KNOWLEDGE OF MAGGOT DEBRIDEMENT THERAPY AMONG MEDICAL AND SURGICAL NURSES IN HOSPITAL USM, KELANTAN

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SCHOOL OF HEALTH SCIENCES
UNIVERSITI SAINS MALAYSIA

2023

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by

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Dissertation submitted in partial fulfillment of the requirements for the degree of Bachelor in Nursing (Honours)

July 2023

ACKNOWLEDGEMENT

I want to express my deepest appreciation to my supervisor, Associate Professor Dr Soon Lean Keng, for her invaluable guidance and feedback. I also could not have undertaken this journey without her knowledge and expertise sharing with me. She encouraged and reminded us of the quote by Lao Tzu: "A journey of a thousand miles begins with a single step," which serves as an inspiring reminder of the importance of taking that first step, regardless of the obstacles that may lie ahead during my research work journey in my final year nursing degree study.

Special thanks to Dr Azlina Yusuf and Ms Hasni Embong for their support during my dissertation and degree nursing journey. Mere words could never express my gratitude for their truly caring for me. Besides, this endeavour would not have been possible without the teaching and support of my course coordinator, Dr Norhasmah Mohd Zain.

Additionally, I sincerely thank my senior, Ong Yi Yi, who motivate me throughout the research process, which I greatly appreciate.

Finally, I'd like to mention my family and partner provided me with unconditional support, such as emotional and financial support, to overcome the challenges. Thank you for lending a helping hand. Words can barely express how thankful I am that they are in my life. Also, they believe in me, encouraging me to work smart and hard to reach my goals. Furthermore, I would be remiss in not mentioning my good friends for motivating me during the process.

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LIST OF ABBREVIATIONS

APEX	-	Accelerated Programme for Excellence
CNHW	-	Chronic Non-Healing Wound
DFU	-	Diabetes Foot Ulcer
DM	-	Diabetes Mellitus
Hospital Universiti Sains Malaysia	-	Hospital USM
LMICs	-	Low and Middle-Income Countries
MDT	-	Maggot Debridement Therapy
MOH	-	Ministry of Health
PU	-	Pressure Ulcer
QoL	-	Quality of Life
USM	-	University Science Malaysia
WHO	-	World Health Organisation

PENGETAHUAN TENTANG TERAPI DEBRIDEMEN BERENGGA DALAM KALANGAN JURURAWAT MEDIKAL DAN SURGIKAL DI HOSPITAL USM, KELANTAN

ABSTRAK

Terapi debridmen berengga (MDT) semakin mendapat pengiktirafan sebagai rawatan alternatif yang penting untuk penyembuhan luka kronik. Oleh itu, pengetahuan jururawat tentang MDT adalah penting. Kajian ini bertujuan untuk mengenalpasti pengetahuan MDT dalam kalangan jururawat medikal dan surgikal. Satu kajian keratan rentas keatas 165 jururawat yang bekerja di wad medical dan surgikal, dipilih secara rawak telah dijalankan di Hospital USM dari 1 Februari 2023, hingga 31 Mac 2023. Soal selidik tinjauan 20 item yang disahkan telah digunakan untuk mengukur pengetahuan jururawat tentang MDT. Populasi kajian diterangkan melalui statistik deskriptif (min, sisihan piawai, frekuensi dan peratusan). Ujian pekali korelasi Pearson digunakan untuk menentukan perkaitan antara ciri sosio-demografi dan skor pengetahuan MDT. Purata umur peserta ialah 32.72 ± 5.19 tahun. Daripada peserta, 52.7% mempunyai pengetahuan yang lemah tentang MDT, manakala 21.2% mempunyai pengetahuan sederhana. Hanya 26.1% peserta mempunyai pengetahuan yang baik tentang MDT. Kolerasi yang signifikan diperhatikan antara pengetahuan MDT jururawat dan pernah mendengar berkenaan MDT (p=0.034), dan melakukan MDT (p=0.025). Tiada perkaitan yang signifikan secara statistik antara skor pengetahuan dan pembolehubah sosiodemografi (umur, tahap pendidikan kejururawatan, tempat kerja, dan tahun pengalaman bekerja). Dapatan menunjukkan bahawa pengetahuan jururawat tentang MDT adalah rendah hingga sederhana, dan korelasi yang signifikan diperhatikan antara pengetahuan MDT jururawat dan pernah mendengar dan melakukan MDT. Oleh itu, program pendidikan dan

latihan dalam perkhidmatan diperlukan untuk meningkatkan pengetahuan jururawat tentang MDT.

KNOWLEDGE OF MAGGOT DEBRIDEMENT THERAPY AMONG MEDICAL AND SURGICAL NURSES IN HOSPITAL USM, KELATAN

ABSTRACT

Maggot debridement therapy (MDT) is gaining recognition as an important alternative treatment for chronic wound healing. Hence, nurses' knowledge of MDT is critical. This study aimed to determine the knowledge of MDT among medical and surgical nurses. A cross-sectional study of 165 nurses working in the medical and surgical wards, randomly selected, was carried out at Hospital USM from February 1, 2023, to March 31, 2023. A validated 20-item survey questionnaire was used to measure nurses' knowledge of MDT. The study population were described by descriptive statistics (means, standard deviations, frequencies and percentages). The Pearson correlation coefficient test was employed to determine the association between socio-demographic characteristics and MDT knowledge score. The mean age of participants was 32.72 ± 5.19 years old. Of the participants, 52.7% had poor knowledge of MDT, whereas 21.2% had moderate knowledge. Only 26.1% of participants had good knowledge of MDT. A significant correlation was observed between nurses' MDT knowledge and heard of MDT (p=0.034) and performed MDT (p=0.025). There was no statistically significant association between the knowledge score and the sociodemographic variables (age, nursing education level, workplace, and years of working experience). Findings shed light that nurses' knowledge of MDT was low to moderate, and a significant correlation was observed between nurses' MDT knowledge, heard of MDT and performed MDT. Therefore, in-service MDT education and training programs are needed to enhance nurses' knowledge of MDT.

CHAPTER 1

INTRODUCTION

1.1 Introduction

Despite the technological advances experienced by nurses, chronic wound treatment remains a challenge for most healthcare systems worldwide. Maggot debridement therapy (MDT) is one of the alternative treatments for non-healing wounds and is beneficial in wound healing. Studies showed that the therapeutic larvae as a natural way to remove necrotic and infected tissue had saved patients from needing amputation (Moya-Lopez et al., 2020; Naik & Harding, 2017). MDT plays an essential role in the salvaging of limbs. As reported by Nair and colleagues, a foot is amputated every 20 seconds worldwide. Since 2003, the use of maggots as a 'weapon' to preserve a limb from amputation has become a viable option for persons with diabetes, with a total of 10,000 patients benefiting from maggot therapy over the last six years in Hospital Kuala Lumpur (Nair, Wasi, Teh, Lee, & Chong, 2021)

Wound healing has been under the patronage of basic nursing care practices encompassing wound management, such as caring for patients with dressings. As such, the myriad of nurses practising effective wound care management in settings across the continuum should be understood for their unique contribution to wound care and knowledge. Effective management of chronic wounds is complex. Therefore, nurses should have the appropriate knowledge and skills to maximise positive patient outcomes, wound care and treatment (Welsh, 2018). Knowledge deficit will cause more issues and an inability to provide proper health education to the patient. However, little is known about nurses' knowledge regarding MDT in wound care.

Wound management provides an optimum environment for wound healing, which

includes treating all types of wounds by nurses in a clinical healthcare setting. Therefore, nurses' knowledge is vital in applying MDT to wound care. This thesis presents a cross-sectional study determining the knowledge regarding MDT among medical-surgical nurses at Hospital Universiti Sains Malaysia (Hospital USM), Kelantan.

1.2 Background of the Study

The Malaysian Ministry of Health's (MOH) statistics revealed that out of over 3 million Malaysian citizens diagnosed with Diabetes Mellitus (DM), nevertheless, 15% would develop lower limb ulcers (MOH, 2014). Furthermore, studies by Nair and Nur Zati (2019) show that chronic wounds of the lower extremities are hard to heal. As a result of poor wound healing, patients' quality of life (QoL) worsens, raising morbidity and mortality rates and typically increasing healthcare costs. Furthermore, as Burgess et al.'s (2021) study argued, nearly 25% of diabetes patients with chronic non-healing wounds (CNHW) often result in lower limb amputation, economic burden and psychosocial stress. However, early studies have demonstrated that an alternative treatment for wound care options in a healthcare setting is maggot debridement therapy (MDT), a low-cost treatment with various therapeutic benefits and is easy (Prete, 1997; Sherman, Hall & Thomas, 2000). Furthermore, MyHEALTH (2016), Prete (1997) and Sherman, Hall and Thomas (2000) have documented that sterile live maggots are used to eliminate dead tissues, disinfect and enhance wound healing. The MDT therapeutic effects of maggots on the healing of chronically infected wounds have been recognised in the literature for hundreds of years (Moya-Lopez et al., 2020; Naik & Harding, 2017).

1.3 Problem Statement

Chronic wounds affect over 1% of the world's population and constitute a serious

and underestimated problem for healthcare systems, medical personnel, and patients (Martinengo et al., 2019; Le Goff-Pronost et al., 2018; Jarbrink et al., 2016). Chronic wounds caused by underlying physiological causes such as diabetic wounds, pressure ulcers, venous leg ulcers and infected wounds affect a significant portion of the population. Therefore, to treat chronic wounds, a strong debridement, removal of necrotic tissue, elimination of infection and stimulation of granulation tissue are required. Maggot debridement therapy (MDT), an alternative treatment method based on history, has been widely used (Tombulturk & Kanigur-Sultuybek, 2021). Many treatments are available in wound healing, and MDT is one option (Nair et al., 2021).

The burden of chronic wounds remains the utmost challenge to the healthcare system worldwide despite the emergence of technology. The National Health Service's cost of looking after patients with chronic wounds in the United Kingdom is around £2.3 billion to £3.1 billion per year (Naik & Harding, 2017). In Malaysia, diabetic foot ulcers (DFU) account for 15% of all occurrences of diabetes and are on the rise as the population ages. When left untreated or inadequately treated, diabetic foot ulcers (DFUs) are one of the main problems of long-term diabetes and can result in amputation. As a result, the financial burden on DFU patients is rising. The cost per person annually in total was approximately MYR5981 in public and MYR8581 in private settings (Nair et al., 2022).

Nurses are responsible for wound care and management therapy in most medical centres and hospitals and represent the most important multidisciplinary team members in healthcare settings (Moore et al., 2014; Vuolo, 2006; Surme et al., 2022). However, a thorough literature review shows a little study was conducted on this research topic in Malaysia or internationally. Hence, the present study is to determine the knowledge of MDT among medical and surgical nurses in Hospital USM, Kelantan.

In this context, Promoting Excellence as the conceptual framework guides the

study. For example, knowledge is important for creating patient awareness (Mihalache et al., 2021). Therefore, this framework provides a useful reference point in informing this study to determine the knowledge about MDT among medical and surgical nurses in Hospital USM.

1.4 Research Questions

Formulating the research questions is important as the research question discover an existing uncertainty in an area of concern and provides direction (Ratan et al., 2019). For this study proposal, the following research questions guide the researcher in achieving the study's objectives are as follows:

i. What is the knowledge level about MDT among medical and surgical nurses in Hospital USM, Kelantan?

ii. Is there any association between socio-demographic characteristics (age, nursing education level, workplace, year of working experience, heard of MDT and performing MDT on the patient) and knowledge level regarding MDT among medical and surgical nurses in Hospital USM, Kelantan?

1.5 Research Objectives

Research objectives describe concisely what the research is trying to achieve and explain; and the reason for pursuing it (Ryan, 2022).

1.5.1 General Objective

This study aims to determine MDT knowledge among medical and surgical nurses in Hospital USM, Kelantan.

1.5.2 Specific Objectives

i. To determine the level of knowledge on MDT among medical and surgical nurses in Hospital USM, Kelantan.

ii. To determine the association between socio-demographic characteristics (age, nursing education level, workplace, year of working experience, heard of MDT and performing MDT on the patient) and knowledge regarding MDT among medical and surgical nurses in Hospital USM, Kelantan.

1.6 Research Hypotheses

A research hypothesis is a statement of expectation or prediction that research will test. Following are the alternative and null research hypotheses of this study:

Hypothesis 1 : A significant association exists between selected socio-demographic characteristics (age, nursing education level, workplace, year of working experience, heard of MDT and performing MDT on the patient) and knowledge regarding MDT among medical and surgical nurses in Hospital USM. (H_A)

: No significant association exists between selected socio-demographic characteristics (age, nursing education level, workplace, year of working experience, heard of MDT and performing MDT on the patient) and knowledge regarding MDT among medical and surgical nurses in Hospital USM. (H_O)

1.7 Significance of the Study

Consensus on the assessment and management of wound infection varies. Additionally, wound healing involves complex biochemical and cellular events. Chronic wounds do not follow a predictable or expected healing trajectory. They may persist for months or years due to underlying disease processes, excessive or prolonged inflammation, recurrent injury and comorbid conditions (Woo, 2016). Many treatments are available in association with wound healing in patients, and biological therapy using maggots is one treatment option. The Institute of Medical Research Malaysia found wounds using the application of MDT showed a reduction in slough and necrotic tissue, with wound healing as assessed by area measurements. In MDT, pain reduction was noted, and there were no untoward effects (Nair et al., 2021).

Nurses have a critical role in wound care and dressing selection. However, a literature search shows no study on Malaysian nurses' knowledge levels about MDT. Better knowledge of MDT decreases wound-related complications and enhances patients' quality of life. With sufficient knowledge concerning MDT, a nurse can perform a systematic and holistic patient assessment and identify possible wound complications early (Surme et al., 2022; Mihalache et al., 2021). Therefore, this study aimed to determine medical-surgical nurses' knowledge of MDT.

1.8 Conceptual and Operational Definition

The following conceptual and operational definitions of this research study are as follows:

Variables	Conceptual Definition	Operational Definition
Maggot Debridement Therapy (MDT)	MDT is known as biosurgery, biodebridement, and larval therapy. It is a type of alternative treatment and uses live maggots (disinfected fly larvae) to treat the diabetes non-healing wound (MyHealth, 2016).	In this study, MDT is the application of live fly larvae to wounds to facilitate wound debridement by sterilised *Lucilia cuprina* larvae species. It helps to debride the necrotic and sloughy wound, disinfect it, and enhance the healing process by allowing healthy granulation tissue to develop (Nair et al., 2021; MyHealth, 2016).
Knowledge	Knowledge refers to understanding information about a subject learned through education or experience, either known by a person or possessed by people generally (Cambridge English Dictionary, 2015).	This study's knowledge is about MDT, which contains 20 questions. It comprises four domains: physiology of medical maggot, benefits of MDT, type of wound suitable for MDT and MDT wound care and side effect determined through "True," "False," and "Unsure" responses (Appendix A). The total knowledge scores will be

		categorised into three levels based on Bloom's Taxonomy cut-off: High (≥80%), moderate (≥60% to <80), and low level (<60%) (Feleke, Wale & Yirsaw, 2021).
Nurse	A person has been trained to care for people who are sick or injured, especially in a clinic or hospital (Cambridge English Dictionary, 2015).	In this study, the nurse refers to staff nurses working at medical and surgical wards in Hospital USM.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter details the literature review relevant to the research being investigated. The keywords used to search these articles include maggot debridement therapy (MDT), knowledge among medical and surgical nurses, diabetes foot ulcer, and Malaysia. Two sub-headings were included in this literature review: Maggot Debridement Therapy, the current perspective in wound healing, nurses' knowledge of MDT and the study's conceptual framework underpinning the research study.

2.2 Maggot Debridement Therapy: Current Perspective in Wound Healing

According to World Health Organization (WHO, 2022), diabetes is a significant cause of lower limb amputation. It was stated that a patient with diabetes has a 15–20 times higher risk of experiencing lower limb amputation than a non-diabetes person (Kogani, Mansournia, Doosti & Holakouie, 2015). The prevalence of lower limb amputation is ever-increasing worldwide. It causes morbidity and mortality, leading to healthcare burdens (Ahmed, Tannous, Agho, Henshaw, Turner & Simmons, 2021).

Diabetes is escalating globally while incidences of diabetic foot ulcers have been growing (Yazdanpanah, Shahbazian, Nazari, Arti, Ahmadi, Mohammadianinejad, Cheraghian & Hesam, 2018). An alternative treatment method that has produced satisfactory outcomes in chronic wound healing since World War II is maggot debridement therapy (MDT) (Naik & Harding, 2017). MDT mainly treats foot ulcers associated with diabetes mellitus, peripheral arterial disease, and chronic venous

insufficiency (Von Beckerath et al., 2020). The primary function of MDT is debriding, disinfecting and enhancing healing. Wound bed preparation is crucial in assisting chronic non-healing wounds in the healing process. It required an effective debridement technique to eliminate the dead tissue and slough to heal. MDT is also an antimicrobial treatment for chronic wounds (Naik & Harding, 2017). Therefore, MDT could be a preferable alternative treatment for patients with multidrug-resistance bacteria in DFU.

MDT, also referred to as larval therapy, biodebridement, or biosurgery, is a type of biotherapy that entails the intentional application of live, sterilised fly larvae or maggots into the non-healing wound of a human or animal to debride the necrotic wound, reduce bacterial contamination of the wound, as well as to enhance the formation of healthy granulation tissue and stimulate healing in a non-healing wound. MDT is an alternative method that uses biological agents such as maggots and aseptically reared larvae on wounds to accelerate wound healing and debridement. MDT is one option for treating chronic, infected, necrotic and sloughy wounds (Nair et al., 2021). It was reported in previous studies during clinical observations that MDT is a promising alternative method to debride, disinfect, and stimulate the healing of chronic wounds (Marimuthu & Wan Sulaiman, 2022; Choudhary et al., 2016).

Maggots are the common green bottle fly, the *Lucilia sericata*. Its sister species is *Lucilia cuprina* (Davis, Belikoff, Dickey, Scholl, Benoit & Scott, 2021). It could eliminate slough and necrotic tissue from the wounds because of the nature of larvae feeding. *Lucilia sericata* species can be found in countries with a temperate climate, such as in America and Europe. Contrary, *Lucilia cuprina* species could be found in tropical countries, such as Malaysia, which are ideal maggots used in MDT. The positive clinical outcome showed decreased pathogenic organism, complete debridement, reduced odour, and improved healing rates in 2 months (Baer, 2011). According to Cazander, Gottrup &

Jukema (2009), cited by (Marimuthu & Wan Sulaiman, 2022), the scientific evidence and reports issued on MDT, the United States Food & Drug Authority approved the registration of *Lucilia sericata* species as a medical device in 2004. MDT was approved to treat venous stasis ulcers, neuropathic foot ulcers, pressure ulcers and non-healing traumatic post-surgical wounds (Cambal, 2006; Lipsky, 2004). Furthermore, research on *Lucilia cuprina* species, which is mainly found in tropical countries, especially in Malaysia, indicated that the *Lucilia cuprina* species in MDT could play an essential role in the debridement of sloughy wounds and enhance healing (Paul et al., 2009)

2.3 Nurses' Knowledge of Maggot Debridement Therapy

A study by Bazalinski, Mita, Scislo and Wiech (2022) among 290 nurses in Poland found that the perception and readiness to implement the method in the tested sample is average (standard). The image of maggots in the wound causes negative emotions among medical personnel. The higher the knowledge of the MDT method, the greater the motivation to implement it in practice. A cross-sectional study of nurses on the use of MDT in the treatment of diabetic ulcers in Cameroon, Africa, found divided awareness and attitude towards the use of maggots in the treatment of diabetic ulcers and the need to increase awareness amongst the nurses on its importance in the treatment of diabetic ulcers (Cumber et al., 2016). A survey by Nigam (2021) at Swansea University to assess nurses' views on MDT in wound care found that nurses deter from using maggots in wound care. However, a study by Peterson, Jung, Hoffmann and Rice (2016) found that nurses were comfortable managing the dressing changes in MDT and participated in the application and removal processes.

Hopkins, William, Brown, Humphreys, Clifford and Nigam (2022)'s in-depth interviews on the opinion and perception of nurses regarding the MDT and found that a

lack of knowledge about maggot therapy was a prime concern and highlighted a need for better education and training in MDT for all nurses, to address issues with acceptance and willingness to treat or help treat patients with hard-to-heal wounds which are suitable for MDT.

2.4 Conceptual Framework of the Study

The "National Wound Care Core Capabilities framework" is developed by National Wound Care Strategy Programme (National Wound Care Strategy Programme, 2021). The National Wound Care Core Capabilities Framework will direct this study to accomplish the research objectives and investigate pertinent data. The framework describes the required skills, knowledge and behaviours to improve wound care in three clinical areas (Pressure Ulcers, Lower Limb and Surgical Wounds). However, this study's core capabilities framework identifies and describes MDT's knowledge. Improving knowledge and practice of wound care is paramount to reducing wound infection. In addition, better knowledge and practice of wound care decreases wound-related complications and enhances one's quality of life (QoL) (Tegegne et al., 2022). This framework outlines the knowledge required from a health care professional, nurses, to provide specific interventions and care for patients undergoing MDT.

According to the National Wound Care Strategy Programme (2021), the framework is built based on the knowledge that must be passed to provide competent patient care. In addition, the framework can be useful in guiding and informing on areas to be improved on personal (nursing practice) and organisational levels. It can help nurses identify knowledge gaps on an academic and professional level. As a result, they would have more confidence in using larvae in wound care. In addition, the educational sector may use the

gaps in nurses' knowledge to guide the content of the education and training they give and shape the design and delivery of future professional education and training. The Core Capabilities Framework identifies and describes the skills and knowledge required to deliver high-quality, person-centred wound care. The present study determines the nurses' knowledge level about MDT in wound care. Figure 2.1 illustrate the framework used to establish the relationship between the concepts such as MDT knowledge among medical and surgical nurses in Hospital USM and their socio-demographic characteristics. The higher the scoring percentage, the higher the knowledge of MDT.

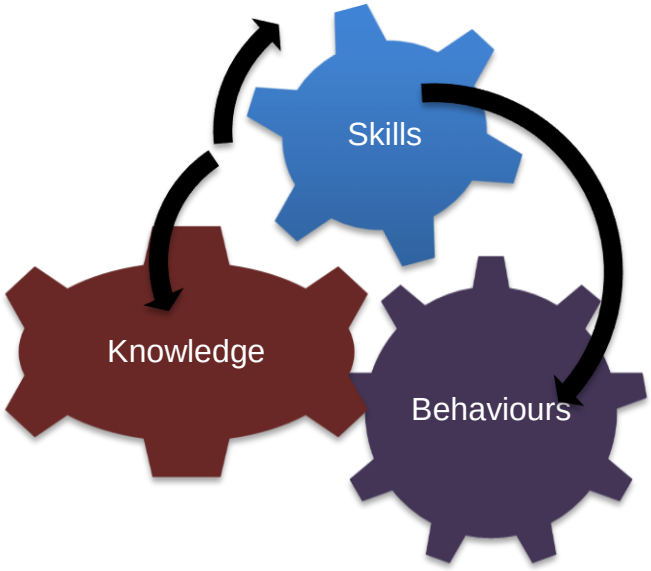

Figure 2.1 The National Wound Care Core Capabilities Framework
[Source: National Wound Care Core Capabilities Framework for England]

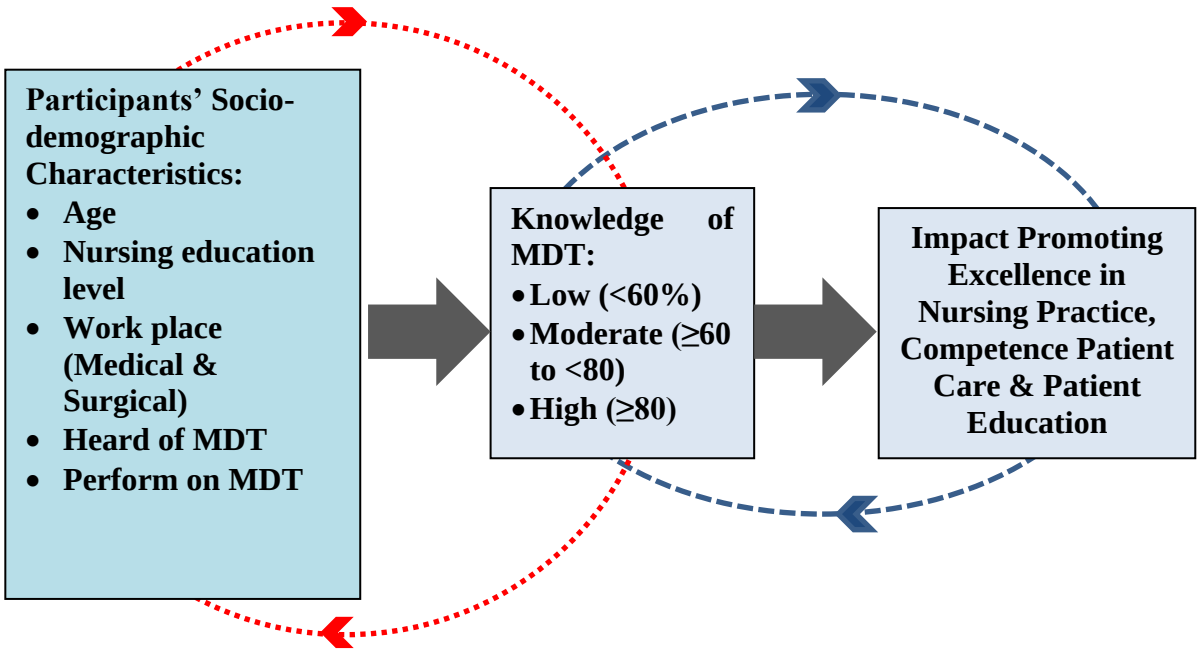

Figure 2.2 Conceptual Framework for the Study based on the National Wound Care Core Capabilities

[Source: National Wound Care Core Capabilities Framework for England]

CHAPTER 3

RESEARCH METHODOLOGY AND METHOD

3.1 Introduction

Maggot debridement therapy (MDT) has been used successfully in treating severely infected or necrotic wounds for many years. However, it can present challenges for nurses (Bazalinski, Przybek Mita, Scisło & Wiech, 2022). The present study aimed to determine the MDT knowledge among medical and surgical nurses in Hospital Universiti Sains Malaysia (Hospital USM), Kelantan. First, the chapter explains the approach and rationale used to support the chosen research methodology. Choosing and understanding an appropriate research design is important for achieving the study's aims. The chapter thus begins by describing a cross-sectional design and a justification for this approach. Second, the chapter describes the study setting, population, participant selection criteria, sampling plan, sample size determination, and instrumentation, including ethical considerations through data collection methods. Finally, this chapter details the statistical analyses.

3.2 Research Design

A cross-sectional study design was utilised to determine the medical-surgical nurses' knowledge regarding MDT in Hospital USM, Kelantan. The justification and rationale are the characteristics of the cross-sectional design of the observed variables collected at a single point in time and are suitable for this study (Polit & Beck, 2018).

3.3 Study setting and population

The Hospital USM, Health Campus, Kelantan, is the study setting. The hospital

was chosen due to its recognition as a referral hospital with 768 beds for patients in Kelantan and its provision of a wide range of clinical services for approximately 1,792,501 million people in Kelantan (Department of Statistic Malaysia Official Portal, 2022). The researcher utilized the randomizer to select the nurses from medical and surgical wards, respectively, from the listed adult medical and surgical wards (1 Selatan, 2 Intan, 2 Zamrud, 3 Utara, 4 Utara, 4 Selatan, 7 Selatan, 7 Utara, 8 Selatan, 8 Timur Depan) in Hospital USM. Moreover, the study population is the subset of the target population available for study, for example medical and surgical nurses in Hospital USM.

3.4 Sampling Plan

Sampling is the process whereby the researcher(s) selects a small section from a larger group of people which is known as the population (Taherdoost, 2018). According to Morse (2016) cited by Muslim, Bakar & Omar (2021), the purpose of the sampling method is to maximise the research efficiency and validity. In addition, the sample that completes all aspects and is adequate in size has higher representativeness, thus allowing results to be generalised back to the targeted population.

3.4.1 Inclusion Criteria

Specific eligibility requirements for inclusion in this study stipulated that each participant must be:

- Nurses working at Medical and Surgical Wards, Hospital USM
- Have at least one year of work experience as a nurse. Previous studies stated that the extent of one year qualified the ability of the nurses to use their clinical place experience in their daily work in the health service (Manoochehri, Imani, Atashzadeh & Alavi, 2015). Thus, this implies that nurses with a year of more clinical experience impact work efficiency.

- Nurses who were readily available at the workplace during the data collection period.

3.4.2 Exclusion Criteria

Participants were excluded from the study if they:

- Weren't specifically engaged in patient care at the bedside, like nursing matrons and those working in the Outpatient Clinics.

3.4.3 Sampling Size Estimation

Sample size estimation is the most crucial methodological part of a research study for drawing inferences about the population or generalising study results (Sharma et al. (2019). For example, a statistical report 2022 showed that the Hospital USM had 261 nurses in different medical and surgical wards working as a rotation method.

For objective 1, the single proportion formula and the population proportion were taken based on a similar previous study conducted by Bazalinski et al. (2022). Therefore, the proportion of the level of knowledge regarding MDT on wound healing from this study is 10% (p=0.1). The estimated sample size for objective one is calculated using the sample size estimation formula as follows:

$$N = \left[\frac{1.96}{0.05}\right]^2 0.1\ (1 - 0.1)$$

N = 139

If n is the sample size required per the formula and d (10%) is the dropout rate, then adjusted sample size N is obtained as N = n/(1-d) = 153. Thus, for objective one, the total sample size was 153.

For objective 2, the sample size was calculated using a priori G*power analysis to generate the minimum sample size required to detect the medium effect size, with a 0.80 desired statistical power level. The calculated sample size was 150. Therefore, N= 150

By considering the dropout rate as 10%, the adjusted n is 165. The highest sample size of 165 participants was employed for this study. Therefore, the sample can be considered as the representative sample size.

3.4.4 Sampling Method

The best method to obtain a representative sample is randomly selecting the sample from the population (Polit & Beck, 2018). This study used simple random sampling to choose the study setting and recruit the participants. Hence, the study site and participants have an equal chance of being chosen, and a carefully matched sample is said to have external validity (Polit & Beck, 2018). Because it uses randomisation, any research performed on this sample should have high internal and external validity (Polit & Beck, 2020). The advantage of this technique is that it is easy to use and the most direct method among the probability sampling methods. Also, simple random sampling works best when studying a limited target population that can be sampled easily. For example, the researcher used the randomizer to select the nurses from medical and surgical wards, respectively, from the listed adult medical and surgical wards (1 Selatan, 2 Intan, 2 Zamrud, 3 Utara, 4 Utara, 4 Selatan, 7 Selatan, 7 Utara, 8 Selatan, 8 Timur Depan) in Hospital USM.

The nurses from these wards were chosen randomly using the same method. This sampling method gives the researcher a representative sample that can be used to draw conclusions about the population (Polit & Beck, 2020).

3.5 Research Instrument

The research instrument used in this study was a structured, self-administered questionnaire developed by researcher and supervisor based on the Ministry of Health Malaysia Official Portal Patient's Education on Maggot Therapy and literature reviews (Nair et al., 2021; Naik & Harding, 2017; MyHEALTH, 2016) and underwent a sequential validation process, including content, face validity and exploratory factor analysis (Polit & Beck, 2020).

3.5.1 Questionnaire

The self-administered questionnaires in this study consist of two parts (Appendix A). Part 1 consists of socio-demographic characteristics such as age, nursing education level, workplace (medical and surgical), years of working experience, heard of MDT and performing MDT). Part II consists of 20 items questions covering MDT to determine the knowledge of nurses of MDT, which contained four domains: physiology of medical maggot (Questions 1 to 6), benefits of MDT (Questions 7 to 13), type of wound suitable for MDT (Questions 14 to 16), and MDT wound care and side effect (Question 17 to 20). In addition, each item asked participants to rate their responses on "True", "False", and "Unsure" options.

3.5.2 Validity and Reliability of Instrument

Validity and reliability are two important components in research to ensure the quality of the research as well as the rigour of the research. Validity refers to how accurately the instrument corresponds to real properties, characteristics and variations, whereas reliability refers to how consistent the results can be achieved (Middleton, 2022). An instrument with high validity is generally reliable; in contrast, an instrument with high reliability is not necessarily valid. According to Tavakol and Dennick (Tavakol &

Dennick, 2011), the accepted values of Cronbach's alpha should range from 0.70 to 0.95.

Three expert panels (two surgical doctors from Hospital USM and a nursing matron in charge of the medical and surgical ward) were consulted to determine whether the instrument was appropriate and concise in content validity. In addition, these professionals assist with suitable phrasing and review each item for clarity. The acceptance of the content validity index was then determined (Taber et al., 2018). Finally, following expert confirmation, the instrument was modified accordingly.

A pilot study was essential to assess the instrument's reliability, and the results were not included in the main study. According to Tseng and Sim (2021), one aspect of pilot and feasibility studies that remains unclear is the required sample size, which is usually small-scale. Also, there is no consensus, but the recommendations vary from 12 to 50 participants depending on the study's main objective (Lewis et al., 2021). According to Hassan et al. (2006), participants for the pilot study should ideally come from different populations to avoid skewing the results. Hence, a pilot study was performed among twenty randomly selected nurses at the Outpatient Clinic, Hospital USM, to test the instrument's feasibility and internal consistency. The Cronbach's α value for the knowledge scale derived was 0.9, indicating the internal consistency was excellent (Taber et al., 2018). For the actual study, the internal consistency scale were also calculated. Results revealed was excellent Cronbach's alpha of 0.9.

3.6 Variables

Variables are measurable traits that can alter throughout a scientific investigation (Mariecor, 2018). Independent and dependent variables were used in this research. An independent variable is a variable that the researcher manipulates to explore its effects and is not influenced by other variables. In contrast, the dependent variable is a variable

that reflects an outcome and depends on the independent variable (Bhandari, 2022). In other words, the independent variable is the cause, while the dependent variable is the effect. The value for the dependent variable depends on the independent variables (Bhandari, 2022).

3.6.1 Measurement of Variables

The variables measurements in this study are the independent and dependent variables. The independent variables used in this study were socio-demographic characteristics. Nominal measurements were used to classify socio-demographic variables. In nominal measurement, the categories are mutually exclusive, and the variable either has or does not have the characteristic (Geri & Judith, 2014). Table 3.1 illustrate the independent and dependent variables.

Table 3.1 Independent and Dependent Variables

Independent variables	Socio-demographic characteristics of participants were age, nursing education level, workplace, year of working experience, heard about MDT and performed MDT.
Dependent variables	Knowledge about MDT was based on four domains: Knowledge of the physiology of medical maggot, knowledge of benefits of MDT, knowledge of the type of wound suitable for MDT, and knowledge of side effects of MDT. The response was marked with “True”, “False”, and “Unsure” options.

3.6.2 Variable Scoring

In this self-administered survey, knowledge of MDT among medical and surgical nurses was determined with “True”, “False”, and “Unsure” options. The ‘Unsure’option avoids unnecessary Yes or No guessing by the participants. One point was awarded for each correct response and a zero for each wrong or unsure response. This study utilised

the formula (raw mark x 100)/20. The total points collected were transformed into a percentage mark from the raw mark. The percentage marks collected were interpreted and divided into three groups based on Bloom's Taxonomy cut-off: high (80%), moderate (60% to 80%), and low (60%) (Feleke, Wale, & Yirsaw, 2021). Table 3.2 illustrates the knowledge level about maggot debridement therapy among participants, whereby highly indicated nurses who responded to greater than or equal to 80% of the knowledge of MDT statements correctly. Moderate refers to nurses who responded to less than 80% of the knowledge of MDT statements correctly, while low indicates nurses responded to 60% and less than MDT knowledge. The higher the scoring percentage, the higher the knowledge of MDT.

3.7 Data Collection Process

Data collection commenced from February 2023 to March 2023 after gaining ethical approval from the Human Research Ethical Committee (HREC), USM and permission from the Director of Hospital USM. After selecting eligible participants who fulfil the inclusion criteria, the researcher explains the purpose of the study to participants and attains verbal and written consent. The researcher acknowledged to all participants that participation is voluntary and they must complete a self-administered questionnaire which takes approximately 10 to 15 minutes. Upon completion, the researcher gathered the questionnaire and checked for completeness. Figure 3.1 illustrates the flow chart of the data collection process. Appendix D details the Gantt Chart of this study.

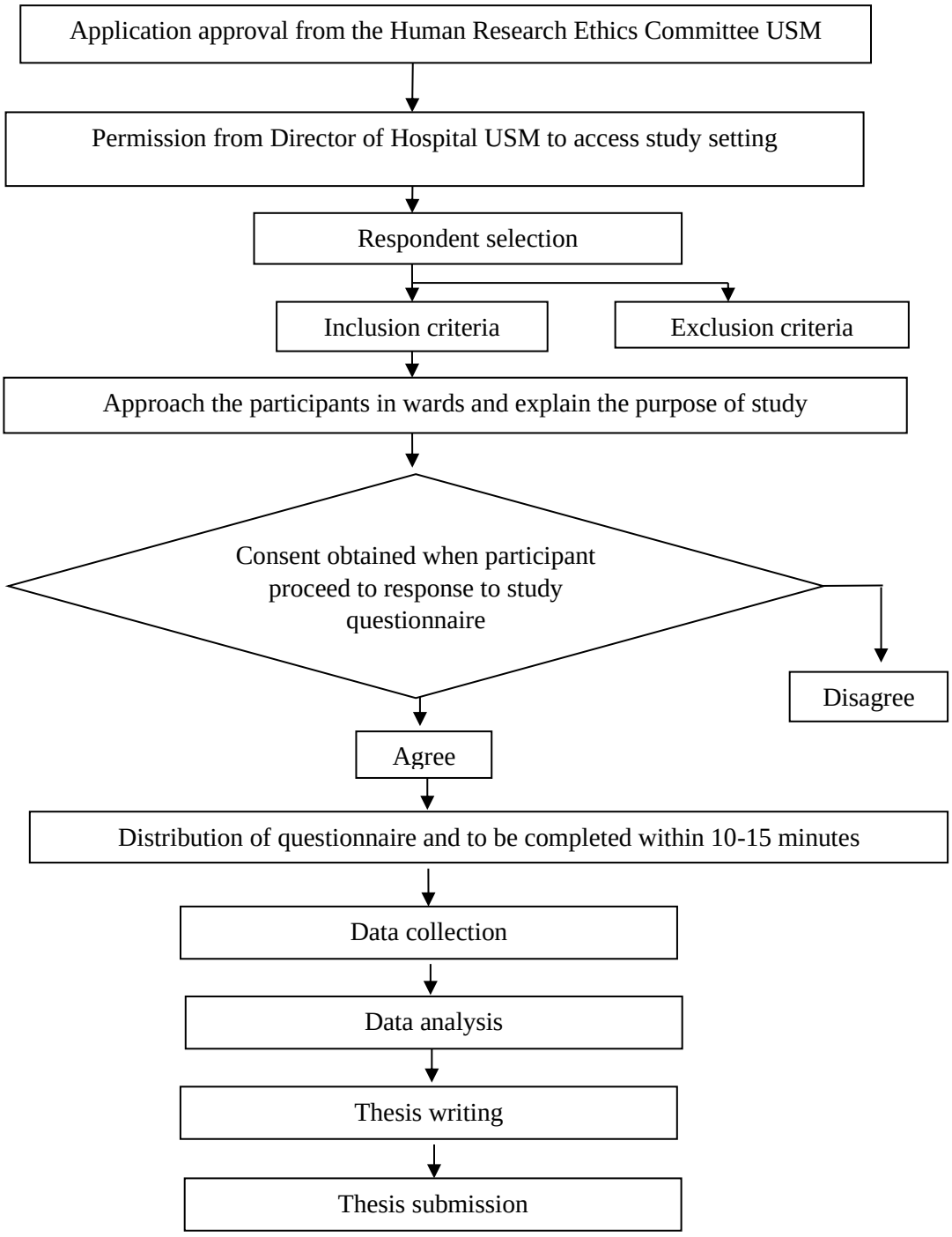

Figure 3.1 Flow Chart of Data Collection Process

3.8 Ethical Consideration

Approval was sought from the Human Research Ethics Committee (HREC), Universiti Sains Malaysia (USM/JEPeM/22120807)(Appendix E) and the Director of Hospital USM, Health Campus, Kelantan, before the conduct of the actual study. Eligible participants were informed regarding the purpose and procedures of the study by providing the information sheet. The research information sheet encompasses the purpose of the study, research procedure, potential risks and benefits of participation, and the role of research participants (Appendix B). Participants were informed that their participation in this study is voluntary without any influence on their treatment, coercion or persuasion, and they have the autonomous right to participate, reject or withdraw at any time without penalty. The nature of the study to the participant and seeking their consent using a consent form as evidence of voluntary involvement in this study were explained before the commencement of the study. The researcher has no conflicts of interest associated with the material presented in this thesis as this study is part of the final-year research project. However, the researcher will declare any relevant non-financial potential conflict of interest to preserve study integrity. Participants were assured of data privacy, anonymity and confidentiality. All participants acknowledged that the study was for academic and research purposes only. Therefore, the researcher and supervisor can only access the data obtained from the survey. Moreover, the individual identity will be kept and strictly protected from the third party to avoid data exploitation. This research project will be significantly important to medical and surgical nurses as this research project will provide information regarding MDT to gain knowledge about alternative wound treatment and aid in patient care. Hence, it is hoped that data from this research study will be useful in developing in-service health education about alternative wound treatment to assist medical-surgical nurses in applying MDT and health education about this therapy.