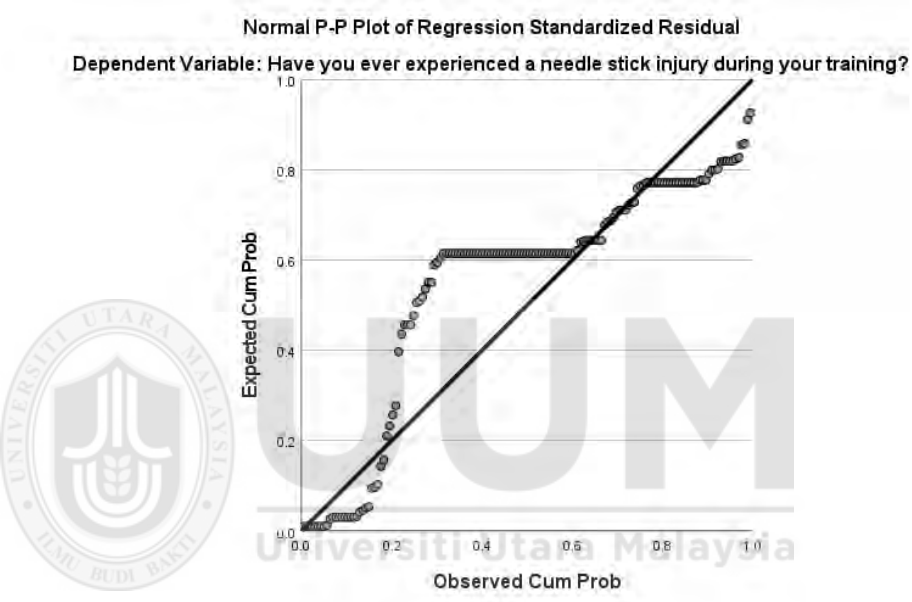
A reliability analysis, as presented in Table 4.2, was conducted to assess the internal consistency of the combined items under the two independent variables in this study: compliance to SOPs and prevention practices related to NSIs. The analysis yielded a Cronbach's alpha value of 0.854, which falls within the very good range for social science research, indicating that the scale has good internal reliability. This result demonstrates that the items measuring both constructs consistently capture the underlying dimensions of compliance to SOP and preventive practices.

In essence, participants responded consistently across the items and the variables reliably measured their intended constructs. The integration of these two variables into a single reliability test indicates that the overall instrument is suitable

for further analysis. A Cronbach's alpha value above 0.7 is generally considered acceptable, supports the validity of using these items in subsequent statistical procedures, such as regression analysis and hypothesis testing.

4.3.1 Normality test for Compliance to Standard of Procedure (SOP)

Figure 4.1: *Histogram Plot and Normal Probability for Compliance to Standard of Procedure (SOP)*



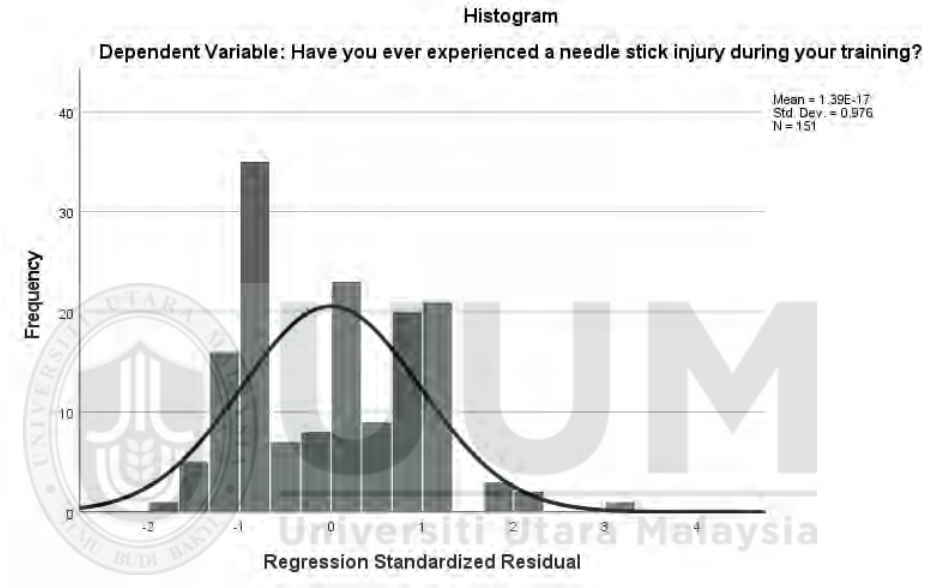
To evaluate the normality of the regression standardized residuals for the NSIs in relation to the compliance to SOP, a histogram was constructed in Figure 4.1. The resulting distribution was compared with a normal curve, represented by an overlaid black line on the graph.

The visual representation revealed a relatively symmetrical distribution with a slight inclination towards the left, indicating minor deviations from perfect normality. The mean value of the residuals is 1.39e-17, which approximates zero,

suggesting they are centrally positioned around the average. With a standard deviation of 0.976, the variability of the residuals was measured, and the analysis encompassed 151 data points (N). The figure below shows the normality test results for the independent variable.

4.3.2 Normality test for Prevention Practices

Figure 4.2: *Histogram Plot and Normal Probability for Prevention Practices*



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The graph presented in Figure 4.2 shows a histogram of standardized residuals for the NSI in relation to the prevention practices. A normal distribution curve was overlaid on the histogram to facilitate visual assessment of the normality of the residuals.

The residuals exhibited an approximately symmetrical distribution with a slight leftward skew. The majority of residuals cluster around the mean, suggesting that the model's predictions demonstrate general accuracy. The residual mean approximates zero (Mean = 1.39E-17), indicating the absence of systematic bias in the regression

model. The standard deviations (Std. Dev. = 0.976) indicate an appropriate dispersion of the residuals.

With a sample size of 151, the dataset is sufficient for analyzing the relationship between NSI and prevention practices. Although the histogram generally aligns with a normal curve, minor deviations, particularly at extremes, suggest that the residuals may not perfectly adhere to a normal distribution.

4.4 DESCRIPTIVE ANALYSIS

4.4.1 Sociodemographic Data

Table 4.3: *Demographic information of participants*

Variable		Frequency (f)	Percentage (%)
Program of study	Medical Assistant Program	68	45.00
	Nursing Program	83	55.00
Ethnic	Malay	122	80.80
	Chinese	15	9.90
	Indian	13	8.60
	Others	1	0.70
Gender	Male	63	41.70
	Female	88	58.30
Age	20-22 years	16	10.60
	23-25 years	67	44.40
	26 years and above	68	45.00
Hepatitis B	Yes	151	100.00

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Vaccination	No	0	0
Hepatitis B	Complete (3 doses)	151	100.00
Immunization status	Partially vaccinated	0	0
	(1 – 2 doses)	0	0
	Not vaccinated	0	0

In this investigation, descriptive analysis provided a comprehensive overview of the participants' demographic characteristics. This encompasses information regarding their ethnic background, gender, age, Hepatitis B vaccination status and Hepatitis B Immunization status, occurrence of needle stick injuries, and the frequency of such occurrences during various clinical rotations.

Table 4.3 presents a comprehensive overview of the study participants' demographics. The research encompassed 151 individuals, with a nearly equal distribution between the Medical Assistant Program (68 participants, 45%) and the Nursing Program (83 participants, 55%). Malay individuals constituted the predominant group, representing 80.80% (122 participants) of the sample. Chinese and Indian participants accounted for 9.90% (15 individuals) and 8.60% (13 individuals), respectively. A single participant (0.70%) identified with other ethnicities, contributing to the sample's diversity.

The gender distribution revealed a slight female majority, with 88 women (58.30%) compared to 63 men (41.70%). This gender imbalance may have influenced various aspects of the study's results. With respect to age, the sample was predominantly older, with 67 participants (44.40%) aged 23 to 25 years and 68

participants (45%) aged 26 years or above. The group of youngest participants, comprising 16 individuals (10.60%) between 20 and 22 years of age, represented a smaller portion of the study population.

Notably, all participants (100%) reported receiving the Hepatitis B vaccine, demonstrating high health awareness among the group. Furthermore, every respondent confirmed completing the full three-dose Hepatitis B immunization schedule, indicating strong adherence to preventive healthcare measures. This comprehensive vaccination coverage underscores the participants' commitment to health protection, with no instances of partial or incomplete immunization reported.

4.4.2 Occurrence of Needle Stick Injuries

Table 4.4: *Occurrence of Needle Stick Injuries by program*

Program of Study	N	NSI Experienced	Mean	Std. Deviation
Medical Assistant Program	68	10	1.85	.357
Nursing Program	83	20	1.76	.430
Total	151	30	1.80	.400

Table 4.4 illustrates disparities in the frequency of NSIs reported and the Medical Assistant Program exhibited a slightly higher incidence, with a mean score of 1.85, compared to the Nursing Program's 1.76. Across both programs, the overall average of needlestick injury occurrences is represented by a total mean of 1.80 suggested that Medical Assistant program.

The study involved 151 participants, with 68 from the Medical Assistant Program and 83 from the Nursing Program. The Medical Assistant Program demonstrated a standard deviation of 0.357, suggesting that NSI experiences among these trainees are more consistent. In contrast, the Nursing Program showed greater variability in reported needle-stick injuries, with a higher standard deviation of 0.430. A total standard deviation of 0.400 reflects the overall response variability across both programs.

4.4.3 Occurrence of NSIs in the Medical Assistant Program by Clinical Posting

Table 4.5: *Occurrence of Needle Stick Injuries in the Medical Assistant Program*

Program of Study	Category	Frequency	Percentage (%)
Medical Assistant Program	Accident & Emergency Department	8	17.79
	Paediatric Ward	0	0.00
	Medical Ward	2	2.94
	Surgical Ward	0	0.00
	Orthopaedic Ward	0	0.00
	Obstetrics & Gynaecology Ward	0	0.00
	Never Experienced	58	85.29
Total		68	100.00

Based on Table 4.5, a study of the Medical Assistant program involved 68 participants. Among these, eight individuals (17.79%) experienced NSIs in the Accident & Emergency Department, while two (2.94%) encountered such incidents

in the Medical Ward. The Paediatric, Surgical, Orthopaedic, and Obstetrics and Gynaecology Wards reported no occurrences, each showing a zero-incidence rate. The majority of participants, consisting of 58 respondents (85.29%), reported that they had not experienced. The total number of participants in this program was 68, accounting for 100% of the sample size.

4.4.4 Occurrence of NSIs in the Nursing Program by Clinical Posting.

Table 4.6: *Occurrence of Needle Stick Injuries in the Nursing Program*

Program of Study	Category	Frequency	Percentage (%)
Nursing Program	Accident & Emergency Department	8	17.79
	Paediatric Ward	0	0.00
	Medical Ward	6	2.94
	Surgical Ward	6	0.00
	Orthopaedic Ward	0	0.00
	Obstetrics & Gynaecology Ward	0	0.00
	Never Experienced	63	85.29
Total		68	100.00

The study conducted in the Nursing Program involved 83 participants, as shown in Table 4.6. Among the participants, 17.79% (8 individuals) reported NSIs in the Accident & Emergency Department, while 2.94% (6 individuals) experienced such incidents in the Medical Ward. An additional six respondents noted zero injuries in the Surgical Ward. The Paediatric Ward, Orthopaedic Ward, and

Obstetrics & Gynaecology Ward all reported zero incidents of injuries, indicating that no harm occurred in these departments. The majority of participants, 85.29% (63 individuals), indicated that they had never experienced a needle stick injury. These data were provided by all 83 respondents, representing the entire sample (100%) of the program's participants.

4.5 DESCRIPTIVE ANALYSIS OF COMPLIANCE TO SOP AND PREVENTION PRACTICES.

Table 4.7: *Summary of descriptive analysis of study variables.*

Study Variables	**Number of Items**	**Mean**	**Standard Deviation (SD)**
Compliance to SOP.	9	4.628	.234
Prevention practices following NSIs	7	3.052	.402

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This section offers a descriptive analysis of the study constructs, concentrating on key variables pertinent to the research. The analysis encompassed the calculation of the mean scores and standard deviations for each construct, as detailed in Table 4.7. Two independent variables were evaluated, variable SOPs and preventive practices following NSIs. Compliance to SOPs was measured using nine items, revealing a high mean score of 4.628, with a standard deviation of 0.234. This indicates that most respondents reported a high level of compliance, with minimal variation in their responses. Seven items were employed for prevention practices after experiencing NSIs, such as attending blood tests and receiving post-exposure prophylaxis. The mean score was 3.052, with a standard deviation of 0.402,

reflecting a moderate level of practice among respondents, with slightly more variation in responses than the compliance to SOP variable.

4.5.1 Descriptive Statistics for Compliance to SOP Regarding the Occurrence of NSI.

Table 4.8: *Descriptive Statistics for Compliance to SOP Regarding the Occurrence of NSI*

No.	Item	N	Minimum	Maximum	Mean	Std. Deviation
1.	I am concerned that needle stick injuries pose a significant health risk	151	4	5	4.55	.499
2.	I am interested in learning about needle stick injury prevention and management.	151	4	5	4.64	.481
3.	I think working in environments with high exposure to sharp instruments increases the risk of NSIs.	151	4	5	4.66	.477
4.	I have received adequate training in using personal protective equipment (PPE) to prevent NSIs.	151	3	5	4.57	.510
5.	I believe that failure to	151	4	5	4.64	.483

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	comply with SOPs during procedures can negatively impact my work performance and safety.					
6.	I am ready to comply with SOPs to prevent NSIs.	151	4	5	4.70	.459
7.	I always ensure the proper use of personal protective equipment (PPE) when handling needles or sharps.	151	4	5	4.62	.486
8.	I believe vaccination and post exposure prophylaxis are important to reduce NSI related risk.	151	4	5	4.65	.479
9.	I think that certain medical procedures involving needles pose a risk if SOPs are not strictly followed	151	2	5	4.63	.524
	Valid N (listwise)	151				

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As shown in Table 4.8, the analysis of the provided data revealed a remarkably high compliance to SOP, with participants scoring an average of 4.628. This indicates widespread compliance to SOP among the respondents. The minimal standard deviation of 0.234 suggests a uniform approach to following these procedures across the board.

In contrast, measures taken to address potential complications following NSIs, including blood screening and post-exposure management, demonstrated a moderate level of implementation, averaging 3.052. A larger standard deviation of 0.402 for these practices indicates greater variability than compliance to SOPs. This implies that while compliance to SOP is strong, there is potential for enhancement in post NSI preventive actions.

Table 4.8, presents an overview of the descriptive statistics for questions assessing participants' compliance to SOPs regarding NSIs. The responses provide insights into their awareness, training, and perceptions of safety measures in preventing needle stick injuries. One of the key aspects evaluated was the level of concern about the health risks associated with NSIs. For instance, Item 1: "*I am concerned that needle stick injuries pose a significant health risk*", received an average core of 4.55, indicating that respondents generally agree on the severity of NSI-related health hazard. The standard deviation of 0.499 reflects minimal disparity in responses, suggesting a shared level of concern regarding NSI related health risks among participants. With a response range from 4 to 5, most individuals strongly agreed with the statement, reinforcing the perception that NSIs are a serious occupational risk.

The second item, "*I am interested in learning about needle stick injury prevention and management,*" achieved an average score of 4.64, indicating substantial participant interest in gaining knowledge about NSI prevention practices. A minimal standard deviation of 0.481 suggests consistent responses, reflecting a uniform desire to expand the understanding of this subject. The participants exhibited

widespread agreement regarding their keen interest in studying NSI-related topics.

Additionally, the statement "*I think working in environments with high exposure to sharp instruments increases the risk of NSIs*" in Item 3 received a mean score of 4.66, indicating a strong consensus that settings with frequent sharp instrument exposure elevate NSI risk. A low standard deviation of 0.477 indicates minimal response variability, which further supports this view. Most participants concurred that exposure to sharp instruments was associated with a higher risk of NSI.

Furthermore, the statement "*I have received adequate training in using personal protective equipment (PPE) to prevent NSIs*" in Item 4 yielded a mean score of 4.57. This indicates that respondents generally felt that they had been sufficiently trained in PPE usage for prevention practices. The standard deviation of 0.510 points indicates some variability in answers, suggesting that while most participants concur, there are slight differences in how they perceive the adequacy of their training. Although the overall trend is towards agreement, a small number of respondents might feel less sure about the training they received.

Regarding Item 5, "*I believe that failure to comply with SOPs during procedures can negatively impact my work performance and safety*," the average score of 4.64 suggests strong support for the notion that disregarding SOPs can adversely affect job performance and safety. The low standard deviation of 0.483 indicates minimal variation in responses, suggesting a shared perspective among participants. The reply further underscores the broad consensus that compliance to

SOPs is essential for sustaining optimal performance and safety standards within the work environment.

For Item 6, "*I am ready to comply with SOPs to prevent NSIs*," the average score was 4.70, demonstrating a strong consensus among participants regarding their readiness to adhere to SOPs for prevention practices. The minimal standard deviation of 0.459 indicates a high level of consistency in the responses, suggesting uniform preparedness across the sample. This broad dedication is further underscored, indicating a general readiness to adhere to established standard operating procedures.

The analysis of Item 7, which states "*I always ensure the proper use of personal protective equipment (PPE) when handling needles or sharps*," revealed a mean score of 4.62. This high score indicated a strong consensus among participants regarding their consistent utilization of PPE when working with needles or sharp objects. The low standard deviation of 0.486 suggests minimal variation in responses, indicating widespread compliance with PPE guidelines. Most participants demonstrated a strong commitment to the proper use of personal protective equipment and compliance to safety measures.

Moreover, Item 8, which states "*I believe vaccination and post-exposure prophylaxis are important to reduce NSI-related risks*," achieved a mean score of 4.65, indicating strong support for the significance of vaccination and post-exposure prophylaxis (PEP) in reducing the risks associated with NSIs. The low standard deviation of 0.479 points indicates a high level of agreement among respondents, with minimal variation in their answers. This consistency underscores the widespread

recognition of the value of these preventive measures in managing NSI-related risk.

The survey's Item 9, which stated, "*I think that certain medical procedures involving needles pose a risk if SOPs are not strictly followed*," received an average score of 4.63. This high score indicates that respondents strongly agreed with the notion that failing to adhere to SOPs during needle-based medical procedures increases the potential risks. A slightly higher standard deviation of 0.524 was observed, suggesting a broader range of opinions among participants. Although some disagreement was present, the overall response trend supports the belief that rigorous compliance to SOPs is essential to minimize the risks associated with needle-related procedures in medical settings.

4.5.2 Descriptive Statistics for Prevention Practices Regarding the Occurrence of NSI.

Table 4.9: *Descriptive Statistics for Prevention Practices Regarding the Occurrence of NSI*

No.	Items	N	Minimum	Maximum	Mean	Std. Deviation
1.	I am aware about post exposure prophylaxis (PEP) for HIV/ AIDS.	151	1	2	1.63	.485
2.	I was taught about PEP before entering hospital/ clinic.	151	1	2	1.66	.477
3.	Should more emphasis	151	3	5	4.12	.757

	be given to teaching about PEP in curriculum.					
4.	All patients undergoing surgical procedures should be asked for mandatory HIV test.	151	3	5	4.13	.760
5.	Patients with HIV infection should be treated separately.	151	1	2	1.62	.488
6.	PEP can reduce the chances of HIV infection among HCWs	151	3	5	4.11	.735
7.	Post exposure prophylaxis medication is available in government hospital.	151	3	5	4.11	.732
	Valid N (listwise)	151				

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Table 4.9 presents descriptive statistics for the items assessing participants' knowledge and attitudes for preventive practices regarding the occurrence of NSI. The study involved 151 respondents who answered questions regarding their knowledge of PEP, previous education on the subject, perceived significance of incorporating PEP education into academic programs, and opinions on HIV testing

and treatment protocols. These findings offer a thorough evaluation of participants views on NSIs and prevention practices.

The average score of 1.63 for the statement "*I am aware about post exposure prophylaxis (PEP) for HIV/AIDS*" in Item 1 suggests that most respondents have limited knowledge about PE, rather than being knowledgeable. A low standard deviation of 0.485 indicates strong agreement among respondents regarding their understanding of PEP.

Regarding Item 2, "*I was taught about PEP before entering hospital/clinic*", most respondents reported receiving PEP education prior to their hospital or clinic entry, as shown by an average score of 1.66. The answer distribution was similar to that described in the previous section. There was little variation in responses, with a standard deviation of 0.477, indicating a high level of consistency in responses, suggesting that most participants shared a similar perception of the statement. However, it should be noted that some individuals did not receive PEP training prior to their clinical assignments.

Nevertheless, Item 3, "*Should more emphasis be given to teaching about PEP in curriculum*?", respondents exhibited strong support for enhancing PEP education within the curriculum, as evidenced by a mean score of 4.12. A standard deviation of 0.757 indicates slightly more varied opinions compared to the previous items.

The survey Item 4 "*All patients undergoing surgical procedures should be asked for mandatory HIV testing"* received an average score of 4.13, indicating

substantial agreement with the proposition of requiring compulsory HIV testing for surgical patients. The 0.760 standard deviation suggests some variation in opinions on this matter. However, the majority of the participants endorsed this suggestion, as evidenced by the response.

Regarding Item 5, *"Patients with HIV infection should be treated separately*," the majority of respondents expressed disagreement with this statement, as evidenced by an average score of 1.62. A low standard deviation of 0.488 indicates a high level of agreement among participants in their opposition to this idea. This consistency in response further reinforces the widespread rejection of segregating HIV-positive patients for treatment.

The statement "*PEP can reduce the chances of HIV infection among health care workers*" in Item 6, with a mean score of 4.11, suggesting that participants generally agreed with the effectiveness of PEP in decreasing HIV transmission risk. The standard deviation of 0.735 indicates some variation in responses; however, an overall agreement was prevalent.

The statement "*Post exposure prophylaxis medication is available in government hospitals*" in Items 7 received a mean score of 4.11, indicating strong consensus on the accessibility of PEP drugs in public healthcare facilities. With a standard deviation of 0.732, reflects minimal variation in responses, suggesting that most respondents were confident about the availability of PEP medication in state-run hospitals.

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4.6 BINARY LOGISTIC REGRESSION

This analysis aimed to assess how effectively the independent variables (compliance to SOPs and preventive practices) predicted the likelihood of experiencing an NSI.

4.6.1 Analysis of the Relationship Between Compliance to SOP and occurrence of NSI.

Table 4.10: *The Relationship Between compliance to SOP and Occurrence of Needle Stick Injuries*

Test/Model Component	**Chi-square**	**B**	**S.E.**	**Exp(B)**	**Sig**	**-2 Log likelihood**	**Cox & Snell R^2**	**Nagelkerke R^2**
Omnibus Tests of Model Coefficients	22.498				.007			
Variables in the Equation		1.395	.204	4.033	.000			
Model Summary						128.068[a]	.138	.219

This study investigated the association between compliance to SOP and the occurrence of NSIs using logistic regression analysis. The analysis evaluated the predictive significance of SOP in relation to NSIs, and the results are summarized as shown in Table 4.10.

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The overall significance of the model shown in Table 4.10 was evaluated using the Omnibus Tests of Model Coefficients, which produced a chi-square value of 22.498 and p-value of 0.000. This highly significant results demonstrates that the model effectively predicts NSI occurrence based on compliance to SOPs, underscoring the importance of the independent variable affecting NSI incidence.

Further analysis of the regression coefficients revealed that compliance to SOP had a regression coefficient (B) of 1.395, indicating a positive association between compliance to SOPs and a reduced likelihood of NSIs. This corresponding odds ratio (Exp(B) = 4.033), suggests that greater compliance to SOPs is associated with a significantly lower likelihood of NSIs. A standard error (S.E.) of 0.204 indicates the precision of this estimate while the p-value of 0.000 confirms that this relationship is statistically significant.

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The model fit was further assessed using the -2 Log Likelihood value of 128.068 indicating an adequate fit. The Cox and Snell R^2 value of 0.138 suggests that compliance to SOP account for approximately 13.8% of the variance in NSI occurrence while the Nagelkerke R^2 value of 0.219 showed that the model explained 21.9% of the variability in NSI incidence. While this suggests that compliance to SOP is a significant predictor, the relatively low R^2 values imply that additional factors, not included in this model, may also influence NSI occurrence.

4.6.3.1 Hosmer and Lemeshow Test Results for compliance to SOP

The Hosmer-Lemeshow test is employed to evaluate the goodness-of-fit of a

binary logistic regression model, assessing how well the model's predictions align with the actual observed data. Specifically, it compares the observed event rates (e.g. the occurrence of NSIs) with the expected event rates predicted by the logistic regression model. Typically, the data were grouped into deciles based on predicted probabilities, and the observed and expected frequencies within each group were compared.

Table 4.11: *Hosmer and Lemeshow Test Results for compliance to SOP*

Test/Model Component	Chi-square	Sig
Hosmer and Lemeshow Test	7.315	.198

In this study, the Hosmer and Lemeshow Test was used to determine whether the logistic regression model for predicting NSIs, based on variables such as compliance to SOPs and prevention practices, adequately fit the data. A p-value greater than 0.05 indicates no significant difference between the observed and expected outcomes, suggesting a good model fit. Conversely, a p-value less than 0.05 would suggest a poor model fit, indicating a misalignment between the model's predictions and the actual outcomes.

According to the results in Table 4.11, the Hosmer-Lemeshow test yielded a chi-square value of 7.315, with a p-value of 0.198. Because the p-value exceeds the threshold of 0.05, the results suggest that the logistic regression model fits the data well. This implies that the predicted probabilities of NSI occurrence based on the assessed factors are consistent with the actual observed data, further supporting the validity of the model.

4.6.3.2 Classification Table for Compliance to SOP

Table 4.12: *Classification Table for Compliance to SOP*

Occurrence of NSI	Experienced	Never Experienced	Percentage Correct
Yes	7	23	23.3
No	2	119	98.3
Total			83.4

The Classification Table is a tool used in logistic regression analysis to evaluate the accuracy of a model in predicting the outcomes. It compares the predicted results with the actual observed outcomes and provides insight into how effectively the model classifies cases into their respective categories. In the context of binary logistic regression, for example, the model predicts whether an event, such as NSIs, has occurred. The Classification Table then shows the number of cases in which the model has been correctly or incorrectly classified.

The accuracy of the model was determined by adding the true positives and true negatives and dividing by the total number of cases. This calculation helps assess the model's overall ability to classify cases accurately. An effective model should aim for a high rate of true positives and true negatives, while reducing false positives and false negatives. In essence, the Classification Table offers a clear view of the logistic regression model's ability to predict the dependent variable, and aids in assessing the model's performance.

According to the Classification Table, the model's predictions regarding the occurrence of NSIs were divided into two categories: those who had experienced an NSI (yes) and those who had not (no). Among those who had an NSI, the model accurately predicted only seven individuals, whereas 23 were mistakenly classified as not having the injury, resulting in a prediction accuracy of 23.3% for this group. Conversely, for those who had never experienced an NSI, the model demonstrated high accuracy, correctly identifying 119 individuals, with only two incorrectly classified as having an NSI. This resulted in a prediction accuracy of 98.3% for individuals without an NSI.

Overall, the model achieved an accuracy rate of 83.4%, indicating that it correctly predicted whether participants experienced or did not experience NSIs in 83.4% of cases. Although the model predicted the non-occurrence of NSIs, it showed a relatively low prediction accuracy (23.3%) for those who experienced an NSI, suggesting that the model's ability to identify NSI occurrences could be enhanced.

In summary, the Classification Table reveals that although the logistic regression model has high overall accuracy, its capability to predict the occurrence of NSIs is somewhat limited. The model excels in forecasting the absence of NSIs (true negatives), yet it struggles to accurately identify those who have actually experienced NSIs (true positives), achieving only 23.3% accuracy in this regard. Consequently, enhancing the predictive power of the model for NSIs could boost its overall effectiveness.

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4.6.3 Analysis of the Relationship Between Prevention Practices and Occurrence of NSI.

Table 4.13: *The Relationship Between Prevention Practices and Occurrence of NSIs*

Test/Model Component	Chi-square	B	S.E.	Exp (B)	Sig	-2 Log likelihood	Cox & Snell R^2	Nagelkerke R^2
Omnibus Tests of Model Coefficients	146.067				.000			
Variables in the Equation		1.395	.204	4.033	.001			
Model Summary						4.499[a]	.620	.982

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This investigation examined the association between preventive measures and the incidence of NSIs using logistic regression analysis. The results, including the model components and statistical tests, are presented below in Table 4.13.

Table 4.13 shows the Omnibus Tests of Model Coefficients, which indicates that the overall model significantly predicted NSI occurrence, with a chi-square value of 146.067 and $p < 0.001$. This result highlights the significance of prevention practices as key predictors of NSI likelihood within the model.

Further analysis of the regression equation variables provided further insight into the strength and direction of this relationship. The regression coefficient (B) for prevention practices was 1.395, suggesting a strong association between compliance to these practices and NSIs occurrence. The standard error (S.E.) of 0.204 indicates a precise estimate, while the odds ratio (Exp(B)) of 4.033 suggests that consistent compliance to prevention practices decreases NSI risk by approximately fourfold. The p-value of 0.001 confirm that relationship is statistically significant.

The model's fit was assessed using the -2 Log Likelihood value of 4.499, indicating an adequate fit. Prevention practices explained 62% of the variation in NSI occurrence, as reflected by the Cox and Snell R^2 value of 0.620. Additionally, the Nagelkerke R^2 value of 0.982 suggests that the model accounts 98.2% of the variance in the dependent variable, demonstrating a high level of explanatory power. However, this unusually high Nagelkerke R^2 (0.982) may be attributed to an imbalanced dataset, with 80.1% of the participants reporting no NSI.

Given that most subjects followed prevention practices and NSIs were infrequent, the model might have overfitted the majority class, resulting in an artificially inflated R^2. Additionally, the exceptionally high Nagelkerke R^2 value (0.982) implies that compliance to prevention practices was nearly the exclusive determinant of NSI occurrence in this sample. This suggests that other factors, such as gender or work experience, may have a minimal impact compared with strict compliance to preventive measures.

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4.6.4.1 Hosmer and Lemeshow Test Results for preventive practices.

The goodness of fit of the logistic regression model, assessing the relationship between preventive practices and the occurrence of NSIs, was evaluated using the Hosmer and Lemeshow Test as presented in Table 4.14. This test determines whether the model's predicted probabilities align with the actual observed data. A p-value exceeding 0.05 suggests an adequate fit, indicating no significant difference between observed and expected outcomes.

Table 4.14: *Hosmer and Lemeshow Test Results for preventive practices*

Test/Model Component	Chi-square	Sig
Hosmer and Lemeshow Test	.000	1.000

In this study, the Hosmer and Lemeshow Test yielded a chi-square value of 0.000 with a p-value of 1.000. This result indicates a perfect model fit, showing that the values predicted by the logistic regression model precisely matched the observed data. A p-value of 1.000 confirms the absence of deviation between the predicted and actual values, demonstrating that the model provides an exceptionally strong fit for explaining the relationship between preventive practices and NSI occurrence.

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4.6.4.2 Classification Table for Preventive Practices.

The predictive accuracy of the classification model was evaluated in relation to preventive measures for NSIs. The model demonstrated exceptional performance, correctly identifying 100% of cases involving respondents who had encountered NSIs and 99.2% of cases involving those who had not. The model exhibited robust predictive capabilities for preventive practices, with an overall prediction accuracy of

99.3 %. The outcomes are presented in table 4.15.

Table 4.15: *Classification Table for preventive practices*

Occurrence of NSI	Experienced	Never Experienced	Percentage Correct
Yes	30	0	100.0
No	1	120	99.2
Total			99.3

4.7 SUMMARY OF FINDINGS.

This section presents key findings from the analysis of factors influencing NSIs among paramedic trainees. The study examined the relationships between compliance to SOPs, and safety practices using descriptive and inferential statistical techniques. Descriptive analysis highlighted variations in NSI prevalence, compliance to SOP, and prevention practices. However, compliance to SOP showed a strong negative correlation with NSI incidents ($p = 0.000$). Additionally, safety practices significantly influenced NSI occurrence ($p = 0.001$), emphasizing the need for proper preventive measures.

Overall, the findings underscore the critical role of compliance to SOP and effective safety practices in mitigating NSI risks among paramedic trainees. Establishing a strong safety culture and compliance to protocols are essential for a safer training environment.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

Table 5.1: *Hypothesis summary*

Hypothesis	Decision
The relationship between SOP and the occurrence of needlestick injuries among paramedic trainees.	Accepted
The relationship between prevention practices and the occurrence of needlestick injuries among paramedic trainees.	Accepted

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This chapter presents an overview of the research, findings, implications and conclusions, based on the research objectives and questions. It examines the relationships explored, highlights the study's contributions and limitations, and provides recommendations for future research. The final section summarizes the overall conclusion of the study.

This study analyze the factors contributing to the occurrence of NSIs among final- year paramedic trainees at public health education institutions in Perak.

Specifically, it investigated the relationship between the compliance to SOPs affects NSIs and prevention practices in reducing these injuries. By identifying these variables, the study contributes to improving preventive strategies, strengthening compliance to SOPs, and promote a safer clinical training environment. The findings provide valuable insights into NSIs, emphasizing the importance of compliance to SOPs and preventive measures in minimizing risks.

This research is grounded in the TPB, which explains that behavior is influenced by 3 factors, which is attitude, subjective norms, and perceived behavior control. The findings found that compliance to SOPs and preventive practices significantly reduce NSI occurrences. This aligns with TPB concept of perceived behavior control, which suggests that individuals believe they can manage risks are more likely to engage in preventive behaviours.

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In conclusion, the hypothesis summary in Table 5.1 supports the TPB by confirming that compliance to SOPs and preventive measures are crucial factors in reducing NSIs. These findings reinforce the importance of perceived behavioural control in influencing safety practices among paramedic trainees (Ditching et al., 2020). Future research should focus on organizational policies, the effectiveness of training programs, and workplace culture to further enhance NSI prevention practices.

5.2 Relationship Between Compliance to SOPs and Prevention Practices with NSIs Occurrence Among Paramedic Trainees.

This study investigated the association between compliance to SOPs, and preventive practices with the occurrence of NSIs among final-year paramedic trainees at public health education institutions in Perak.

5.2.1 Relationship between compliance to SOP and the occurrence NSIs among paramedic trainees.

The data analysis results in Chapter 4 highlight the importance of compliance to SOPs in reducing NSIs among paramedic trainees. The statistically significant correlation shows that strict compliance to SOPs effectively reduced the likelihood of NSIs. Furthermore, the regression coefficient and odds ratio reinforce the strong positive relationship between compliance to SOP and reduced NSI occurrence, emphasizing the effectiveness of preventive measures when properly implemented (Wiarto et al., 2022). SOPs serve as essential safety guidelines designed to protect HCWs from HIV, HBV, and other blood-borne pathogen by handling the blood and specific body fluids as potentially infectious.

The results of this study are consistent with previous research by Meilawati et al. (2019) who emphasized that inadequate training in needle-handling techniques leads to unsafe practices, predominantly needle recapping. Naing et al. (1999) found that 67.4% of students recapped needles after use, likely due to a lack of awareness of proper practices and the tendency to mimic other HCWs. Similarly, Azmi (1997)

reported that 60.7% of staff in the Emergency Department at Kuala Lumpur Hospital also engaged in this unsafe practice, highlighting the widespread of incorrect needle-handling procedures. Behavioral factors, particularly the practice of needle recapping, have been widely documented as a major contributor to NSIs. Assen et al. (2020) noted that syringes, especially when mishandled during procedures, are among the primary instruments involved in NSIs.

This observation aligns with our findings, which revealed that paramedic trainees were concerned about the health risks associated with NSIs and expressed a strong interest in improving their knowledge of NSI prevention practices. Despite the high awareness levels, gaps in practice persist, particularly in the safe disposal and handling of needles. Motulo et al., (2022) found that improper needle handling during procedures like phlebotomy or intravenous therapy, significantly increases the risk of NSIs. A study by Gańczak et al. (2020) identified other risk factors, including the absence of safely-engineered devices (SEDs) and the practice of recapping needles. The risk of injuries was further exacerbated by the lack of comprehensive training and strict compliance to SOPs, underscoring the importance of comprehensive education to safeguard HCWs, including paramedic trainees.

These findings emphasize the critical importance of ongoing education and training to ensure that paramedic trainees not only understand but also consistently apply safety protocols in their clinical posting. Paramedic trainees' strong belief that following SOPs is essential for both safety and job performance highlights the need to maintain training standards and compliance to SOPs.

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However, Osborn et al. (1999) emphasized that merely teaching SOPs is insufficient, trainees must also become proficient in safely performing clinical procedures. Additionally, the research revealed an inverse relationship between higher levels of SOP practice and NSI occurrence, suggesting that improved compliance with universal precautions can significantly reduce injury rates (Duncan et al., 2014). Paramedics trainees must be developed to be an expertise in performing clinical procedures safely to ensure optimal protection. Management should evaluate the effectiveness of preventive efforts and provide performance feedback (Shen et al. 1999).

This study also highlights a recurring issue, the underreporting of NSIs. Research by Xu et al. (2022) revealed that HCWs particularly those in training, avoid reporting NSIs due to fear of consequences or disciplinary actions. This lack of reporting undermines the accuracy of NSI prevalence data and hinders the development of effective preventative measures. To improve safety outcomes, it is essential to foster an environment that encourages openness and the reporting of all NSIs.

An examination of compliance to SOP and preventive actions following NSIs further underscores the importance of comprehensive safety protocols. Trainees demonstrated a high level of compliance to SOP, with a small standard deviation, indicating consistent practices across the group which aligns with previous findings on the role of adherence in reducing NSI risk. However, the implementation of post-NSI measures, including blood testing and exposure management, showed a greater variability.

The differences between strong preventive practices and post-NSI responses highlights the need for better management of NSIs after occurrence. To achieve a holistic approach to NSI management, organizations should prioritize enhancing both preventive strategies and response protocols. Improving post-exposure procedures will help provide better safeguards to paramedic trainees. These findings are consistent with existing research, which indicates that while paramedic trainees often recognize the importance of SOPs, they may lack sufficient training or support in managing post NSI incidents (Bagnasco et al., 2020; Mubarak et al., 2023). By giving equal attention to post-exposure management as a preventive measure, institutions can foster a stronger safety culture and reduce long-term NSI-related risks.

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5.2.2 Relationship between prevention practices and the occurrence of NSIs among paramedic trainees.

The findings of this study underscore the significant role of prevention practices in mitigating the risk of NSIs among paramedic trainees. Statistical analysis demonstrated that compliance to preventive measures strongly influenced the occurrence of NSIs, with a statistically significant p-value. This finding supports the notion that effective prevention strategies are essential to minimize NSI incidents. Result of odds ratio (Exp(B)) suggests that strict compliance to these protocols reduces NSI risk by approximately four times, underscoring the critical nature of carefully following preventive guidelines

These results align with the existing research, which underscores that NSI

prevention practices required not only awareness but also consistent application of appropriate safety measures. The World Health Organization (WHO, 2023) emphasizes the primary prevention, through safe practice implementation, is crucial in reducing NSI risk. Reducing the likelihood of infection spread requires a strategy that ensures sufficient resources and encourages safe practices (King & Strony 2019). A crucial element of this strategy is following standard precautions, such as using correct needle-handling and avoiding recapping, which are essential measures to prevent NSIs.

Despite high awareness levels, gaps in practice persist. While paramedic trainees recognize the importance of preventive measures, inconsistencies in their application remain evident. For instance, improper needle disposal and failure to use safety-engineered devices continue to pose risks. Studies have shown that inadequate training and a lack of institutional reinforcement contribute to these gaps (Meilawati et al., 2019; Assen et al., 2020). Addressing these issues through structured education and continuous monitoring is essential to enhancing compliance.

Timely reporting and appropriate follow up of NSIs are also critical components of prevention practices. Research by Xu et al. (2022) indicates that NSI under-reporting is a widespread issue, with non- reporting rates reaching as high as 77.4% in healthcare setting. This failure to report incidents not only limits the effectiveness of intervention strategies but also sustains unsafe practices. Promptly reporting NSIs by paramedic trainees is crucial for ensuring timely post-exposure actions, which helps reduce potential health hazards and improve workplace safety. This approach is supported by Alsabaani et al. (2022), highlighted the importance of

developing a culture that emphasises incident reporting and post-exposure management to minimise the risks linked to NSIs.

The findings of this study reinforce the need for a comprehensive preventive strategy that integrates through training, institutional support, and compliance to safety protocols. Advanced healthcare systems have successfully reduced NSIs by integrating comprehensive educational programs, adopting safer needle devices, and enforcing strict compliance with safety guidelines (Bouya et al., 2020). In contrast, resource-limited settings face challenges due to inadequate training and insufficient access to protective equipment. Addressing these disparities requires targeted interventions that prioritize both preventive measures and organizational commitment to safety.

In conclusion, this study provides strong evidence of the relationship between prevention practices and NSI occurrence among paramedic trainees. Enhancing compliance through structured training, regular audit and institutional reinforcement is essential to safeguarding paramedic trainees and minimizing occupational hazards. strengthening these preventive strategies will contribute to a safer clinical environment and reduce the long-term impact of NSIs.

5.3 IMPLICATION OF THE STUDY.

This study provides a implications of factors contributing to NSIs among final year paramedic trainees at public health education institutions in Perak, focusing on compliance to SOP and preventive practices.

5.3.1 Implications of Compliance to SOPs on the Occurrence of NSIs

Theoretical Implications

This study identified a statistically significant between compliance to SOP and the occurrence of NSIs, demonstrating that following SOPs greatly reduces the risk of NSIs. This finding aligns with earlier research indicating that well-defined safety procedures can prevent injury (Osborn et al., 1999). However, this study offers new perspectives, suggesting that reducing errors and promoting safe behaviours require structured training environments with explicit rules and close supervision. While many attribute occurrences of NSIs is mainly due to human error, this study indicates that a supportive learning environment can substantially mitigate this risk.

This study also revealed a gap between knowledge and practice in the current training programs. Although many trainees understand the causes of NSIs, compliance to strict SOPs is inconsistent, regardless of hands-on training or real-time supervision. Theoretical knowledge alone is inadequate; practical training, including hands-on learning and regular skill assessments, is crucial for maintaining safety. Despite the benefits of complying with SOPs, implementation remains challenging, as adherence often fluctuates under workload pressure. Additionally, the lack of reinforcement and inconsistent supervision can lead to protocol deviation.

Practical Implications

A common concern in clinical practice is the perception that SOPs are too rigid and impractical, particularly in emergency situations where rapid decision-making is

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essential. Resistance to compliance to SOP may also arise from insufficient institutional support, inadequate training, and unclear instructions, which discourage trainees from strictly following procedures.

This study also found that trainees often failed to follow guidelines after experiencing NSIs, highlighting the need for strict enforcement of reporting protocols in the future. Underreporting has remained a significant barrier to effective post-exposure management (Bagnasco et al., 2020) due to fear of blame and stigma that may lead to avoidance of seeking medical care. Therefore, fostering a supportive and non-punitive reporting culture is essential to ensure timely and appropriate post-exposure interventions.

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5.3.2 Implications of Prevention Practices on the Occurrence of NSIs

Theoretical Implications

The findings indicate that compliance to preventive measures significantly influences the occurrence of NSIs, as demonstrated by the statistical analysis showing an association with compliance. The results suggest that strict compliance to these protocols can substantially reduce NSI risk, underscoring the importance of following safety guidelines in daily practice. According to the WHO (2023), prevention practices are critical for minimising the risk of infection associated with NSIs. Both primary preventions, through safe handling and disposal of needles, and secondary prevention, such as PEP, are essential for mitigating the impact of NSIs.

The study also underscores the gap between knowledge and the practical application of preventive measures. Although paramedic trainees are aware of the risks associated with NSI, they encounter difficulties in effectively implementing safety protocols. Theoretical models of safety behaviour (TPB) the importance of a structured approach, where preventive knowledge is reinforced through continuous training, supervision, and institutional support.

Practical Implications

From a practical perspective, this research highlights the importance of enhancing training programs to close the gap between theoretical understanding and practical application. This gap between theoretical understanding and real-world application is consistent with findings from global studies, which indicate that many paramedic trainees struggle to apply preventive measures effectively in clinical settings despite being aware of their importance. Vardhini et al. (2020) found that the significance of PEP was acknowledged. Barriers to implementation may include insufficient training, ineffective reporting mechanisms, and limited resources in healthcare institutions.

Although there is a high level of awareness regarding preventive measures, the inconsistent implementation of post-NSI interventions, such as blood testing and PEP, suggests the need for better training in clinical environments. This study highlights the importance of enhancing PEP instruction within training programs. This reflects a growing understanding that comprehensive education should not only provide theoretical knowledge but also ensure practical application, especially in high-risk environments, such as hospitals and clinics. Anuradha et al. (2022)

emphasised that strict compliance to SOPs, including immediate PEP administration within the critical two-hour window after exposure, is essential for minimising risks.

Prompt reporting and follow-up of NSIs are essential for effective prevention practices and management. However, Xu et al. (2022) indicate that underreporting remains a widespread issue, with some healthcare institutions experiencing non-reporting rates as high as 77.4%. Failure to report NSIs can hinder timely medical intervention and contribute to continued risks in the workplace.

5.4 LIMITATIONS OF THE STUDY

This study provides important a deeper understanding about the occurrence of NSI and compliance to SOPs and preventive measures among final-year paramedic trainees. However, certain limitations that may affect the applicability and thoroughness of the study must be acknowledged. These limitations include the study's narrow scope, dependence on self-reported data, and limited definition of NSIs.

The study's focus on final-year paramedic trainees at public health education institutions in Perak presents limitations in terms of broader applicability of the findings. Given the variability in training environments, institutional policies, and safety cultures across healthcare institutions in Malaysia, these findings may not comprehensively represent all paramedic trainees in nationwide. Variations in healthcare infrastructure, clinical supervision, and enforcement of safety protocols can affect NSI rates and compliance to preventive measures. Additionally, future

research should consider expanding the sample size to include multiple institutions from different regions to enhance the generalisability of the results.

Moreover, the research focused on a narrow range of variables, mainly emphasising demographic elements, compliance to SOPs, and preventive strategies. It overlooked other crucial aspects, such as job-related stress, workload, and organizational policies concerning NSI management, which may also influence NSI risk. Factors such as heavy workloads and extended working hours can increase the chances of mistakes and accidental injuries. Furthermore, this study did not evaluate the effectiveness of institutional policies in handling NSIs. Future research addressing these gaps would offer a more thorough understanding of NSI risk factors among paramedic trainees.

Additionally, dependence on self-reported data may lead to potential biases such as including recall bias and social desirability bias. Some trainees may have experienced challenges in accurately recalling previous NSI incidents, while others may have underreported incidents due to concerns about judgment or misinterpretation of what constitutes an NSI. These biases may affect the accuracy and reliability of the data.

It is important to consider the possibility of underreporting due to fear of the consequences. Although recall bias and social acceptability bias were recognised, some trainees might have refrained from reporting NSIs due to concerns about disciplinary measures or negative judgments from their supervisors. In hierarchical training settings, where trainees may feel pressured to show competence, fear of

consequences could lead to underreporting of errors. Future research should investigate how institutional culture and reporting policies affect the disclosure of NSIs.

Additionally, differences in training and curriculum standards may have influenced the results. While this study concentrated on final-year paramedic trainees, variations in curriculum design, clinical exposure, and training methods across institutions could impact their compliance with preventive measures. Some trainees may have received more comprehensive training on NSI prevention practices, while others may have had limited exposure, potentially affecting the outcomes. A more extensive study that includes diverse training programs would help to address this limitation.

Furthermore, differences in clinical rotations and work assignments were not considered. Paramedic trainees participate in clinical placements in various healthcare settings, and some may encounter higher-risk environments, such as emergency departments, intensive care units, and surgical wards, where NSIs are more common. Others may have minimal direct patient interactions, thus reducing their risk. These differences could result in variations in the occurrence and reporting rates of NSIs. Future studies should examine how clinical placements influence the risk of exposure."

Finally, this study defined NSIs strictly as accidental needle pricks and did not encompass other sharp-related injuries or bloodborne exposure incidents. However, trainees are also at risk of similar hazards, such as cuts from broken ampules or

surgical instruments, as well as exposure to infected blood splashes, which were not accounted for in this definition. The exclusion of these incidents limits the study's capacity to capture the full scope of the occupational hazards encountered by paramedic trainees.

In summary, the limitations of this study underscore the necessity for more extensive research on NSI risks among paramedic trainees. The results may not be entirely applicable across different settings because of variations in training environments, institutional policies, and clinical experiences. Furthermore, the use of self-reported data could introduce biases, and the study's narrow focus on compliance to SOP neglects other important factors, such as workload and organizational policies. Additionally, this study did not consider differences in clinical placements or provide a comprehensive definition of NSIs. Future research should aim to fill these gaps to offer a more precise and comprehensive understanding of NSI prevention practices in healthcare.

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5.5 FUTURE STUDIES

Future studies should involve multiple institutions from various regions to make the results more widely applicable and consider a broader range of factors affecting NSI risk among paramedic trainees. Broadening the study group and including more risk factors, such as workload and institutional policies, would provide deeper insights into NSI prevention practices. To enhance data accuracy, future research should incorporate objective data sources, such as hospital records, official NSI reports, and observational studies, alongside self-reported data.

Moreover, using a broader definition of sharp-related injuries will provide a more comprehensive understanding of the clinical risks. To bridge the gap between knowledge of theory and application of practical, healthcare institutions should enhance hands-on training through simulation-based learning, scenario-based case studies and structured competency assessments. Regular refresher courses and real-life case discussions can reinforce safety protocols and ensure consistent application in clinical settings.

Institutions should also conduct routine audits of compliance to SOP and provide direct supervision during high-risk procedures. A key priority should be the consistent use of safety-engineered devices, such as self-capping needles and retractable syringes, along with accessible sharp-disposal containers and comprehensive training on their proper use. Simplifying NSI reporting through anonymous digital systems and establishing dedicated response teams can encourage timely and transparent reporting of NSIs.

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Additionally, thorough training on post-exposure protocols should be mandatory to ensure the prompt and appropriate management of injuries. Creating a strong safety culture from the outset is essential, and institutions should incorporate compulsory workshops on NSI reporting while emphasising the ethical and professional responsibilities of trainees. Encouraging mentorship programs, where experienced professionals model safe practices and guide trainees in exposure management, can further strengthen safety behaviours.

Collaboration with occupational health services should be reinforced to ensure

that trainees receive immediate medical assessment, counselling, and follow-up care after NSI. Introducing a reward system for compliance to safety protocols and responsible incident reporting, such as recognition through certificates or incentives, can further promote compliance. Building a proactive safety culture within healthcare training institutions is essential for reducing the occurrence of NSIs. Strengthening early education on safety protocols, fostering mentorship, ensuring access to occupational health services, and recognising compliance efforts will reinforce these preventive measures.

Expanding research on NSI risk factors and refining institutional policies will contribute to long-term improvements in safety. By prioritising safety and equipping trainees with the necessary resources and support, healthcare institutions can create an environment which NSI prevention practices is consistently maintained, ultimately leading to a safer clinical training experience.

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5.6 CONCLUSION

This study examined the occurrence of NSIs among paramedic trainees at a public health education institution in Perak, focusing on the compliance to SOPs, and prevention practices. The research findings revealed that despite the presence of safety protocols, NSIs remain a significant concern, with a considerable proportion of trainees reporting incidents. This suggests that current safety measures are not entirely effective in preventing injuries and that compliance to SOP remains inconsistent, highlighting the need for enhanced strategies to reduce risks.

The findings revealed that, despite the presence of safety protocols, NSIs remain a significant concern for paramedic trainees. A notable proportion of trainees reported experiencing NSIs during their training, suggesting that current safety measures are not entirely effective in preventing injuries. These results indicate that while SOPs exist, they are not always consistently followed, highlighting the need for additional strategies to improve compliance and reduce risks.

The TPB theory provided a useful framework for understanding trainee behaviors related to NSI risk and compliance to SOP. According to the theory, there are 3 main factors influencing behaviour comprises of attitudes, subjective norms and perceived behavioral control. In this study, trainees' attitudes toward safety procedures played a significant role in their likelihood of following SOPs. Those who had positive attitudes toward safety and understood the risks of NSIs were more likely to adhere to protocols, while those with negative perceptions or limited understanding were more likely to neglect safety measures.

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The influence of peers and instructors, called 'subjective norms' also played a big role in whether trainees followed safety rules. Trainees who felt supported by their colleagues and mentors were more likely to follow safety guidelines. However, those in an environment where safety was not a priority were more likely to ignore the rules. Another important factor was the trainee's confidence in their ability to avoid injuries, called 'perceived behavioural control'. Trainees who felt confident in their skills, knowledge and access to resources followed safety rules more often. Those who felt unprepared or didn't have enough resources were less like to follow the rules.

In terms of policy and practices, this study emphasized the needs to improve existing paramedic training programs. Institutions should focus on building a stronger safety culture and providing adequate resources and equipment. They should also create a supportive environment where compliance to safety rules is encouraged by both peers and the organisation. Additionally, training programs should include more hands on, practical lesson to help trainees manage real world risks more confidently.

Future research could explore other factors that affect whether trainees follow safety rules such as the culture of the institution, the leadership style of trainers, and the long-term impact of NSIs on trainees' mental health and careers. Comparing different training executed by different institutions could also help identify regional or institutional differences in NSI rates and the extent of compliance to safety protocols.

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These findings suggest that improving attitudes toward safety, building stronger support from peers and mentors, and as increasing trainees' confidence in following safety rules, are crucial for lowering the risk of NSIs. In addition, policymaker and training institutions also need to ensure safer and more productive learning environments for future HCWs.

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APPENDIX

APPROVAL LETTER

KEMENTERIAN KESIHATAN MALAYSIA
(Ministry Of Health Malaysia)
Institut Latihan Kementerian Kesihatan Malaysia
Sultan Azlan Shah
31250 Tanjong Rambutan
PERAK DARUL RIDZUAN

No. Tel.: 05-533 0270 05-533 1173
05-533 1171 05-533 1176
05-533 1172 05-533 5233
E-mel : sas@ilkkm.edu.my

Ruj. Kami: KKM.ILKKMSAS.PK.100-2/2/1 Jld.3(52)
Tarikh : 6 Disember 2024

Mohd Shahrul Azwan bin Ramli
Pelajar Sarjana
Pengurusan Keselamatan dan Kesihatan Pekerjaan
Universiti Utara Malaysia Kuala Lumpur
Jalan Raja Muda Abdul Aziz
Kampung Baru
50300 Kuala Lumpur
Wilayah Persekutuan Kuala Lumpur

Tuan,

PERMOHONAN KEBENARAN MENJALANKAN KAJIAN PENYELIDIKAN SARJANA DI INSTITUT LATIHAN KEMENTERIAN KESIHATAN MALAYSIA SULTAN AZLAN SHAH (ILKKM SAS), PERAK.

Dengan hormatnya saya merujuk perkara di atas dan rujukan e-mel tuan bertarikh 28 November 2024 adalah berkaitan.

2. Dimaklumkan bahawa, ILKKM Sultan Azlan Shah Perak **tiada halangan dan meluluskan** permohonan pihak tuan untuk membuat kajian penyelidikan sarjana di ILKKM SAS. Cadangan tarikh bagi penyelidikan tersebut ialah **6 Januari 2025 hingga 10 Januari 2025.**

3. Pihak Institusi akan **membatalkan** kelulusan permohonan ini sekiranya terdapat aktiviti/majlis rasmi yang diadakan pada tarikh yang sama dengan permohonan di atas. Sekiranya terdapat sebarang pertanyaan, pihak tuan boleh menghubungi pegawai kami

(a) Puan L. Yohgasundary a/p Letchumanan - samb. 2038
(b) Encik Zaidi bin Ahmad - samb. 1140

4. Sehubungan dengan itu, dimohon pihak tuan agar **mematuhi peraturan-peraturan yang telah ditetapkan** oleh pihak pengurusan Institusi sepanjang keberadaan pihak tuan di kawasan ILKKM SAS. ILKKM SAS juga merupakan **kawasan larangan merokok** dan pihak tuan akan dikenakan kompaun sekiranya melanggar peraturan yang telah ditetapkan. Bersama-sama ini disertakan peraturan-peraturan penggunaan fasiliti untuk rujukan tuan.

QUALITY SYSTEM SIRIM IQNet
CERTIFIED ISO 9001 : 2015
CERT NO : MY - CMS 01948

Kerjasama dan perhatian pihak tuan dalam perkara ini saya dahulukan dengan ucapan terima kasih.

Sekian.

"MALAYSIA MADANI"

"BERKHIDMAT UNTUK NEGARA"

Saya yang menjalankan amanah,

(WAN HAIRUDDIN BIN CHE WAN MOHD YASIN)
Pengarah

CCHASNIZA/Penyelidikan

s.k.:

(i) YBrs. Dr. Dhanabalan Sandra Segaran
Timbalan Pengarah Pengurusan

(ii) Tuan Haji Zaidi bin Ahmad
Ketua Program Pembantu Perubatan

(iii) Puan L.Yohgasundary a/p Letchumanan
Ketua Program Kejururawatan

Disertakan salinan e-mel bertarikh 28 November 2024 untuk makluman dan tindakan tuan/puan selanjutnya.

(iv) Puan Nurul Sakinah binti Hassan
Penolong Pegawai Tadbir N6 (TBK)

(v) Puan Hidayatu Fasihah binti Zakaria
Penolong Pegawai Tadbir N5

(vi) Encik Mohammad Saiful bin Mahmud
Ketua Unit Keselamatan

Universiti Utara Malaysia

RESEARCH QUESTIONNAIRE

QUESTIONNAIRE FORM

AWARNESS OF STANDARD OPERATING PROCEDURE COMPLIANCE AND NEEDLESTICK INJURIES PREVENTIVE PRACTICES AMONG PARAMEDIC TRAINEES

Greetings. The researcher is a Master of Science student in Occupational Safety and Health Management from School of Business, *University Utara Malaysia.*

You are kindly invited to complete this questionnaire. Your cooperation is highly appreciated.

- **The purpose of this questionnaire is to:**
    - Assess the level of awareness among paramedic trainees regarding compliance to Standard Operating Procedures related to needlestick injuries.
    - Examine the level of knowledge and preventive practices regarding needlestick injuries among paramedic trainees.
- All responses provided will be treated as **CONFIDENTIAL** and will be used solely for academic purposes.

- If you have any questions regarding this questionnaire, please contact: Mohd Shahrul Azwa at 018-7944973.
- **Instructions to respondents**:

  Please answer the following questions by marking the most appropriate option based on your situation. Please tick (/) in the appropriate box or fill in the blank spaces where applicable.

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SECTION A: SOCIO-DEMOGRAPHIC DATA

1. What is your current program of study?

☐ Medical Assistant Program ☐ Nursing Program

2. Ethnic:

☐ Malay ☐ Chinese

☐ Indian ☐ Others (please specify):

3. Gender:

☐ Male ☐ Female

4. Age:

☐ 20-22 years ☐ 23-25 years

☐ 26 years and above

5. Hepatitis B Vaccination:

☐ Yes ☐ No

6. Hepatitis B Immunization status:

☐ Complete (3 doses) ☐ Partially vaccinated (1 – 2 doses)

☐ Not vaccinated

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SECTION B: Incidence of needlestick injury:

1) Have you ever experienced a needle stick injury during your training?

☐ Yes ☐ No

2) If you have experienced a needlestick injury (NSI), please indicate the setting where it occurred.

☐ Accident & Emergency Department ☐ Pediatric Ward

☐ Medical Ward ☐ Surgical Ward

☐ Orthopedic Ward ☐ Obstetrics & Gynecology Ward

☐ Never Experienced

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SECTION C: Compliance to Standard Operating Procedures Regarding Needle Stick Injuries

Section C: **Compliance to Standard Operating Procedures (SOP) Regarding Needle Stick Injuries**	Answer Options				
	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
1. I am concerned that needle stick injuries pose a significant health risk	1	2	3	4	5
2. I am interested in learning about needle stick injury prevention and management.	1	2	3	4	5
3. I think working in environments with high exposure to sharp instruments increases the risk of NSIs.	1	2	3	4	5
4. I have received adequate training in using personal protective equipment (PPE) to prevent NSIs.	1	2	3	4	5

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5. I believe that failure to comply with SOPs during procedures can negatively impact my work performance and safety.	1	2	3	4	5
6. I am ready to comply with SOPs to prevent NSIs.	1	2	3	4	5
7. I always ensure the proper use of personal protective equipment (PPE) when handling needles or sharps.	1	2	3	4	5
8. I believe vaccination and post exposure prophylaxis are important to reduce NSI related risk.	1	2	3	4	5
9. I think that certain medical procedures involving needles pose a risk if SOPs are not strictly followed.	1	2	3	4	5

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SECTION D: Prevention practices following NSIs

Section D: **Prevention practices following NSIs, such as undergoing blood tests and accessing post-exposure prophylaxis.**	Answer Options				
	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
1. I am aware of post exposure prophylaxis (PEP) for HIV/AIDS.	1	2	3	4	5
2. I was taught about PEP before entering hospital/ clinic.	1	2	3	4	5
3. Should more emphasis be given to teaching about PEP in curriculum.	1	2	3	4	5
4. All patients undergoing surgical procedures should be asked for mandatory HIV test.	1	2	3	4	5
5. Patients with HIV infection should be treated separately	1	2	3	4	5
6. PEP can reduce the chances of HIV infection among health care workers.	1	2	3	4	5
7. Post exposure prophylaxis medication is available in government hospital.	1	2	3	4	5

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