

Assessment of knowledge, attitude and practice of nurses regarding Enteral Nutrition at a Military hospital

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for the degree Master of Nutrition at the University of
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DECLARATION

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ABSTRACT

Background: Enteral nutrition support plays a vital role in reducing malnutrition in hospitalised patients, and its provision is primarily a nurse's role. Therefore, nurses need to have adequate knowledge and a positive attitude with regard to enteral nutrition.

Objectives: The objectives of this study are to determine the knowledge, attitudes and practices regarding enteral nutrition learnt during the undergraduate qualification of nursing personnel at the nursing college of 1 Military Hospital and to determine differences based on professional rank.

Method: A descriptive, cross-sectional design with an analytical component was used to collect data from military nurses through self-administered questionnaires. A score of 80% and above was rated as adequate knowledge, and questions regarding attitude were measured by means of a Likert scale. The data collected was captured using Microsoft Excel. Descriptive statistics were employed to describe the results of the study participants; Chi-Square tests were applied to determine the level of association between groups, and correlations were used to determine relationships between continuous variables. A p-value of <0.05 was used to test the hypothesis.

Results: In total, 207 (86.2% response rate) questionnaires were completed and captured. The average knowledge score was 46.3%. Participants scored above 80% in the individual questions relating to enteral nutrition as part of the medical treatment and the definition of EN. More than two-thirds (75.4%) of the participants consider themselves competent to administer enteral nutrition and have protocols in their workplace (29.3%), with 79.6% referring to them once or twice per month. The most common sources of nutrition knowledge are in-service training (24.9%) and the nursing college (20.6%). Participants prefer lectures (45.4%) provided by the dietician to upgrade their nutrition knowledge. No significant differences were found between knowledge and professional rank or in the relationship between knowledge and years of working experience ($r = -0.01$; $p=0.85$).

Conclusion: Nursing personnel have inadequate enteral nutrition knowledge, irrespective of their professional rank and experience. However, they are perceived to have positive attitudes towards the importance and administration of enteral nutrition. Future research should focus on whether continual in-service training improves the knowledge and practice of enteral nutrition among nurses.

OPSOMMING

Agtergrond: Enterale voeding speel 'n belangrike rol in die vermindering van wanvoeding onder gehospitaliseerde pasiënte en die toediening daarvan is 'n primêre funksie van verpleegpersoneel. Daarom behoort verpleegpersoneel voldoende kennis en 'n positiewe instelling te toon teenoor enterale voeding.

Doelwitte: Die doelwitte van die studie was om die kennis, houding en praktyke rakende enterale voeding te bepaal soos geleer tydens die voorgraadse kwalifikasie van verpleegpersoneel by die Verpleegkollege van 1 Militêre Hospitaal en om verskille tussen professionele rang te bepaal.

Metode: 'n Dwarssnit beskrywende studie met 'n analitiese komponent is gevolg om data te versamel van militêre verpleegpersoneel d.m.v. self-voltooides vraelyste. 'n Punt van 80% en hoër is aanvaar as voldoende kennis en houding vrae is bepaal d.m.v. 'n Likert skaal. Data is vasgelê deur gebruik te maak van Microsoft Excel. Beskrywende statistiek is gebruik om die resultate van die deelnemers te bespreek; Chi-kwadraat toetse is gebruik om verskille tussen groepe te bepaal en korrelasies is gebruik om die verband tussen kontinue data te bepaal. Hipotese toetsing is gedoen met 'n p-waarde < 0.05 .

Resultate: In totaal, is 207 (86.2% respons syfer) vraelyste voltooi en data vasgelê. Die gemiddelde kennisvlak was 46.3%. Deelnemers het hoër as 80% behaal vir individuele vrae oor enterale voeding as deel van mediese behandeling en die definisie van buisvoedings. Meer as twee-derdes (75.4%) van deelnemers het hulself bevoegd beskou om enterale voeding toe te dien; protokolle is beskikbaar in die werkplek (29.3%) en 79.6% raadpleeg die protokolle een tot twee maal per maand. Die mees algemene bron van voedingkennis was indiensopleiding (24.9%) en die verpleegkollege (20.6%). Deelnemers het lesings deur die dieetkundiges (45.4%) verkies as metode om hul kennis te verbeter. Geen betekenisvolle verskille is gevind tussen kennis en professionele rang of in 'n verband tussen kennis en aantal jare van diens ($r = -0.01$; $p=0.85$).

Gevolgtrekking: Verpleegpersoneel besit oor onvoldoende kennis rakende enterale voeding, ongeag die professionele rang en ondervinding. Hul blyk egter 'n positiewe houding te toon teenoor die belang en toediening van enterale voeding. Toekomstige navorsing kan gedoen word om te bepaal of deurlopende indiensopleiding kennis en praktyke rakende enterale voeding van verpleegpersoneel verbeter.

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CONTRIBUTIONS

The principal researcher, Londolani Goodness Ramuada, developed the idea and the protocol. The principal researcher planned the study, undertook data collection without research assistance, captured the data for the analyses, analysed the data with the assistance of a statistician, Livhuwani Nedzingahe, interpreted the data and drafted the thesis. Prof Renée Blaauw and Mrs Lizl Veldsman (supervisors) provided input at all stages and revised the protocol and thesis.

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Addendum C	Approval from Stellenbosch University ethics department Approval from 1 Military hospital ethics department
Addendum D	Approval letter from Defence Intelligence

LIST OF ABBREVIATIONS

ACG	American College of Gastroenterology
AEG	Allergic eosinophilic gastroenteritis
ASPEN	American Society for Parenteral and Enteral Nutrition
BMI	Body Mass Index
CCPGs	Canadian Critical Care Practical Guidelines
CHO	Carbohydrates
CPD	Continuous professional development
DM	Diabetes mellitus
DoD	Department of Defence
EN	Enteral nutrition
ENA	Enrolled nurse assistant
ENs	Enrolled nurses
GALT	Gut-associated lymphoid tissue
GI	Gastrointestinal
GIT	Gastrointestinal tract
GRV	Gastric residual volume
HOB	Head-of-bed
ICU	Intensive care unit
KAP	Knowledge, attitude and practice
LAN	Local area network
NG	Nasogastric
NPO	Nothing by mouth (nil per os)
ORG	Orogastric
PEG	Percutaneous endoscopic gastrostomy
PN	Professional nurse
PNS	Professional nurse with speciality
PRG	Percutaneous radiology gastrostomy
RF	Refeeding syndrome
SA	South Africa
SAMHS	South African Military Health Services
SANC	South African Nursing Council
SANDF	South African National Defence Force
TPN	Total Parenteral nutrition

CHAPTER 1: INTRODUCTION AND MOTIVATION

1.1 INTRODUCTION AND SIGNIFICANCE OF THE STUDY

Numerous studies have mentioned that malnutrition is a common health problem, especially in hospitalised patients in whom it is associated with longer hospital stay, prolonged rehabilitation, diminished quality of life, a higher rate of morbidity, high usage of medication and mortality.^{1, 2} Oral intake of food is the first choice in the correction or prevention of malnutrition in hospitalised patients.³ During the course of a hospital stay, patients' nutritional requirements and/or feeding methods may change depending on the nature of the disease and presence of comorbid conditions.³

The management of patients with poor voluntary intake, chronic neurological or mechanical dysphagia and patients who are critically ill incorporates enteral nutrition (EN) as one of the methods used in providing adequate nutrition.⁴ In these circumstances, Rowat⁵ stipulates that EN is the best method of feeding to meet patient nutritional requirements. This method is able to deliver a nutritionally complete feed since it contains protein, carbohydrates (CHO), fat, water, minerals and vitamins.⁴

It is stated that EN can be employed as one of the first alternative methods of feeding, providing the gut is functioning properly.⁶ Although EN can be a life saver, if not administered properly, the patient's quality of life may be adversely affected. Diarrhoea is reported as most common complication of EN, and poses as an irritant for nursing personnel.⁷ Furthermore, tube dislodgement and infection are complications linked to incorrect tube placement.⁸

Therefore, the administration of EN requires adequate training and proper co-ordination of the multidisciplinary team, especially nursing personnel.⁹ With proper administration of EN and continual monitoring, associated complications can be minimised.¹⁰

1.2 NUTRITION KNOWLEDGE, ATTITUDE AND PRACTICES OF NURSING PERSONNEL

Literature reports that poor interaction and ineffective nursing involvement are obstacles in the optimal provision of nutrition care in patient management.¹¹ Although evidence-based practice is emphasised by nurses as an important tool, the lack of resources and ineffective aspiration-reduction measures are found to impede adherence to these guidelines.¹² In addition, the majority of staff nurses are found to understand the advantages of EN, when EN should be

initiated and the indication therefore.¹² Lack of knowledge in administering proper nursing care, the poor recording of nutritional information and the understanding of nurses' responsibilities with regard to EN are the greatest challenges observed.¹³ The study by Gupta et al.¹² that assessed EN practices and perspectives in an intensive care unit (ICU), revealed a great interest in the upgrading of knowledge, with the majority of participants preferring an updated manual in their working environment and others preferring nursing tutorials.

1.3 NURSING ATTITUDE TOWARDS ENTERAL NUTRITION

Nursing personnel are the ideal group within the multidisciplinary team to provide nutrition care, though there are still many perceived barriers in implementing EN guidelines by nursing personnel.^{14,15} A Canadian study found high uncertainty and variability with regard to the interruption of EN, high gastric volumes and the initiation of EN, all of which warrant a standardised protocol.¹⁵ Delayed EN has a negative impact on the health status of the patient because it increases the risk of hospital-acquired malnutrition.¹⁶ Despite professional nurses having shown a high obligation (felt that the provision of nutrition is part of their role) and a favourable attitude in providing nutrition care to their patients diagnosed with chronic disease, an Australian study showed that 50.3% used the available nutrition-care protocol and guidelines.¹⁴ Furthermore, training and nutrition updates to enhance their positive attitudes were lacking due to continuous professional development (CPD) activities being expensive and the lack of time due to work and family commitments.¹⁴ Other factors considered to affect the poor implementation of nutrition guidelines were that nurses felt that the general assessment and the monitoring of patients takes a considerable amount of time and with their other responsibilities, it becomes impractical to adhere to the guidelines.¹⁴

It is of vital importance that evidence-based practice guidelines should be adhered to when administering EN.¹⁷ The Patients' Right Charter ensures that patients have access to the best medical service when they need it.¹⁸ Protocols and guidelines have been formulated by various scientific structures to promote safety and to encourage uniformity in regard to EN in nursing practice.¹⁷ It has been reported by Darawad et al.¹³ that 41% of nurses have EN guidelines in their units, but only the minority are using them.

The goal of using protocols and guidelines is to minimise EN-related complications such as feeding intolerance, aspiration, tube dislodgement and infections.¹⁷ Results from a study in which nurses followed an aspiration risk-reduction protocol showed a 39% lower incidence of aspiration compared with 88% in the care group not following the aspiration risk-reduction guidelines.¹⁹ Overall findings from an evidence-based guideline review showed poor adherence

to EN protocols, with less frequent monitoring and poor management of gastric residual volume (GRV).¹⁷ Other feeding practices led to underfeeding of critically ill patients, slowing down their recovery. The use of inferior methods of testing tube location was also a challenge, despite reliable techniques being available for use (e.g. X-rays).¹⁷

The health-system workforce is dominated by nurses in South Africa (SA). With the high burden of infections and diseases that the country is experiencing, it is of vital importance that nursing personnel are well trained and are competent to deal with the impact of diseases.²⁰ Therefore, nursing colleges and training institutions have the imperative role of equipping nursing practitioners with a comprehensive programme for patient care that covers the basic fundamentals of nutrition.²⁰ In addition, the promotion and maintenance of a positive environment to practise the theory learnt is required.²⁰

At the South African Military Health (SAMHS) Nursing College, nutrition modules are offered as practical sessions in the first level of the course and throughout the duration of the other levels. The scope covered includes: nutrition through the gastrointestinal tract (GIT); different routes of feeding a patient; composition of a balanced diet; indications for dietary adjustment (soft, mechanical diet); indications for EN and/or total parenteral nutrition (TPN); practical guidelines on how to administer TPN/EN and management of potential complications thereof; and conditions that require special dietary changes, for example, diabetes mellitus and hypertension. However, with the training provided, there is still an observed disconnection between what nurses have learnt at the training college and what they do in practice. There are certain components of nutrition that are not properly implemented according to internationally accepted guidelines, for example, the guidelines for EN management of the American Society for Parenteral and Enteral Nutrition (ASPEN) and the American College of Gastroenterology (ACG).^{21, 22} The study questionnaire is based on these guidelines.

In summary, the 1 Military Hospital is a 250-bed tertiary hospital that admits various categories of patients and uses all the different routes of feeding to render nutritional care. Oral and EN are the most commonly used feeding routes in meeting patients' nutritional requirements. Successful provision of EN depends on the knowledge and skills of healthcare workers, especially nursing personnel since they nurse the patients throughout the duration of their hospital stay.

The aim of this study is to determine EN knowledge, attitude and practice (KAP) among nurses at 1 Military Hospital in Thaba Tshwane, Pretoria. The results will contribute to the update of the nutrition module of the SAMHS Nursing College and ultimately, will contribute towards improvement in the management of nurses' nutrition care for patients and enhance the

implementation of the evidence-based guidelines with the goal of improving patient quality of care.²²

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

This chapter focuses on the KAP regarding EN among nursing personnel. The literature covers an overview of malnutrition, the role of EN, general guidelines and information regarding the administration of EN, complications of EN and general usage of protocols. Malnutrition is defined as:

[A]n acute, sub-acute or chronic state of nutrition, in which a combination of varying degrees of over nutrition or undernutrition with or without inflammatory activity have led to a change in body composition and diminished function.^{21(p6)}

Malnutrition is a serious challenge to hospitalised patients.²¹ This research study focuses on the undernutrition form of malnutrition. The main cause of undernutrition among children is an imbalanced intake of essential nutrients (protein, CHO and micronutrients). In adults, undernutrition is mainly caused by conditions that interfere with nutrient intake or nutrient use by the body e.g diarrhoea and inadequate nutrient intake due to poverty.^{23,24,25}

2.2 PREVALENCE OF MALNUTRITION IN HOSPITALS

Malnutrition is a debilitating and highly prevalent condition in hospital settings.²⁵ During hospitalisation, malnourished patients continue to deteriorate due to their nil per os (NPO) status and interruptions to feeding due to medical and surgical procedures.²⁶ Globally, malnutrition affects 20–50% of hospitalised patients, with other studies reporting a prevalence rate of 13–69% worldwide.^{25,27,28} International studies have reported a 40% prevalence of malnutrition cases, with European hospitals reporting rates of 23.7% (one in four patients).²⁷ The study in Spain of dysphagia patients reported a total cost of malnourished patients to be 8 004 ± 5 854 € (± R121 180) vs. 6 967 ± 5 630 € (± R105 480) of well-nourished; $p = 0.11$.²⁸ In geriatric hospitalised patients, the prevalence of malnutrition is between 12% and 75%.²⁹ A study done in the Netherlands showed that approximately 2.1% of the health budget is spent managing and treating malnutrition-related ailments.³⁰ Doig et al. assessed the cost implications of early EN nutrition and discovered a reduction of US\$14,462 (± R201 311) in the total cost of acute hospital care per patient.³¹

The presence of malnutrition poses a challenge in both chronic and acute patients and creates a burden on the patients and the healthcare system.²⁵ Haile et al. found that in Amhara National Regional State Referral Hospitals in Ethiopia, approximately 55.6% of hospitalised patients were malnourished, and this was mainly due to weight loss associated with HIV/AIDS.³² The prevalence of malnutrition in Ecuadorian hospitals is 37.1%, and this is associated with patient age, education level, length of hospital stay and the presence of a chronic disease such as cancer, which is exacerbated by the status of malnutrition prior to admission.³³

The risk of malnutrition increases each day after admission, even in patients who were well nourished prior to admission.³⁴ The disease process itself may contribute to the development and/or worsening of malnutrition due to factors such as loss of appetite, increased nutritional requirements and immobility leading to a loss in lean body mass. Furthermore, a lack of nutritional screening on admission to hospital, unavailability of feeding protocols, inadequate in-service training sessions for healthcare workers, especially for nurses who are the first contact for patients on admission, and a limited number of nutritionist/dietician posts available in hospitals may further contribute to the development and worsening of hospital malnutrition.^{27,35} Barriers to eating that may further exacerbate the development of malnutrition in hospitalised patients include poor food intake due to interruptions at meal times, meals not being given after the stipulated meal times, loss of appetite and patients feeling too sick or too tired to eat.³⁶ Literature has documented the relationship between nutritional status and patient outcome well.^{24,25} If left untreated, malnutrition poses a poor prognosis for critically ill patients.²⁴

The risk of malnutrition increases with age, length of hospital stay and the type of disease for which the patient is being treated.³⁷ A study conducted in Valencia demonstrated that 76.6% of patients who were protein-energy malnourished were elderly.² Patients who are 70 years and above in age have a two-fold increased risk of malnutrition, and for those with neoplasm and digestive tract disease, the risk increases to 14-fold.³⁷

2.3 CONSEQUENCES OF MALNUTRITION

Poor nutritional status in critically ill patients is an independent risk factor for impaired immune function that leads to prolonged ventilator dependence and delayed wound healing, which ultimately increase ICU and hospital stay.^{1,38,39} This increases the risk of hospital-acquired infections, mortality and morbidity, thus placing an increased burden of hospital cost onto the Department of Health.³⁹ A positive association was shown between malnutrition and mortality within one month of admission in patients undergoing medium to long hospital stays.⁴⁰

2.4 ROLE OF NUTRITION SUPPORT

The management and prevention of malnutrition is part of comprehensive care and provides an opportunity to optimise the quality of care provided to the patients.¹⁶ Traditionally, the role of nutrition was mainly focused on preserving lean body mass, but it has since evolved and is observed to assist in attenuating the metabolic response to stress, in modulating the immune system and the hyper-dynamic system responses and in preventing oxidative cellular injuries.^{41,42} Healthcare facilities continue to recognise and treat malnutrition in hospitalised patients insufficiently.¹⁶ Nutrition support is a critical component that needs to be rendered accordingly in critically ill patients to prevent malnutrition and its related complications and to improve overall patient prognosis.^{3,37,39}

Early screening and management of malnutrition has positive outcomes on the prognosis of the patient.⁴³ Ideally, patients should be screened on admission to determine their risk for poor nutritional status that may hinder the delivery of nutrition. The nutritional requirements should then be calculated by the dietician and a goal-feeding prescription formulated that considers various factors such as anthropometry, biochemistry, clinical and dietary history.²²

2.5 DIFFERENT FEEDING METHODS

During screening, patients are assessed on their ability to take food orally. There are three options for feeding hospitalised patients. Oral nutrition medical therapy should be the first option for feeding.⁴⁴ Traditionally, patients are kept at NPO following certain procedures. This unnecessary cessation of oral intake should be prevented at all times since hospitalised patients struggle to consume the caloric requirements, and most intakes are less than 75% of the prescription.⁴⁴ In certain medical conditions (e.g. dysphagia), patients have difficulty consuming food orally. In this situation, EN in the form of supplementation or complete nutrition via EN is recommended.²⁶ If EN is not feasible and the patient is at high risk of malnutrition, Total parental nutrition (TPN) should be considered and initiated as soon as possible.²²

2.6 ENTERAL NUTRITION

2.6.1 Definition and overview

Enteral nutrition is defined as feeding through the GIT via a tube, catheter or stoma that delivers nutrients distal to the oral cavity.^{21,(p5),45(p159)} The use of EN in the management of malnutrition is effective from the perspective of health economics.³⁰ In the absence of nutrition intervention,

mortality is likely to occur within 28 days in chronically ill patients in comparison with 70 days in healthy individuals.³⁰ Management of malnutrition is a low-risk and cost-effective strategy that requires a multidisciplinary approach.²⁹

2.6.2 Indications for EN

In situations where the patient presents with feeding difficulties, is at a high risk of developing malnutrition and is compromised on nutrient and fluid intake, EN should be considered as the first line of intervention in providing nutrition to the patient.^{39,43,46} Enteral nutrition can be administered either into the stomach or the small intestine.⁸ The most common indications for EN is in patients who are unable to maintain oral intake or in situations where it is not safe to feed orally e.g dysphagia or patients presenting with altered levels of consciousness.^{22,26} Contraindications that should be considered include obstruction or perforation of the bowel, uncontrolled life-threatening hypoxia, hypercapnia and active upper gastrointestinal (GI) bleeding.^{47,48}

2.6.3 Assessment of patient prior to feeding

Enteral nutrition forms part of the medical intervention, and guidelines should, therefore, be followed to ensure proper administration, management and monitoring.⁴⁹ Factors that should be considered during the screening process for EN include the nutritional risk of the patient as determined by an appropriate screening tool such as, gut functionality and accessibility, percentage of nutrient targets met via the oral route, presence of any fluid and/or electrolyte restriction, special requirements and any factors that may hinder the design and delivery of the nutrition regime such as the presence of other comorbid diseases and the risk of aspiration.^{22,26}

In improving the nutritional intake of hospitalised patients, healthcare workers and especially nurses should be allocated more time in assisting patients with feeding. Nutrition support should be provided without considering the traditional nutrition indicators such as albumin, pre-albumin, transferrin, surrogate markers of infection and inflammation (e.g. cytokines) and the anthropometric status of the patient.^{22,41} The fact that patients are obese compared to their lean counterparts does not disqualify them from receiving early EN since malnutrition has been shown to occur in both extremes.^{22,41} High body mass index (BMI) is not an indication of better nutrition reserves because it exposes patients to the risk of fuel utilisation and increased loss of lean body mass.⁴¹ Obese patients who are critically ill will benefit from a hypocaloric high-protein diet in order to achieve a positive nitrogen balance and wound healing while preserving lean

body mass.⁵⁰ Furthermore, there is no need to test the presence or absence of bowel sounds or the passage of flatus and stools in order to administer EN.^{39,49,51}

2.6.4 Initiation of EN

Enteral nutrition should be initiated within 24–48 hours in critically ill, haemodynamically stable patients who can either no longer take food and liquids orally or are not expected to eat orally for the following three consecutive days. The goal is to reach the target feeding by 48–72 hours to counter energy deficit.^{22,39,46,49} A retrospective data of mechanically ventilated, critically ill patients treated with vasopressors showed a significant decrease in mortality rate and ICU length of stay ($p < 0.001$ and $p = 0.03$ respectively) in the group that received EN within two days compared with the group that was initiated at a later stage. Interestingly, these benefits were more evident in the group that was haemodynamically unstable, and no complications were reported.⁵² Conversely, the study by Huang et al. found that late enteral feeding (after 48 hours) in severely ill patients was associated with reduced feeding complications and reduced hospital stay.⁵³ Haemodynamically unstable patients are at an increased risk of intestinal ischemia, mostly of a non-occlusive nature due to increased oxygen consumption and diminished splanchnic blood flow, which is associated with serious complications such as mortality.⁵⁴

Preterm infants have increased nutrients requirements, due to difficulty in coordinating sucking, swallowing and breathing and EN is the preferred method of feeding.⁵⁵ Timing of the initiation of EN is critical in reducing intestinal inflammation and risk of disease in the neonatal population.⁵⁶ Introduction of enteral feeding after day 3 was associated with a 4.5-fold increase in chronic lung disease, a 2.9-fold increase in retinopathy of prematurity and a 3.4-fold increase in multiple organ failure.⁵⁶

Early EN improved the nutritional status and the length of hospital stay in the older adult cancer and post laryngectomy patients who received early EN when compared with those who received TPN.^{38,44,57} Following outpatient percutaneous fluoroscopic guided gastrostomy placement initiating of feed within 5 hours after the procedure was well tolerated in oncology patients and carried no additional risk, eliminating the need for post procedural hospital admission.⁵⁸

In comparing early EN with TPN administered for over 14 days in patients with burn-induced invasive infections, the study by Zhang et al. revealed that the early EN group demonstrated improved malnutrition outcomes, with better stress reaction, cellular immune function and wound healing.⁵⁹ This promoted the recovery of the GIT motility and the intestinal mucosal barrier.⁵⁹ A significant difference regarding feeding tolerance was not demonstrated in surgical

abdominal-trauma patients who were administered EN within 72 hours compared with patients for whom EN was delayed.⁶⁰ There was improved infection-complication rates and reduced length of hospital stay observed in those who were initiated within 24–48 hours.⁶⁰

Patients diagnosed with pancreatitis who were given early EN within 48-72 hours as a source of nutrition presented with lower mortality, lower infection rates, reduced incidence of multiple organ failure, decreased hospital stay and lower needs for surgery.^{45 53,61} In a randomised trial of patients presenting with acute pancreatitis, the group that received EN within 24 hours had a significantly reduced pain intensity and a significant reduction in post-operative complications, although overall length of hospital stay remained the same.⁶²

During the war between Iraq and Afghanistan, only 11% of the American combatants were recommended to receive EN by the dietician, and none of them resumed early EN at Level III hospitals due to aeromedical evacuation to higher levels of care.⁶³ This delayed early EN was mainly due to multiple competing medical priorities rather than lack of nutrition support in the deployed military hospital.⁶³

2.6.5 Monitoring of patients on EN

Daily monitoring of patients on EN is necessary. The following should be assessed and managed accordingly: presence of abdominal distension and discomfort, total fluid intake and output, GRV, development of oedema or dehydration, stool output and consistency, weight where possible, patient daily EN intake and general electrolyte profile.^{22,26,64} Patients should be monitored for risk of aspiration, cumulative caloric deficits, inappropriate cessation of EN and adequacy of feeding (EN product selected should provide the right dosage of macro- and micronutrients to avoid underfeeding).^{22,64} Permissive underfeeding (restriction of non-protein calories) or trophic feeding is permitted temporarily in certain conditions such as acute lung injury and respiratory distress while more investigations regarding the diagnosis and the condition of the patient is taking place.^{22,64}

2.6.6 Benefits of EN

Among other reasons for the provision of EN, literature has indicated numerous benefits, including those outlined in Table 2.1 below.^{22,45}

Table 2.1: Benefits of enteral nutrition

Immune responses	Metabolic responses	GIT responses	Nutritional benefits
<ul style="list-style-type: none"> •Modulates key regulatory cells to enhance systemic immune function •Promotes dominance of anti-inflammatory Th-2 over pro-inflammatory Th-1 responses •Stimulates oral tolerance •Influences anti-inflammatory nutrient receptors in the GIT (duodenal vagal, colonic butyrate) •Maintains mucosal-associated lymphoid tissue at all epithelial surfaces (pulmonary, hepatic, lacrimal, genitourinary and pulmonary surfaces) •Modulates adhesion molecules to attenuate trans-endothelial migration of macrophages and neutrophils 	<ul style="list-style-type: none"> •Promotes insulin sensitivity through the stimulation of incretins •Reduces hyperglycaemia, allergic eosinophilic gastroenteritis, muscle, and tissue glycosylation •Attenuates stress metabolism to enhance more physiologic fuel utilisation 	<ul style="list-style-type: none"> •Maintains gut integrity •Reduces gut/lung axis of inflammation and enhances motility/contractility •Absorptive capacity •Maintains mass of GALT(gut-associated lymphoid tissue) •Supports and maintains commensal bacteria •Produces secretory IgA •Produces trophic effect on epithelial cells •Reduces virulence of endogenous pathogenic organisms 	<ul style="list-style-type: none"> •Provides sufficient protein and calories •Provides micronutrients and anti-oxidants •Maintains lean body mass by providing substrate for optimal protein synthesis •Supports cellular and subcellular (mitochondria) function •Stimulates protein synthesis to meet metabolic demand of the host

GALT: gut associated lymphoid tissue , GIT: gastrointestinal tract, IgA: immunoglobulin A

A randomised trial in which early EN, parenteral nutrition and EN+TPN feeding methods were used in elderly patients who underwent gastrointestinal cancer surgery reported that, the most benefits of reducing post-operative complications and enhancing the immune status were demonstrated with early EN being used in combination with TPN.⁶⁵ In addition to EN

demonstrating post-operative benefits, other studies have recommended that initiation should be pre-operative in malnourished patients either through oral intake or EN.⁶⁶

A study comparing mortality rate, development of pneumonia and sepsis post procedure in non-cancer patients who received either TPN or EN found that at Day 30, the mortality rate was 7.6% for TPN vs 5.7% for EN ($p=0.0003$), and patients receiving EN were found to have a better survival rate.⁶⁷ When comparing the risk of post-procedure pneumonia and sepsis, the results demonstrated 11.9% for TPN vs 15.5 % for EN and 4% TPN vs 3.7% EN respectively.⁶⁷ Mashhadi et al.⁶⁸ found no significant difference between groups that were fed through TPN vs EN regarding the nutritional status determined by serum albumin, pre-albumin or transferrin in oesophageal cancer patients. In consistent with other studies, the inflammatory response was reduced with an improvement in immunologic response in the group that was fed via EN.⁶⁸ Although post-operative complications did not differ between the two groups, there was one death reported in the TPN group that was due to myocardial infarction.⁶⁸

In regard to permissive underfeeding (restriction of non-protein calories), a study of patients who were exposed to prolonged underfeeding were separated into two groups and given similar dosages of protein, with the intervention group receiving reduced non-protein calories.⁶⁹ No significant difference in reducing complications was observed in either groups, which challenged the belief that full EN and TPN reduce incidences of complications post operation.⁶⁹

2.7 ROUTES OF EN

Depending on the length of feeding, the function of the GIT and patient condition/diagnosis, specific access routes can be used to insert the tube.⁷⁰ Consideration should be given to factors such as risk, advantages and disadvantages of the route and type of feed to be used according to the patient diagnosis by the medical team.⁷⁰

The following sites can be accessed for feeding

Gastric (stomach)

The tube is placed through the mouth or nose into the stomach. This route is mainly used in hospitals. The types of gastric access are orogastric (ORG), nasoenteric, nasogastric (NG), trans-oesophageal, percutaneous endoscopic gastrostomy (PEG) and surgically placed or radiologically placed gastrostomy tube.^{26, 70, 71} For the gastric route to be utilised, patients should have normal gastric emptying and duodenal contents. An advantage of this type of feeding is that the capacity of the stomach is sufficient to accommodate large volumes, especially if the

patient is to receive bolus feeding.^{26,70} The procedure of inserting a gastric tube is less complicated, and the tube can be inserted at the patient's bedside.^{70,71} The challenges noted with this route are that the risk of aspiration and oesophageal reflux are higher compared to post-pyloric feeding.^{26,71}

The ACG clinical guidelines recommend that ORG or NG feeding should be the first option, and consideration of other feeding routes should be limited to gastric intolerance or increased risk of aspiration.²² After inserting the tube but before the feed is administered, it is important to confirm that the tube is in the right position. The most commonly used methods are testing the pH of the gastric aspirates, which should be <5, chest X-rays and air insufflation with auscultation.^{26,71}

Duodenum (small bowel)

This route is accessed through the use of a nasoduodenal tube and is suitable for patients with impaired gastric emptying and patients at risk of aspiration or oesophageal reflux.^{26,72} Enteral nutrition can be initiated within 4–6 hours after post admission and nasoduodenal tube insertion. Potential side effects include GIT intolerance (e.g. bloating, cramping and diarrhoea).^{72,73} The capacity to carry large feeds is minimal and, therefore, the feeding rate should be closely monitored, preferably through a feeding pump.^{70,72} Close monitoring is advised since the tube can easily dislodge back into stomach. This route poses a challenge for the use of tube aspirates to monitor feed tolerance and may require fluoroscopic or fibre-optic endoscopic placement of the tube, which may not be available in all facilities.^{26,72}

Jejunum (small bowel)

Jejunal feeding can be accessed through a nasojejunal tube, a surgically placed jejunostomy tube or a PEG with a jejunal extension.^{70,72} This is recommended for patients who have had upper GIT surgery so that feeding can bypass the operation area. Initiation of feeds can resume within 4–6 hours post surgery.⁷² The benefit of jejunal access is the reduction of oesophageal- or pulmonary-aspiration risk, but the patient may experience GIT intolerance since the volume capacity of the jejunum is minimal. In addition, the risk of tube dislodgement is increased and similar to the duodenal access, jejunal feeding may require fluoroscopic or fibre-optic endoscopic placement of the tube.^{26,71}

In situations where the patient will require EN for more than 30 days and the GIT is functioning properly, PEG feeding is recommended.⁷² Compared with NG feeding, PEG feeding does not cause incidences of regurgitations, and patients can tolerate the high feeding rates prescribed through the continuous or bolus feeding methods.⁷¹ The PEG method of feeding is mainly recommended for patients presenting with disorders such as neurological disease and

psychomotor retardation, reduced level of consciousness, cancer of the head, neck and oesophagus and gastric compression abdominal malignancy.^{71,72} Care of the site where the PEG tube is placed must be a priority to avoid skin breakdown and infection.^{71,72} The site should be cleaned daily with water and soap and dried thoroughly, and the area should not be dressed.²⁶ A retrospective review that evaluated a comparison of the complications experienced by patients receiving nutrition through the feeding methods of PEG and percutaneous radiology gastrostomy (PRG) identified only three cases of major complications.⁷⁴ Of the 136 patients that were included in the review, one patient in the PEG group developed cellulitis and in the PRG group, one patient developed peritonitis and another demonstrated aspiration pneumonia.⁷⁴

2.8 ADMINISTRATION OF FEED

2.8.1 Feeding systems

The feed can either be administered through a closed system or an open system. The closed system involves the administration of ready to use products and it is considered safer because there is minimal handling of the feed.^{26,75} The open system involves the reconstituted formula or ready-to-feed products being decanted into a feeding bag and administered to the patient.⁷⁵ The closed system reduces labour costs and saves time for nursing personnel since the time spent refilling the reconstituted formulas is minimised.⁷⁶ The open system is more cost effective per unit of volume compared with the closed system, although the fact that it is labour intensive and time consuming can negate the monetary value.⁷⁶ The open system is convenient for patients that require a small volume of feed. There is a potential for feed wastage if the mixed product is not administered to the patient, unlike the closed system.⁷⁶ Both systems can be administered safely, providing the guidelines are followed adequately, and proper labelling specifying the time the feed was mixed and hung is important to avoid bacterial colonisation.⁷⁶

2.8.2 Feeding equipment

When administering EN, the required equipment comprises of a feeding tube, a feeding set, formula and an enteral pump or syringe for bolus feeding.⁷⁰ The feeding set should be used according to the manufacturer's guidelines or instructions. According to the EN guidelines, the feeding set should be used for 24 hours and then changed.⁷⁷ Enteral feeding pumps are a better way of assuring precise delivery of the required volume and the correct rate of feed. It is critical to keep the pumps regularly calibrated by the manufacturer to ensure optimal performance.⁷⁷ Enteral feeding pumps maximise feeding tolerance and allows the lowest possible hourly feed

rate to meet nutrient requirements.²⁶ Unlike jejunum feeding, it is safer when the feed is delivered directly to the stomach because rapid infusion can result in dumping syndrome.⁷⁸ The feeding pump should be kept clean at all times.²⁶ In the absence of feeding pumps, gravity or bolus feeding is the alternative method.⁷⁹ The challenge is delivering the desired volume to the patient, which requires close monitoring.²⁶

2.8.3 Feeding method

There are three feeding methods that can be used to administer EN through a tube.

The first and most preferred method to administer EN is through continuous feeding for 24 hours without interruption.⁷⁷ This method allows for better tolerance since the feed is administered slowly. The feeding rate can run between 50–125 ml/hr.⁷⁷ The feed is poured into a feeding bag, reservoir or bottle. Ready-to-feed products are also available that can be connected to the feeding sets through the feeding pump, or in the absence of feeding pumps, administered through bolus feeding.^{77,78} It is easy to achieve the target feeding goal with continuous feeding, and blood glucose levels are better controlled.²⁶ The challenge with this method is the mechanical malfunctioning of the pump and the clogging of the feeding set if not properly flushed.⁷⁰ Furthermore due to physical attachment to the feeding apparatus patient quality of life may be affected quality of life.²⁶ The expense of equipment (pump and giving sets) might be a challenge to healthcare facilities in poor areas.²⁶

The second method, intermittent feeding, involves the controlled delivery of feeds with rest periods of approximately 4–6 hours in between.⁷⁷ The feeding can be stopped for a period of 4–16 hours in certain circumstances.²⁶ Consideration must be given in situations where a feed was stopped for a very long time so that high feeding rates can be initiated during refeeding.^{26,70} The recommended feeding rate is between 50–125 ml/hr.⁷⁷

The third method, bolus feeding, is usually delivered into stomach due to the increased volume of feed that is given (100–400 ml) at regular intervals (six to eight feeds/day). Bolus feeding increases the risk of aspiration and, therefore, the patient should have a functional oesophageal sphincter.^{70,79} The benefit of bolus feeding is that it allows patient mobility since it follows a meal pattern. It can be used as a supplementary method and as a transition to oral intake, and it is cost effective while accommodating the patient's lifestyle.²⁶ The infusion of large volumes, may be poorly tolerated, increasing the risk of aspiration, abdominal distension, nausea and diarrhoea.⁷⁹ Bolus feeding is more time consuming compared with continuous feeding because more contact is required to infuse more dosages.⁷⁸

2.8.4 Handling and storage of formula feeds/products

Ideally, the ready-to-use products should be stored at room temperature (between 13°C and 24°C), but it is still acceptable and safe to keep them between 0°C and 35°C).⁷⁶ The products can hang for 24 hours. Storage should be in a cool place away from direct sunlight since nutrients such as riboflavin, vitamin B6 and vitamin A are photosensitive.⁷⁶ The product is delivered as sterile from the manufacturer, but temperatures outside the recommended range can affect the quality of the nutrients and the appearance, flavour and sensory attributes of the product.^{25,75} The formula selected should provide the patient with balanced and complete nutrition. Ready-to-hang products should be preferred to powdered formulas in order to reduce the risk of contamination during the mixing process.²⁶

Reconstituted powdered feeds are not sterile and have the potential to carry pathogens that can cause serious harm to the patient; therefore, a reconstituted feed should be used within four hours if kept at room temperature.^{75,80} When the temperature of the environment reaches levels above 4°C, the feed creates a good environment for bacteria to thrive. In the absence of ready-to-hang and specialised powder products, fluid diets and puree diets can be administered, provided the feeding tube is greater than 20 French units.^{41,77} The disadvantages of these diets are that if not well planned, they may be nutritionally incomplete, and purees can easily block the feeding tube, increasing the risk of bacteria colonisation if the tube is not flushed properly.²⁶

2.8.5 Types of feeds provided

Standard polymeric formula

Standard polymeric formula may or may not contain fibre, those that are fibre-enriched formulae have a fibre content of approximately 10-15g/L.²⁶ This are the first option for hospitalised patients presenting with no other complications or known chronic diseases.^{22,64,77} Standard polymeric feeds consists of four categories: Standards feeds for patients with no complications; High protein feeds for patients with increased protein requirements; High energy feeds (1.5kcal/mL) and (2kcal/mL) for patients presenting with high energy needs, or fluid restriction.^{26,77}

Pre-digested formula

These semi-elemental products contain nutrients in a pre-digested form (protein as peptides or free amino acids, carbohydrate as monosaccharides), low in fat (may contain MCT).^{26,77}

Disease specific formula

These products are designed for therapeutic management of specific organ dysfunction and metabolic distress conditions such as renal disease and pulmonary distress. These formulas include those with adapted macro- and micronutrient compositions to meet the needs of a specific disease.⁷⁷ They can be energy dense, contain a reduced fluid and electrolyte content and/or modified protein and carbohydrates content.^{26,77}

Immune-modulating/enriched/supplemented formula

This category of products have been supplemented with one or more nutrients which include glutamine, arginine, probiotics, lipids, antioxidants.⁶⁴ These formulas contain substrates to modulate immune functions.⁷⁷ The routine use of immune-modulating products is controversial, and caution should be taken when prescribing these feeds.²²

Modular products

These products consist of an individual nutrient that is added to available enteral feeds to improve on the specific nutrient required e.g. increasing protein content of feed, or they can be mixed to formulate a unique specific feed.^{26,77}

2.8.6 Feeding rate

The following should be taken into consideration when determining the feeding rate: nutritional status; time that the patient was on NPO prior to starting the feeds; the diagnosis of the patient; the access sites; the type of feeding regime; and the formula to be administered.^{26,77} The literature recommends the feeding to be started at the rate of 15–50 ml/hr with an increment of 10–50 ml/hr within 4–24 hours.^{26,78} The feeding rate should be assessed individually because certain patients may benefit from slow feeding rates whereas low feeding rates may delay the target nutritional goals of other patients.²⁶

2.8.7 Safety considerations

The expiry date should be carefully checked before products are administered.⁴¹ Any product that is used beyond the manufacturer's use-by-date cannot be guaranteed since the stability of vitamins starts to degrade post expiry date.⁷⁵ On-going monitoring of patients receiving EN is essential to ensure that the patients receive adequate nutrition.^{26,77} This also assists in detecting and managing any feeding complications that may occur. Regular monitoring should include

biochemical tests since certain parameters may be affected by the provided formula.⁷⁷ Clinical assessment monitors complications such as abdominal distension, lean tissue stores and fluid status.⁷⁰ Management of general nutrition support should be done daily (e.g. checking of feed tolerance, maintenance of feeding equipment and patient positioning).^{78,80} A review of the requirements should also be done daily to determine if the patient is deteriorating or improving in order to transit to TPN or oral intake.²⁶

2.8.8 Feeding transition

Patients on EN should be monitored daily so that tolerance can be checked with the ultimate goal of the patient transiting to oral intake. This is a process that can take several days or several weeks and should be done slowly. In situations where a patient started feeding via TPN, transition to EN should be done slowly until the patient can tolerate >60% of the nutrient requirements via EN.⁵¹ Transition to an oral diet should include an assessment and confirmation by the dietician that the patient is able to consume at least 60–80% of the food per day for three consecutive days.⁷⁷ Collaboration with the speech therapist is recommended for a full swallowing assessment where necessary.⁷⁷ Abrupt cessation of feeds is not ideal; feeds should be reduced slowly until the patient can receive all or adequate nutrition orally.²⁶

2.9 BARRIERS TO ENTERAL NUTRITION

Nursing personnel spend 24 hours at patients' bedsides, unlike other health care workers.⁸¹ This gives them the opportunity to assess, manage and monitor the barriers to feeding as they occur.⁸¹ Deterioration of nutritional status of hospitalised patients is mainly caused by poor appetite, GIT-related symptoms, reduced ability to chew or swallow, inflammation, infection, NPO status for medical purposes and catabolic conditions.⁸² Additionally, patients receiving EN often do not receive their recommended energy and protein requirements for a few days due to interruptions at ward level.⁸² The most common interruptions noted in the literature are related to unavailability of clear and uniform EN guidelines.⁸³ A cohort study of critically ill, adult patients in Korea reported that EN can be interrupted for six hours during the four-day period that the patient is admitted to the ICU and has started feeding.⁸² Most of the interruptions have been attributed to gastrointestinal intolerance of the feed, which is reported to occur at least 29.5% of the time.⁸²

Other factors that were discovered were routine nursing care, GIT-feeding intolerance, various medical procedures and an elevated GRV above 500 ml.^{81,82} Regarding the use of the bolus

feeding method, challenges with feeding tubes not being available or being pulled out by patients were noted as barriers.^{82,83} Inadequate intake of the prescribed feed (60%) was observed in ward and ICU patients; cardiology patients and ICU patients had a higher risk of underfeeding than neurological patients.⁸⁴ This discrepancy was associated with external physician interference as they conduct medical procedures.⁸⁴ The majority of institutions do not have measures or strategies in place to counter the effects of these barriers to continuous feeding.⁸⁵ In spite of this, when nursing personnel had an understanding of specific targeted strategies to minimise interruptions, continuous feeding improved and interference was lessened.⁸⁶

In the study in burns patients assessing barriers (such as logistics, patient haemodynamic stability and resuscitation factors) as possible reasons for delays to early EN, the investigators found these factors not being the primary hindrance to early initiation of feeding.⁸⁷ During the evaluation of EN practices in a paediatric and an adult ICU it was reported that the most common reasons for delays in initiating EN and failure to achieve the recommended nutritional requirement were due to fasting (31%), fluid restriction (22%) for medical reasons, vomiting, difficulty in NG tube placement, diarrhoea and increased GRV.^{88,89}

Meeting nutritional requirements by Day 3 is still a challenge for most facilities administering EN, with only 66% of facilities being able to meet the 80% recommendation by the third day.⁸⁹ Care should be taken to resume feeding as soon as possible after the interruption to minimise underfeeding.^{81,82} Besides the above-mentioned aspects that disrupt the continuous provision of EN, other contributing factors that have been found are myths and misconceptions.⁹⁰

The results of Marik⁹⁰ demonstrated myths that interfere with the initiation of EN:

- There is contraindication for EN when the patient has pancreatitis – When patients present with severe acute pancreatitis, it creates a feeding challenge, and oral feeding and EN have been recommended as the best options in the provision of nutrition because they can be well tolerated.⁹¹
- Following abdominal surgery it is believed that reflexes are inhibited leading to inactive alimentary tract therefore EN should be withheld. Post-operative ileus is a common complication after major surgery, and immediate post-operative feeding is recommended to prevent post-operative ileus since it assists with bowel stimulation and is considered safe and effective.⁹²
- With an open abdomen following GI surgery, EN should not be administered – Early initiation of feeds is safe and possible in patients following GI surgery, provided they do

not present with severe shock and bowel anastomosis instability (complications such as wound infection, bleeding and prolonged functional ileus) .⁹³

- Historically critical care nurses have been trained to assess the presence of bowel sounds as an indication of safety to feeding. The decision to initiate feeding should not be based solely on the presence or absence of bowel sounds.⁹⁴
- There are contraindications for EN in patients presenting with high GRVs – Various literature and guidelines have not yet reached a clearly defined threshold, there is general consensus that a GRV of >500 ml is considered safe to feed a patient demonstrating absence of other GIT complications.⁹⁵
- Patients on vasopressors and mechanical ventilation should not receive EN – Feeding of these patients is safe when administered via the ORG/NG route, and for patients who are at risk of aspiration, small bowel feeding should be considered.⁹⁶
- Adding to the understanding that GRV is associated with the risk of aspiration pneumonia it is generally believed by most clinicians that critically ill patients should be fed post-pyloric.⁹⁷ The routine use of post pyloric feeding is discouraged. Early introduction of EN via the nasogastric / orogastric route is recommended as the first option and those who presents with gastric feeding intolerance should be given prokinetic agents. Should those approaches fail then post pyloric feeding should be initiated.⁹⁷
- There is no problem with starvation or undernutrition – Underfeeding and NPO is a risk of malnutrition, which among other consequences, can result in immune defects through recurrent infections and chronic inflammation and should be prevented at all costs.^{90,98}

In order to improve on the EN target-calorie goal, interventions and guidelines to manage barriers should be adhered to.⁸¹ Kim et al. reported that time lost, which was not compensated when refeeding resumed, had a negative impact on the nutritional status of the patient.⁸²

2.10 COMPLICATIONS OF EN

Daily monitoring of the patient on EN should be a priority to minimise complications and unnecessary cessation of feeds.⁴¹ Despite evidence-based information from different studies regarding the benefits of EN, if EN is not administered properly, multiple potential complications can occur.

2.10.1 Gastrointestinal

Gastrointestinal tract symptoms indicative of feeding intolerance include vomiting, abdominal distension and/or discomfort, increased NG-drainage, increased GRV, diarrhoea, constipation and reduced passage of flatus.^{26,99}

Diarrhoea

Diarrhoea is defined as “the passage of three or more loose or liquid stools per day”^{100(p1)} (or more frequent passage than normal for the individual). Blumenstein et al. denoted diarrhoea as the most common GIT complication.¹⁰¹ It is highly prevalent among critically ill patients and is the most common reason for EN suspension or elimination by healthcare workers, especially by nurses.¹⁰² The diagnosis and management of diarrhoea differs among healthcare facilities and are dependent on factors such as frequency of passing stools, consistency and volume.¹⁰² The cause of diarrhoea in critically ill patients is complex and multifactorial.¹⁰² The observed contributory factors leading to episodes of diarrhoea are not limited to medications such as antibiotics. Others factors include:^{26,102,103}

- Infection
- bacterial contamination
- person-to-person transmission as a result of poor health
- underlying disease
- malabsorption
- hyperosmolar formula (osmolality above 300 mOsm/L)
- bolus feeding or rapidly infused feeds
- administration of feeds at a very cold temperature or straight from a refrigerator
- lactose intolerance
- patient receiving chemotherapy/radiotherapy,
- a low serum albumin of <25 g/l.

Chang et al. mentioned that enteral nutrition is not generally considered the primary cause of diarrhoea and, therefore, it is crucial that the patient is thoroughly evaluated for underlying causes before suspension or reduction of the feeding rate.¹⁰³ Dietary adjustment has been found to have some benefit in minimising diarrhoea and improving bowel function in tube-fed patients through understanding the underlying cause and selecting the appropriate formula to be administered at the desired rate.^{102,103} The recommended choice of feed in the management of EN-related diarrhoea is the feed containing prebiotics, probiotic derivatives and lactoferrin such as Peptamen 1.5 with Prebio¹.¹⁰³ In a case presentation of a 71-year old patient post-

gastrectomy, a nasogastric-jejunal feeding tube, guided by endoscopy, has been shown to reduce the incidence of diarrhoea even when the feed was given at 300 ml/hr.¹⁰⁴

Nausea and vomiting

Nausea and vomiting are common among enterally fed patients, and the leading cause is not limited to initial feeding at a high rate and contaminated feeds and tubes.¹⁰¹ When a patient has an episode of nausea and vomiting, before stopping the feed, it is important to assess and treat the cause.²⁶ The most-identified causes of nausea and vomiting are excessively high feeding rates, overfeeding, delayed gastric emptying (could be due to poor gastric motility or medication), administration of formulas directly from the refrigerator, physical agitation and tube dislodgement.²⁶ Smaller dosages of a concentrated formula are better tolerated by enterally fed patients.²⁶

Gastric residual volume

Gastric residual volume is one of the methods used to monitor the functioning of the upper GIT when the patient is on EN.¹⁰⁵ To determine the GRV, the feed is aspirated from the stomach when the patient is on enteral feeding.¹⁰⁶ Gastric residual volume is a common practice to detect and monitor complications such as vomiting, aspiration and nosocomial pneumonia, especially in ventilated patients receiving EN.¹⁰⁵ Some patients experience delayed gastric emptying with raised GRV which could be due to sedation, pain medication or decreased gastric motility.^{105,106}

In the past, it was routinely practised that when the GRV was >200 ml, EN was withheld. The study by Methany et al. that assessed the criteria used by nurses to measure GRV reported that of the 2 298 participants, 97% indicated 200–250 ml as their threshold for interrupting feeds.¹⁰⁷ Only 12.6% of nurses allowed a GRV of up to 500 ml, with 25% of nurses allowing 150 ml or less.¹⁰⁷ Gastric residual volume used to be one of the barriers to the optimal feeding of patients together with the fear of complications that were linked to high volume.¹⁰⁸ Trials with a feeding protocol have updated this former practice to suggest that a GRV of 200–500 ml poses no feeding threat to the patient.¹⁰⁸ Other studies have found that a GRV of <500 ml aspirated four hours after the initiation of the feed is considered safe and is regarded as an indicator of functioning GIT/good tolerance to the feed.¹⁰⁶ Montejo et al. reported no association of adverse effects in regard to GIT complications or outcome variables (number of days on mechanical ventilator, increased duration of ICU stay and acquired pneumonia).¹⁰⁹

The above mentioned EN complications should be diagnosed based on complex clinical evaluation.⁹⁹ No clear-cut symptoms or values have been defined yet. Management includes the use of prokinetic and/or laxatives, limiting use of drugs impairing motility and control of intra-abdominal pressure.^{99,106,108} If the situation persists TPN should be considered.

Determining GRV is inexpensive, uncomplicated to perform by nursing personnel, easy to interpret and can be linked to either an increased or a reduced risk of pneumonia. Despite GRV being a useful tool to identify feeding intolerance, it is a poor predictor of aspiration. Taking regular aspirates increases nurses workload, especially in short-staffed facilities, and repeated GRV aspirates may clog the tube.^{108,106} Evidence-based protocols should be available and utilised for proper monitoring of GRV.¹¹⁰

Abdominal distention/discomfort

The effects of gastric dysmotility that have been noted in the literature can lead to abdominal distension. Gastric dysmotility can be due to medication, hyperglycaemia, impaired gastric motility and GIT obstruction. This challenge should be discussed within the multidisciplinary team and appropriate measures should then be taken such as the use of prokinetic agents.²⁶

Abdominal discomfort is common and can be caused by shrinkage of the stomach in patients who were not fed for a long duration of time and present with delayed gastric emptying.⁷⁷ Furthermore, certain patients complain of cramps and bloating due to intolerance to lactose-containing feeds, inability to absorb fat, higher feeding rates and regurgitation/aspiration that is linked to gastric retention.¹⁰¹

Constipation

Constipation has been reported in patients receiving inadequate fluid intake and feeds that contain very low levels of fibre.⁷³ Constipation can be resolved by accommodating additional water through flushing. Dehydration and reduced intake of fibre exacerbate the condition.²⁶ In addition, a disruption of the patient's normal routine that leads to reduced mobility increases the risk of constipation. If the patient has a GIT obstruction and is taking medications such as analgesics, the risk of constipation is increased.²⁶ A combination of both a soluble and an insoluble fibre-based formula can assist in alleviating the symptoms of constipation.^{73,101} The multidisciplinary team should discuss the potential causes and manage patients accordingly.⁷⁸

Patients receiving EN are prone to GIT complications such as diarrhoea, nausea and vomiting, increased GRV, constipation, abdominal distention and discomfort. These GIT complications can be reduced by careful adherence to nutrition guidelines, including those related to feed composition, administration rate and general patient monitoring.¹⁰¹

2.10.2 Mechanical

Obstruction of the tube

Feeding tubes are susceptible to mechanical failure such as occlusion or clogging including improper administration of drugs, withholding feeds for a long duration of time, feeding-tube deterioration, kinked or twisted tube, consistency of the formula being administered and inadequate flushing.^{74,101} Feeding-tube blockage is of concern and must be monitored and managed when the patient is on EN. A case report of an elderly patient showed that knot formation in the tube can occur if the feeding tube is inserted too far into the lumen.¹¹¹

The tube should be flushed regularly to minimise blockage and to meet the patient's fluid requirements.^{41,112} It has been noted that after two hours of feeding, the fat and protein in the formula starts to deposit and accumulate in the feeding set, which in combination with bacteria in the feeds can form a sticky layer comprising a community of bacteria.⁷⁷ Smaller tubes such as jejunal tubes are more prone to clogging and require regular flushing.¹¹³ General tap water can be used for flushing since there is no evidence that it poses any bacterial threats. If the patient's condition is critical, sterile water is recommended.²⁶

Flushing should be done before and after medication is administered, preferably with at least 15–30 ml water, with the feed being temporally put on hold,^{41,76,112} Each medication should be administered separately with a flush in between.^{112,77} The feed should be restarted immediately after the last flushing; the whole process should not last more than 30 minutes unless instructed by a pharmacist.¹¹² Medication should not be mixed directly with the formula being fed to the patient because the interaction between the drug and the feed increases the risk of tube blockages due to chemical reactions, alters drug availability and GIT function.¹¹² A study in a Tunisian hospital reported that the protocol for flushing the tube after administration of drugs was not followed by 59% of nurses.¹¹⁴ An evaluation of the different agents available to dissolve feeding clogs revealed that uncoated pancreatic enzymes dissolved in a solution of sodium bicarbonate is an effective way of dissolving nutrition-formula clogs.¹¹⁵

Dislocation and removal of the tube

Fine-bore feeding tubes are usually preferred because they are well tolerated by patients and reduce the risk of sinus infections and breathing obstructions.^{74,101,116} The tube may be dislodged if not anchored in place, balloon has deflated or the tube is damaged.¹¹⁷ An article that compared complications of nasojejunal feeding and jejunostomy feeding technique found an increased risk of tube dislodgement in the nasojejunal-fed patients compared with patients fed via jejunostomy feeding.¹¹⁸ Tube leakage was observed more in patients with a feeding jejunostomy, and the risk of infection doubled in the group that received EN in combination with

TPN.¹¹⁸ The study by Alivizatos et.al evaluated the occurrence of complications in patients receiving EN through a gastrostomy or jejunostomy and discovered that inadvertent removal of the tube was the most common occurrence, followed by tube leakage, dermatitis of the stoma and lastly, diarrhoea.¹¹⁹

The mechanical damage such as injuries to the nasal area, blockage of tube lumen, dislodgment and misplacement of feeding tube should be monitored closely.⁷⁷ Other complications that were noted include tube infection at the site of insertion, pneumonia, over-granulation, falling out of sutures, pain at the tube site, tube dislodgement and leakage.^{120,121} If the blockage is not resolved by any of the flushing solutions, the tube should be removed and replaced with a new one.²⁶ Poor management of these complications can lead to peritonitis, pneumonia, inadequate feeding, brain trauma and infection. Radiology examination should be done to verify the location of the tube, flushing before and after medication and the use of small bore polyurethane tube is strongly recommended.^{74, 77,101,105}

2.10.3 Metabolic

Hyperglycaemia/hypoglycaemia

Hyperglycaemia is common in critically and non-critically ill patients. The main causes of hyperglycaemia are stress, medications, unknown history of diabetes mellitus (DM), DM treatment and fluctuations of caloric intake.¹²² Blood glucose should be well monitored when patients are on EN to prevent the common complication, hyperglycaemia.¹²³ The readings should be maintained at <10 mmol/L.⁶⁴ Poor blood-glucose control is associated with poor prognosis, increased risk of death and infectious complications.¹²³

In order to maintain a controlled glycaemic status, the carbohydrate content of the feed and the administration of intravenous or subcutaneous insulin should be optimised.¹²³ Gosmanov et al. recommended that when patients are on EN and/or PN, blood glucose should be monitored.¹²³ For patients without a prior history of DM, blood-glucose control should be discontinued if readings are <7.7 mmol/L without insulin within 24–48 hours and the target nutrition prescription has been reached. In patients with DM, insulin should be initiated when blood glucose levels are >7.78 mmol/L.¹²³ This insulin management should be in conjunction with CHO reduction, simultaneously preventing the risk of hypoglycaemia.¹²³

Refeeding syndrome

In refeeding syndrome (RF) life-threatening alterations in fluids and electrolytes and other metabolic and clinical alterations occur due to excessive nutrition through oral, enteral or

parenteral routes in severely malnourished patients or in patients post long-fasting periods.^{124,125,126} Refeeding syndrome is avoidable but can be fatal if not identified and managed accordingly.¹²⁴ The first report of RF was in severely malnourished prisoners in World War II.¹²⁷ The risk factors of RF are outlined in Table 2.2.

Table 2.2: Risk Factors for Refeeding Syndrome

Risk Factors for Refeeding Syndrome^{26,128}	
Presentation with one of the following	Or Presentation with two of the following
<ul style="list-style-type: none"> • BMI < 16 kg/m² • Patients presenting with low levels of phosphate, potassium and magnesium before feeding • Minimal or no significant intake for > 10 days • Unintentional weight loss > 15% in the past three to six months 	<ul style="list-style-type: none"> • BMI <18.5 kg/m² • >10% loss of body weight within three to six months • Alcoholism • Anorexia Nervosa • Individuals who fasted 7–10 days and display evidence of physiological stress (weakness, shortness of breath, bradycardia).

BMI= Body Mass Index

The pathophysiology of RF occurs as a result of abrupt feeding following the state of catabolism during the phase in which there was limited CHO intake.^{129,130} This triggers the secretion of insulin in response to raised CHO.¹²⁸ The insulin facilitates glucose uptake into the cells and at the same time, can cause the intracellular movement of phosphates (hypophosphataemia), potassium (hypokalaemia) and magnesium (hypomagnesaemia), which lead to clinical catastrophe.^{28,128,130} Depletion of adenosine triphosphate and 2,3 –diphosphoglyceric results in tissue hypoxia and failure of cellular energy metabolism.¹²⁸ Other adverse effect includes thiamine deficiency, fluid shifts and sodium abnormalities.¹²⁸ Refeeding syndrome may be misdiagnosed by medical teams as sepsis due to the presentation of symptoms such as cardiac failure, shock, acute arrhythmia, hypoventilation, respiratory failure or acute renal failure. This may hinder the recognition of RF and lead to mismanagement.¹²⁸

To prevention and manage RF early identification of at risk patients is crucial. Stabilisation of the patient and treatment of life threatening complications, supplementation with thiamine and multivitamin tablets should be initiated. Serum levels of electrolytes should be monitored within six hours of re-initiating feeding and thereafter, daily during the first week.^{26, 129} During refeeding energy supply should resume slowly, by providing 37% of the total energy requirements and

gradually increased by 10% every 24 hours. The aim is to reach the nutritional goal by the second week.¹²⁸

Hypertonic dehydration

Adequate hydration should be taken into consideration in tube-fed patients but predicting fluid requirements can be challenging. Hydration deficiencies and excesses should be identified and managed accordingly.¹³¹ Awareness of over- and under-hydration signs in those who are taking care of the tube-fed patients should be a priority.¹³¹

Metabolic complications should be taken into consideration when patient is on EN as they can lead to hyperglycaemia, hypoglycaemia, deficiencies, RF, excess fluids, electrolytes, vitamins and trace minerals.¹⁰¹ Identification of patients presenting with underlying metabolic disease is of utmost importance. Gradual introduction of EN over several days will assist in minimising metabolic complications. Fluid replenishment should be carefully controlled.^{101,123,132}

2.10.4 Infectious

Aspiration pneumonia

Aspiration pneumonia is defined as “an inflammation of the lungs and bronchial tubes that occurs after you inhale oral or gastric contents such as vomit, food or liquid”^{133(p1)} In the elderly population, aspiration pneumonia has been found to be a leading cause of death.¹³⁴ Others causes of aspiration include medications such as those that reduce gastric emptying, tube dislodgement, physical agitation that may occur during physiotherapy sessions and incorrect positioning of the patient, which result in a reflux or vomiting episode.²⁶ To minimise the risk of aspiration, the patient’s head-of-bed (HOB) elevation should be 30–45°, and the position of the tube should be properly confirmed.¹³⁵ Marco found a 21.5% and a 25.9% increased risk of broncho-pulmonary aspiration in patients receiving NG and PEG feeding respectively in comparison with those who did not require these techniques.¹³⁶

In a case report of a 79-year-old male who had a history of a gastrectomy and presented with recurrent pneumonia, it was found that the feeding tube was the main cause.¹⁰⁴ To manage and reduce the incidence, the nursing personnel kept him in a reclined position of 30°. ¹⁰⁴ The case study found that a nasogastric-jejunal feeding tube guided by endoscopy is the most-effective method for reducing the incidence of gastro-oesophageal reflux, aspiration pneumonia, dumping syndrome and diarrhoea, even when the feeding rate is increased to levels higher than 300 ml/hr. ¹⁰⁴ This technique is simple and user friendly. Other measures of preventing aspiration pneumonia include the use of H₂ blockers and proton-pump inhibitors and jejunal feeding in

selected high-risk patients.¹³⁷ The traditional use of blue colouring for the monitoring of aspiration risk should be avoided because it has been shown to be dangerous, especially in critically ill patients who have the potential to absorb the dye into their systems, which could be fatal.²⁶

Dietary contamination

The EN feeds provide an ideal environment for bacteria and other organisms to thrive and cause harm to the patient.¹³⁸ Complications such as diarrhoea and pneumonia have been associated with feed contamination.¹³⁸ The temperature of the feed has an influence on the microbial growth. Enteral feeds stored in hyperthermal or thermoneutral environments demonstrate no difference in microbial growth after eight hours in both open and closed systems.¹³⁹ The addition of modular products to the feeds in the hyperthermal environments increased the risk of microbial contamination in eight hours.¹³⁹ In comparison with commercialised products, the risk of contamination by microorganisms in blended and liquid diets is increased due to high handling during preparation and the lack of sterility of the environments in which the feeds are prepared.¹³⁸

Infections can result in life threatening complications such as pneumonia which is usually a consequence of pulmonary aspirations. Poor hygiene and incorrect handling of enteral feeds increase risk of infections through contamination. Correct positioning of bed and good hygiene and storage practices of feeds minimises risk of infections.^{135,138,139}

2.11 NUTRITION PROTOCOL

The nutrition protocol is an operational document with guidelines adapted to local working requirements that are simple to implement in clinical practice.¹⁴⁰ The establishment of protocols and their availability assists clinicians to address diseases related to malnutrition in hospitalised patients effectively.¹⁴¹ Nutrition protocols provide direction and optimise various aspects of nutrition regarding the management of critically ill patients, ultimately improving the nutritional outcome of the patient.^{142,143} The protocols link current scientific knowledge and practices, providing evidence-based data that can be used in clinical settings.¹⁴³ The EN guidelines are an effective tool for ensuring that the patient receives adequate nutrition and that feeding complications are minimised or delayed and interruptions to feeding are managed properly.^{51,64,85} The implementation of nutrition guidelines should be based on their impact on clinical outcome.¹⁴³

The use of nutrition algorithms in critically ill patients is usually based on traditions and norms rather than evidence.¹⁴⁴ Poor adherence and practice of evidence-based protocols can lead to nutrition failure.¹⁴⁵ Unavailability of resources and poor interaction and communication were the greatest challenges in the effective use of protocols.¹⁴⁵ The use of feeding protocols in hospital facilities improved the initiation of EN to within two days after admission into the ICU, the number of patients receiving nutrition therapy improved and the feeding rates were adjusted accordingly.^{142,146}

Introduction of EN guidelines with repeated staff education improved the timing of EN initiation without increasing the risk of aspiration in post-operative surgical patients.¹⁴⁶ In patients with a high GRV, motility agents were frequently used compared with the control group without feeding protocols.¹⁴⁵ Lack of nutritional screening for malnutrition in admitted patients was associated with unavailability of international guidelines, and enteral-nutrition protocols were not followed by nurses and doctors.¹⁴⁷ This practice delayed nutrition screening, surveillance and initiation of nutrition support.¹⁴⁷

In a retrospective review of mechanically ventilated burn patients, it was discovered that when health workers are compliant with the EN protocol of initiating enteral feeds within 24 hours post admission, the duration of time in ICU is shortened and the risk of wound infection is reduced.^{87,143} Compliance with early EN as part of the standard operating procedure in a multicentre observation trial was very good at 80%.⁸⁷ When an EN algorithm was implemented in a paediatric ICU, there was great improvement in the number of days required to reach the target nutritional goals.⁸³ The feeding interruptions were minimal, thus optimising on nutrient delivery and reducing the need for TPN.⁸³ A cross-sectional study on tube flushing before and after administration of medication demonstrated a great difference in working methods regarding administration of drugs through the tube among nursing personnel, and the majority were not following the guidelines outlined.¹⁴⁸

There are evidence-based messages that support the theory of using EN protocols to maximise the efficiency of nutrient delivery and thus meet the patient's nutritional requirements.^{87,142} The implementation of evidence-based protocols enhanced the knowledge regarding safe methods to unclog a blocked tube, elevation of the bed to 30–45°, proper administration of medications via the tube and fluid and feed recording.¹⁴⁴ Discrepancy exist in regard to clinical guidelines for nutrition therapy which might limit the implementation in daily practice.¹⁴⁹ This was linked to differences in expert opinion and a lower-level grade of evidence that formed part of the guidelines.¹⁴⁹

2.12 NURSING ATTITUDE

An attitude is a state of mind about an object, fact or situation that is revealed through one's behaviours.¹⁵⁰ A negative attitude limits performance and motivation and inhibits learning whereas a positive attitude enhances motivation and creates an opportunity to learn.¹⁵⁰ Attitude influences how an individual will adhere to the set guidelines in their daily practice.¹⁵¹ Since poor nutrition affects mortality and morbidity, it is crucial that nurses feel responsible for the provision of adequate nutritional support for their patients while in hospital.¹⁵² With the busy daily routine at ward level, nutrition care tends to be given less priority.¹⁵²

Comparisons were made in New Zealand among medical students, general-practice registrars and general practitioners, and it was found that all groups had a positive attitude with moderate confidence towards the provision of nutritional care in their daily practices.¹⁵³ Although there was a diversity of opinion with regard to certain components of EN, the majority (91.4%) of critical-care practitioners had a positive attitude and valued nutrition as an important component of the medical care.¹⁵¹ With regard to patients on EN presenting with diarrhoea, nurses reported odour and frequent changes of nappies and linen as the most unpleasant characteristics, differing completely in opinion and attitude from those of patients and dietitians.¹⁵⁴ In addition, opinions towards the causes and management of diarrhoea differed between the nursing assistants, professional nurses and physicians. Most nursing assistants associated diarrhoea with EN and would, therefore, most likely discontinue or reduce the volume of the feed and only thereafter, report to the senior nurse.¹⁵⁵ Physicians, responded differently since they do not communicate with the other healthcare workers, especially the dietitians and nutritionists.¹⁵⁵ Practices such as the use of feeding protocols, early EN within 24–48 hours of admission and HOB were endorsed, even though critical care practitioners do not implement them in their daily work routine.¹⁵¹

2.13 KNOWLEDGE OF NURSING PERSONNEL

Knowledge is defined by the *Merriam-Webster's Collegiate Dictionary* as “the fact or condition of knowing something with familiarity gained through experience or association.”¹⁵⁶ Due to the nature of nurses' responsibilities, nursing personnel need to understand how the GIT functions and the changes that occur during acute illness.¹⁵⁷ Thus, it is essential for nursing personnel to possess a basic knowledge of the components of nutrition support. Fletcher et al. found that inadequate knowledge was the main reason for inconsistency in their nutrition-screening methods for patients.¹⁵⁸ Nursing personnel have the responsibility to advocate, to make critical decisions and to ensure that tasks are done according to the standards in order to promote

patient recovery.¹⁵⁷ Inadequate knowledge of healthcare practitioners is the main reason for preventing patients from receiving adequate care.¹⁵⁷ Annetta et al. found that the main barriers to fighting malnutrition in hospitals were inadequate knowledge and lack of commitment by both nurses and physicians.¹⁴⁷ An assessment of nutrition knowledge among doctors and pharmacists determined that both groups had mixed feelings regarding their approach and the screening of malnutrition.¹⁵⁹ Surprisingly, pharmacists scored higher than doctors in this assessment of nutrition knowledge.¹⁵⁹

In a comparison with other healthcare workers, nurses scored a low 26% in terms of demonstrating sufficient understanding of nutrition-support guidelines and practices, with clinicians and dieticians at 44% and 76% respectively.¹⁶⁰ With regard to enhancing the knowledge of nurses, Ke et al. recommends that in-service training is one of the best methods that can be used.¹⁶¹ This will build, promote and improve practices and positive attitudes towards EN, strengthening nurses' efforts to communicate actively and cooperate with physicians in ensuring that patients obtain the most benefit from artificial feeding.¹⁶¹ The majority (89%) of nurses possess the correct knowledge regarding the administration of drugs via a tube when the patient is on EN; however, they differ in the solution used to flush the tube, with tap water being demonstrated as the most-utilised solvent.¹¹² Data collected from the Australian College of Critical Care Nurses discovered a deficit in nutrition knowledge, with only 10.3% of nurses reporting excellent knowledge and 60.1 % demonstrating good knowledge.¹⁶² The greatest deficits in knowledge were noted in questions regarding the effect of malnutrition on patient outcome.¹⁶²

2.13.1 Sources of nutrition knowledge

It is important to understand how nurses acquire their skills so that methods can be adapted and used for in-service training. Literature has shown that most of the learning of nurses is attained through practise and skills taught by co-workers.¹⁶³ Nurses value the importance of research and are always willing to learn.¹⁶³ In Jordan, the four most common sources of learning are formal education at the nursing college, experience acquired on a daily basis, multidisciplinary discussions between nurses, physicians and other role players regarding the patient and information from the policy and procedure manual.¹⁶³ Studies by Morphet et al.¹⁶² and Darawad et al.¹³ outline that nurses also consider hospital dieticians, feeding protocols, personal education, the Internet and nursing colleges as main sources of nutrition knowledge.

2.14 NURSING PRACTICE

A practice is an exercise or daily task that is done with an intention.¹⁶⁴ Because it is a function that is repeated many times, it sometimes feels good to perform it and sometimes, it is boring. Its purpose is to create a channel in the direction that we desire.¹⁶⁴ It is of vital importance to analyse and assess barriers in the healthcare units that contribute to the learning of both successful and unsuccessful knowledge so that the best strategies can be used to implement new changes.¹⁶⁵ The implementation into practice of the knowledge learnt during training and workshops is affected by certain barriers such as conflict regarding who is responsible for issuing an instruction and who is responsible for executing the order.¹⁶⁵ Lack of human resources due to increased workload reduces interest of nursing personnel to perform certain tasks.¹⁶⁵ Nurses can assist in bringing change to the management of tube-fed patients through standardised nutritional practices and the assurance that hospitalised patients are optimally fed.¹⁶⁶

Other identified barriers that affect good clinical practice include resistance to change, limited experience of working with critical-care patients, lack of awareness of the availability of protocols, excessive information, unavailability of resources to implement certain tasks and slow administrative processes.¹⁶⁷ It was also noted that protocols are complicated to interpret and are based on weak or outdated evidence.¹⁴ Lack of time prevented healthcare workers from attending training in the implementation of the protocols.¹⁴ Lack of leadership, lack of multidisciplinary teams and poor communication were highlighted as other contributing barriers.¹⁶⁶ It was found that many protocols were not evaluated for effectiveness, and they lacked sustainability, resulting in poor adherence to implementing them regularly.¹⁶⁵

It is of vital importance that implementation of nutritional guidelines and improvement of nutrition therapy are made a priority.¹⁶⁶ Eliminating barriers such as conflicting evidence-based recommendations, lack of continual education and unavailability of multidisciplinary teams in the ICU during nutrition decision-making should be a priority.¹⁶⁶ Strategies that address barriers to feeding should be made available because this will discourage nurses from seeking nutrition information from social media platforms.^{166,167} Hammad et al. evaluated the practice of nurses with regard to EN and found that 40% initiated feeds within 48 hours, and factors such as bed elevation were consistent with the guidelines.¹⁶⁸

In general, evidence-based guidelines were not followed, especially in the measurement of GRV and its management, which can lead to underfeeding.¹⁶⁸ There was variation among nurses regarding the point at which feeds should be withheld, although GRV was determined in all patients regardless of the symptoms and without waiting for the physicians' orders.¹⁶⁹ This

regular testing of GRV increased hospital-care cost and the workload of nursing personnel.¹⁶⁹ Nurses were found to lack teamwork and ownership, compromising the process of adopting new procedures.¹⁶⁵ The positive factors for improving the success rate of implementing new guidelines are dependent on focusing on the priorities in regard to medical treatment and using multiple strategies to affect the change.¹⁶⁵

Nurses should be empowered to embrace the best medical treatment to bring positive outcomes to the lives of their patients.¹⁶⁶ A change in practice by nursing personnel improved the commencement of EN to within 24 hours of admission and positively affected the goal of achieving the target feeding rate, the calories delivered, including grams of protein per kg of body weight, and overall prescribed volume by day 6.^{170,171} Staff compliance with adhering to guidelines also improved when pre- and post-audits were compared.¹⁷⁰

The administration of medication to patients on EN can be a challenge and a barrier to continuous feeding if guidelines are not followed.¹⁴⁸ A nurse's role includes the administration of drugs via a tube when a patient is on EN.¹⁷² In terms of nursing practice, the position of the tube should be verified before medication and EN is administered.¹⁷² The study by Phillips et al. showed that 12% of the nurses only flushed the tube in between medication, 96% flushed after administration of medication and only 28% flushed before.¹⁷² A great variation between nursing staff members of the same unit was observed with regard to flushing the tube with 15 ml of water before and after administration of medication.¹⁴⁸ Not all EN guidelines were adhered to, and there was a significant gap between the recommendations and guidelines regarding the initiation of EN, the use of pro-kinetics and consideration of feeding through the small bowel in patients presenting with large volumes of GRV, which can lead to suboptimal feeding.¹⁷³

In conclusion, EN is of vital importance in managing patients presenting with oral feeding difficulties. It maintains gut motility and immune and metabolic responses. Literature makes provision for evidence-based guidelines and protocols to guide healthcare workers and clinicians in the appropriate way of administering EN in order to prevent discrepancies and minimise complications. Underfeeding should be avoided, and GRV should be used as one of the tools to monitor EN tolerance.

This study aimed to identify gaps in the KAP of military nurses regarding EN since limited studies have been found of this nature. The results of this study will assist in the planning of in-service training where necessary and in the upgrading of the nutrition module offered at the nursing college of 1 Military Hospital.

CHAPTER 3: METHODOLOGY

3.1 RESEARCH QUESTIONS

Based on the gaps identified from the literature, the following research questions were formulated:

1. To what extent do nursing personnel understand and use the knowledge acquired through the undergraduate nutrition module?
2. How do nursing personnel perceive the importance of providing adequate nutritional care to patients for the improvement of patient health status and recovery?
3. To what extent does the implementation of EN guidelines differ among the nursing personnel within their professional ranking and years of experience?

3.2 AIMS

The aims of the study were:

1. To assess the knowledge, attitude and practice of nurses with regard to EN at 1 Military Hospital, Thaba Tshwane, Pretoria
2. To identify the need to update the scope for undergraduate nursing personnel at the SAMHS Nursing College

3.3 OBJECTIVES

The objectives of the study were as follows:

1. To determine the knowledge of EN as learnt during the course of undergraduate training
2. To determine the attitude and practice of nurses with regard to EN
3. To determine differences in the knowledge, attitude and practice within the professional nursing ranks

4. To determine the availability and practice of EN protocols by nursing personnel
5. To determine the frequency of in-service training and the awareness regarding EN in nursing personnel
6. To determine the need to update the content of nutrition training guidelines regarding EN at the SAMHS Nursing College

3.4 HYPOTHESIS

The null hypothesis in this study was stipulated as follows: There is no difference in knowledge, attitude and the implementation of EN guidelines among the nursing personnel within their professional ranking and years of experience.

3.5 STUDY PLAN

3.5.1 Study design

This quantitative research study followed a descriptive, cross-sectional design with an analytical component.

3.5.2 Study population

The study population consisted of all nursing personnel employed at 1 Military Hospital on a permanent or contract basis from 4 July 2016 to 31 August 2016 who provided direct nursing care to both paediatric and adult patients.

3.5.3 Sample size and sampling procedure

The guideline by the Universal Accreditation Board¹⁷⁴ was used to determine the sample size. The total number of nurses employed at 1 Military Hospital according to information received from the nursing management office at the time of the study was 500. For a population of 500 with a confidence level of 95%, a sample of 210 was needed. To accommodate for questionnaires that would not be returned or would be returned as incomplete, an additional 10% was added. The target sample size was set at 240. The method of simple random sampling

was applied to select the 240 participants. All nursing personnel who were willing to participate and agreed to sign the consent form (Addendum B) during data collection were given the opportunity to take part in the study. From the total group, the participants were randomly selected proportionally within their professional ranking. The sample size selected is indicated in Table 3.1.

Table 3.1: Selection of study sample

Nursing category	Total number available	% contribution	No. selected for study
Professional nurses with speciality	100	20	48
Professional nurses	193	38.6	92
Enrolled nurses	195	39	94
Enrolled nursing assistants	12	2.4	6
Other			
TOTAL	500	100	240

3.5.4 Inclusion criteria

The study included all nurses working directly in paediatric wards, adult wards and out-patient clinics. This is because there is a monthly rotation among nurses throughout the different units. The official language used in the military is English. English is used for general communication, record-keeping and at the training college. The participants included in the study were those who were able to read and write in English because the questionnaire was not translated into different languages and an interpreter was not available to assist with completion of the questionnaires. All nursing personnel working night and day duty during the data collection period were included.

3.5.5 Exclusion criteria

The following nursing personnel were excluded from participating in the study:

- All nursing personnel members who were on internal or external deployment (rendering their services in/outside the country) during data collection were excluded. The Department of Defence (DoD) renders services outside the borders of SA (e.g. Burundi and the Democratic Republic of the Congo for peace missions). Since members are deployed for the duration of one year, it was not possible for them to participate in the study during data collection since the questionnaires were physically delivered and collected from participants in their work unit.
- Nursing managers who are no longer functioning as operational nurses were excluded from the study. Nursing managers have limited contact with patients and do not actively participate on a full-time basis with the patients.
- Agency nursing personnel who are called in only during emergencies were not included. Occasionally when the hospital has a shortage of personnel due to high admission rates, the assistance of agency nurses is requested. These nurses only perform their duties when called and are not part of the monthly South African National Defence Force (SANDF) payroll system.
- Student nurses were excluded because they are still on training and are working under supervision.
- Nursing personnel who participated in the pilot study (n=19) were excluded.

3.6 METHODS OF DATA COLLECTION

The questionnaire (Addendum A) is recognised as the most reliable tool in data collection and is the most commonly used tool in epidemiological surveys. Questionnaires have the capacity to reach a large number of respondents.¹⁷⁵ A standardised questionnaire facilitates comparisons between new findings and other similar study results. Finally, they are an inexpensive way of covering a large geographical area.¹⁷⁵

3.6.1 Questionnaire design and layout

The questionnaire used in this study was designed and constructed by the researcher and was based on recent and relevant literature. It contained two sections. Section A involved the demographic information of the participants, and section B involved the KAP questions.

Questions regarding attitude were measured by means of a Likert scale, which provided different options based on the questions. Regarding knowledge and practice, the majority of the questions were multiple-choice, with a few questions being open-ended. The multiple-choice options were based on current literature, and participants were required to select the correct answers. A memorandum was provided for data analysis purposes. For the purposes of this study, a score of 80% and above was rated as adequate knowledge. This was set in line with other studies that conducted KAP. The score of 80% desire to establish if there is excellency in administering EN by nursing personnel to their patients.¹⁷⁶

3.7 VALIDITY OF QUESTIONNAIRES

The researcher ensured that the questionnaire content and the alignment of the questions were able to answer the aims, objectives and research questions of this study. The questionnaire was guided by the literature review and was assessed for content validity by a panel of experts in EN at Stellenbosch University. Face validity was evaluated by the participants who took part in the pilot study. The questionnaire was to be piloted with 20 nursing personnel from 1 Military Hospital, and 19 questionnaires were achieved. With the assistance of the supervisor and the co-supervisor, feedback from the pilot study questionnaire was used to test if the results met the objectives and the expected results of the study. Minor changes were made to the layout of the questionnaire, and the structure of the questions was adjusted.

3.8 DATA COLLECTION

The questionnaire was completed by the respondents. The purpose of the study and instructions for how to complete the questionnaire were clearly stipulated on the consent form and the questionnaire respectively. The questionnaire was designed in such a way that it would not take the respondents more than 30 minutes to complete. This was to maintain respondents' enthusiasm, energy and interest in order to complete the questionnaires thoroughly and to limit superficial answers. This assisted in obtaining useful responses and limiting the number of incomplete questionnaires.

The data collection was carried out from July 2016 to August 2016 at 1 Military Hospital, Thaba Tshwane, Pretoria, Gauteng. The researcher hand-delivered the questionnaires to each participant and collected them after completion. This minimised loss and improved confidentiality since there was minimal handling of the questionnaires. To ensure a maximum response rate, a face-to-face appointment with the sister-in-charge of each ward and clinic was

made for a time that was most convenient, taking into consideration the day-to-day work responsibilities and thus limiting the distractions that would occur if administered during peak working time. The study aim and the procedure was explained in detail to the sister-in-charge. On meeting with the nursing personnel, it was clearly explained that participation in the research was voluntary and that it did not have any contribution to their annual performance review. Only nursing personnel who were interested were requested to gather in the meeting room of the ward for further instructions and information.

The list of nursing personnel was requested from hospital nursing management who obtained it from human resource department. It had the details of participants such as names, qualifications, ward allocation, staff category, deployment status and type of employment contract with the hospital. The availability of nurses who meet the research criteria was confirmed with the sister in charge of the ward/clinic on booking of the appointment. The nursing manager's role was limited to securing the appointment and providing the nursing personnel list according to professional ranking who meet the inclusion criteria. The nursing manager was not present in the area where participants completed the questionnaire. The researcher explained the purpose of the study to the nursing personnel and obtained informed consent. Because participation was voluntary and the maintenance of confidentiality was a priority at all times, the consent form and the questionnaire were not linked since this would have facilitated the determination of the participant's identity. The details of the participant appeared only on the consent form. Following the brief information session, the questionnaires were handed out. Participants were requested to complete them and were given an opportunity to ask questions to clarify any misunderstandings

The appointment-base method provided a safe tool to ensure that participants answered the questionnaire individually. Training of field workers was not required since the researcher personally hand delivered the questionnaires.

3.9 ANALYSIS OF DATA

The data collected was captured using Excel on a predesigned spread sheet. In order to achieve the results, descriptive statistics were used to analyse the demographic profiles of the participants, using frequencies and percentages presented by means of tables and graphs. Chi-Square tests were used to determine the level of association between the number of years of experience and the attitudes and practices of nurses with regard to EN. A p-value of <0.05 and the correlation test was used to test the hypothesis.

The differences in responses among participants were ascertained. Simple t-tests were applied to compare the mean scores on the Likert scale where the particular mid-point between agree and disagree was determined. The Statistical Package for the Social Sciences software was used to analyse the data.

3.10 TIME SCHEDULE

Table 3.2: Time schedule

2015–2017	Aug 15	Sept 15	Oct 15	Nov 15	Dec 15	Jan 16	Feb 16	Mar 16	Apr 16	May 16	Jun 16	July 16	Aug 16	Sept 16	Oct 16	Dec 16	Jan–July 17	Aug 17				
Protocol finalisation and ethical approval																						
1 Military Hospital ethics approval																						
Pilot study																						
Data collection																						

2015–2017	Aug 15	Sept 15	Oct 15	Nov 15	Dec 15	Jan 16	Feb 16	Mar 16	Apr 16	May 16	Jun 16	July 16	Aug 16	Sept 16	Oct 16	Dec 16	Jan–July 17	Aug 17				
Data analysis																						
Write thesis																						
Submission of final thesis																						

3.11 ETHICAL AND LEGAL CONSIDERATIONS

The study was approved by the Stellenbosch University Health Research Ethics Committee (S15/10/247) and 1 Military Hospital Research Ethics Council (REC-111208-019) (Addendum C).

Written permission was granted by the Defence Intelligence Division of the SANDF (Addendum D). The participants were not required to enter their names on the questionnaires. The questionnaires were numbered from 1 to 207. The data was captured on a computer that used a password to access the documents. The hard copies will be kept secure in a lockable safe for a period of five years. Only the researcher, the statistician and the study leaders will have access to the data until it is officially published.

Participants were required to complete a written consent form, acknowledging their voluntary participation in the study. The consent form stated that participation was voluntary and that participants were allowed to withdraw at any point during the data-collection process. The risks, the benefits and the social implications of the study were also reflected. Since the completion of the questionnaires took place during working hours with the full support of the DoD, no remuneration or rewards were awarded to the participants. This was clearly stated on the consent form together with a declaration that the study was an academic exercise and did not have an impact on the annual performance appraisal.

The total time required to complete the questionnaire was 30 minutes on average. The participants were required to sign the consent form in acknowledgement that they understood all that was required of them. The questionnaires were collected immediately after completion.

CHAPTER 4: RESULTS

This chapter presents the data analysis and the interpretation of results. A summary of the tool, the sample size and the evaluation for the validity and reliability of the tool are presented. The demographic profiles of the participants and the results for the knowledge, attitudes and practices of nurses regarding EN are outlined.

4.1 STUDY POPULATION

The study was conducted at 1 Military Hospital. The calculated sample size of 240 was based on a precision of $C_p=10\%$, 90% power and a confidence level of 95%. A total sample size of 207 was achieved. This moved the precision to 11%, maintaining 90% power and a confidence level of 95%. There were questions that had missing responses and such were excluded from the study. Thus, an 86.25% response rate was achieved for this study. Figure 4.1 details how the sample size was selected.

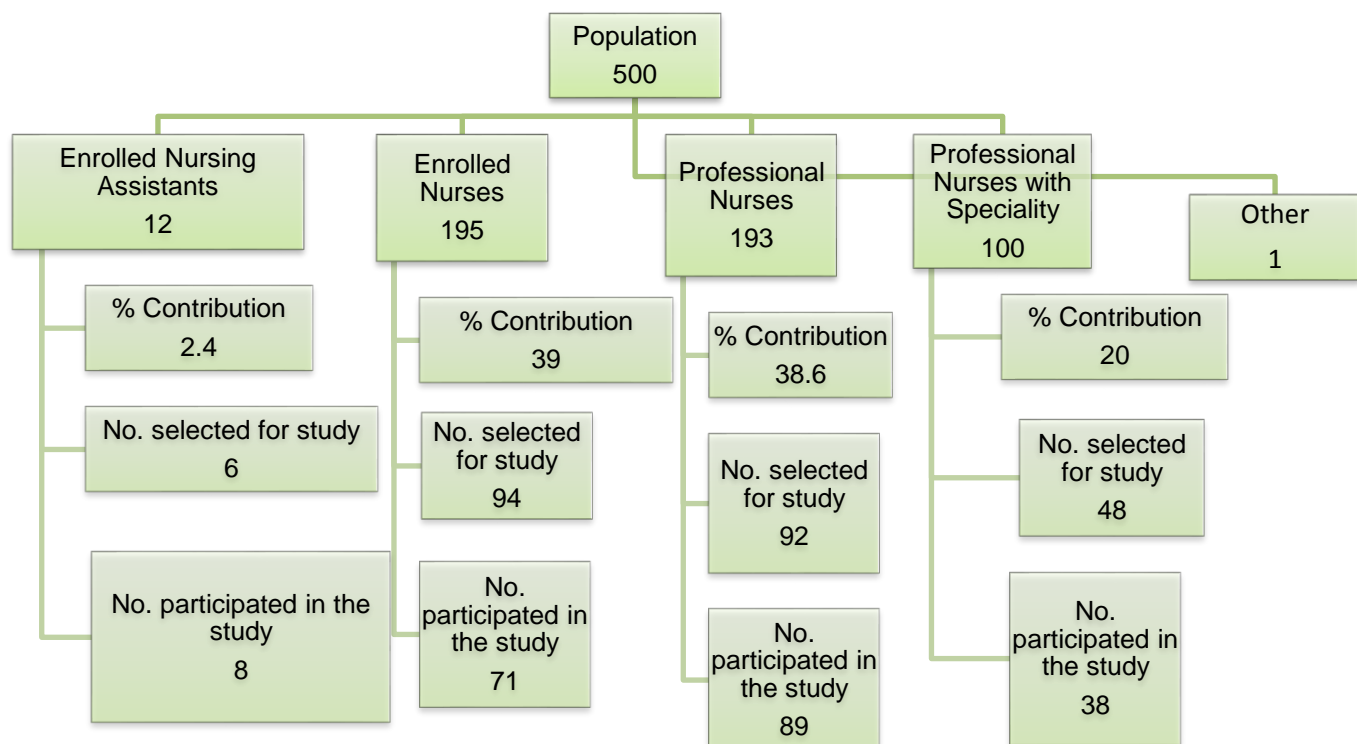


Figure 4.1: Selection of study sample

(No.= Number)

4.2 DEMOGRAPHIC INFORMATION OF PARTICIPANTS

Table 4.1 shows the demographic information of the participants. The information includes participant's' qualification, institution where qualification was obtained, staff category, experience in the nursing profession and age.

Table 4.1: Demographic distribution of participants

Category	Variable	Frequency	
		(n)	Per cent
Gender	Male	45	21.74
	Female	162	78.26
	Total	207	100
Age	<20 years	1	0.48
	20–29 years	80	38.65
	30–39 years	60	28.99
	40–49 years	37	17.87
	50–59 years	29	14.01
	>60 years	0	0.00
	Total	207	100
Qualification	Less than Grade 12	0	0.00
	Grade 12 (Standard 10)	3	1.45
	Nursing certificate	85	41.06
	College degree / diploma	95	45.89
	University degree	24	11.59
	Master's degree	0	0.00
	Total	207	100
Institution where qualification was obtained*	SAMHS Nursing College	158	74.18
	Civilian nursing college	24	11.27
	University	26	12.21
	Other	5	2.35
	Total	213	100

Category	Variable	Frequency	
		(n)	Per cent
Staff category	Enrolled nursing assistant	8	3.86
	Enrolled nurse	71	34.30
	Professional nurse	89	43.00
	Professional nurse with speciality	38	18.36
	Other	1	0.48
	Total	207	100
Nursing experience as a professional nurse	<1 year	16	7.77
	1–5 years	66	32.04
	6–10 years	43	20.87
	11–15 years	24	11.65
	16–20 years	17	8.25
	21–25 years	27	13.11
	>25 years	13	6.31
	Total	206	100

SAMHS = South African Medical Health Services

* More than one option could be identified

It is clear from Table 4.1 that most participants were female (78.3%; n=162) and in age (20–29 years) (38.7%; n=80). None were above 60 years in age, most probably due to 60 years being the standard retirement age in the organisation. None of the participants has a qualification of less than Grade 12, majority held a college degree / diploma qualification (46%; n=95) and worked as a professional nurse (34.3%; n=71), with (3.8%; n=8) being nursing assistants. No participants held a Master's degree or beyond. The majority of the participants acquired their tertiary qualification at the military college (74%; n=158). Less than eight percent had a level of experience in nursing of less than 1 year (7.7%; n=16).

4.3 NUTRITION TRAINING PROFILE OF NURSING PERSONNEL

Most of the participants had received formal training in EN (74.2%; n=153) through a lecture/presentation (57%; n=107). About (7.4%; n=14) of the participants had received training through a full-day workshop. Other methods of training were unfortunately not specified by 16 participants (8.5%). The EN training was mostly carried out at the Military nursing colleges (52.2%; n=104), and (12.6%, n=25) of participants were trained by a dietician. Participants who do not have protocols in their workplace was found to be (27.3% n=56) and (43.4% n=89) did not know whether protocols regarding EN were available. This could have influenced the belief of 67.1% participants who responded that EN can be administered at the same rate throughout the duration required by the patient. In contrast with their response regarding where they received EN training, (25%; n=115) indicated that in-service training was their main source of nutrition knowledge, followed by the nursing college (20.5%; n=89). The Intranet, the internal DoD communication system (16%; n=3) and scientific journal articles (2.3%; n=11) were the least indicated as sources, which is concerning since evidence-based practice is learnt through research findings. Table 4.2 outlines the training profile of the participants.

Table 4.2: Participants' nutrition training profile

Category	Variable	Frequency(n)	Percentage
Formal training received on EN administration	Yes	153	74.27
	No	53	25.73
	Total	206	100.00
Format of formal training received on EN	Half-day workshop	25	13.37
	Full-day workshop	14	7.49
	Lecture/presentation	107	57.22
	Tutorial	25	13.37
	Other	16	8.56
	Total	187	100.00
Who trained you on EN?	Lecturer at university/college	104	52.26
	Dietician	25	12.56
	Colleagues in the workplace	62	31.16
	Other	8	4.02
	Total	199	100.00
Protocols and policies available regarding EN	Yes	60	29.27
	No	56	27.32
	I do not know	89	43.41
	Total	205	100.00
How often do you refer to these protocols?*	Daily	11	10.68
	Weekly	10	9.71
	1–2 times per month	82	79.61
	Never	0	0.00
	Total	103	100.00
Main source of nutrition knowledge*	In-service training	115	24.89
	Nursing-college training	95	20.56
	Internet	74	16.02
	Intranet	3	0.65
	Nutrition textbook	37	8.01
	Magazine	60	12.99
	Scientific journal article	11	2.38
	Consulting with colleagues	60	12.99
	Other	7	1.52
	Total	462	100.00

*Responses with more than one selection

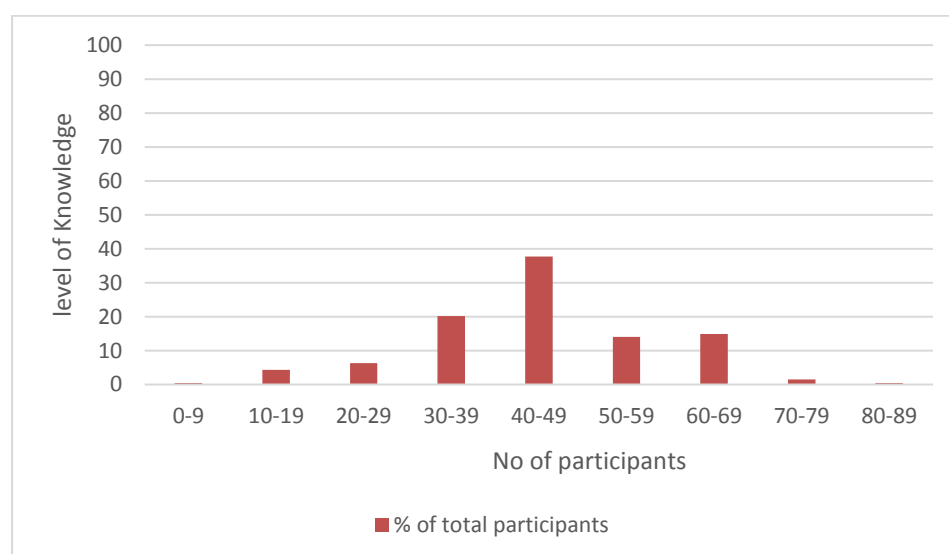
(EN= Enteral Nutrition)

4.4 KNOWLEDGE, ATTITUDE AND PRACTICES OF NURSES

4.4.1 Knowledge with regard to EN as learnt during the course of undergraduate training

A percentage score of 80% was stated a priori as the ability to respond to the question correctly. Questions with more than one answer are discussed separately. As discussed in Chapter 3, the sample size was proportionally selected with reference to the nurse's structure as provided by nursing management. The sample was evenly spread, with the category of Enrolled Nursing Assistant (ENA) demonstrating the least participants ($n=8$). For hypothesis testing, the percentage score of the ENA participants was combined with Enrolled Nurses (ENS), and the percentage score of the Professional Nurses (PN) was combined with Speciality Nurses (PNS) in order to establish an adequate power calculation. The effect size was small (0.35) with 87% power and a type II error of 0.05 of the two groups.

The study results revealed that participants had a knowledge score level of 46.3%, which is significantly below the set score. Only one participant achieved the target score of 80%, and 16.3% achieved above 60%. The mean in this study is $45.8\% \pm 13.7$, with a range of 6.25–81.2%. The null hypothesis in this study was accepted because there is no difference in knowledge, attitude and implementation of EN guidelines among the nursing personnel with regard to their professional ranking and years of experience. Figure 4.2 represents the results of the participants with regard to EN knowledge.



No = Number

Figure 4.2: Level of knowledge score among participants

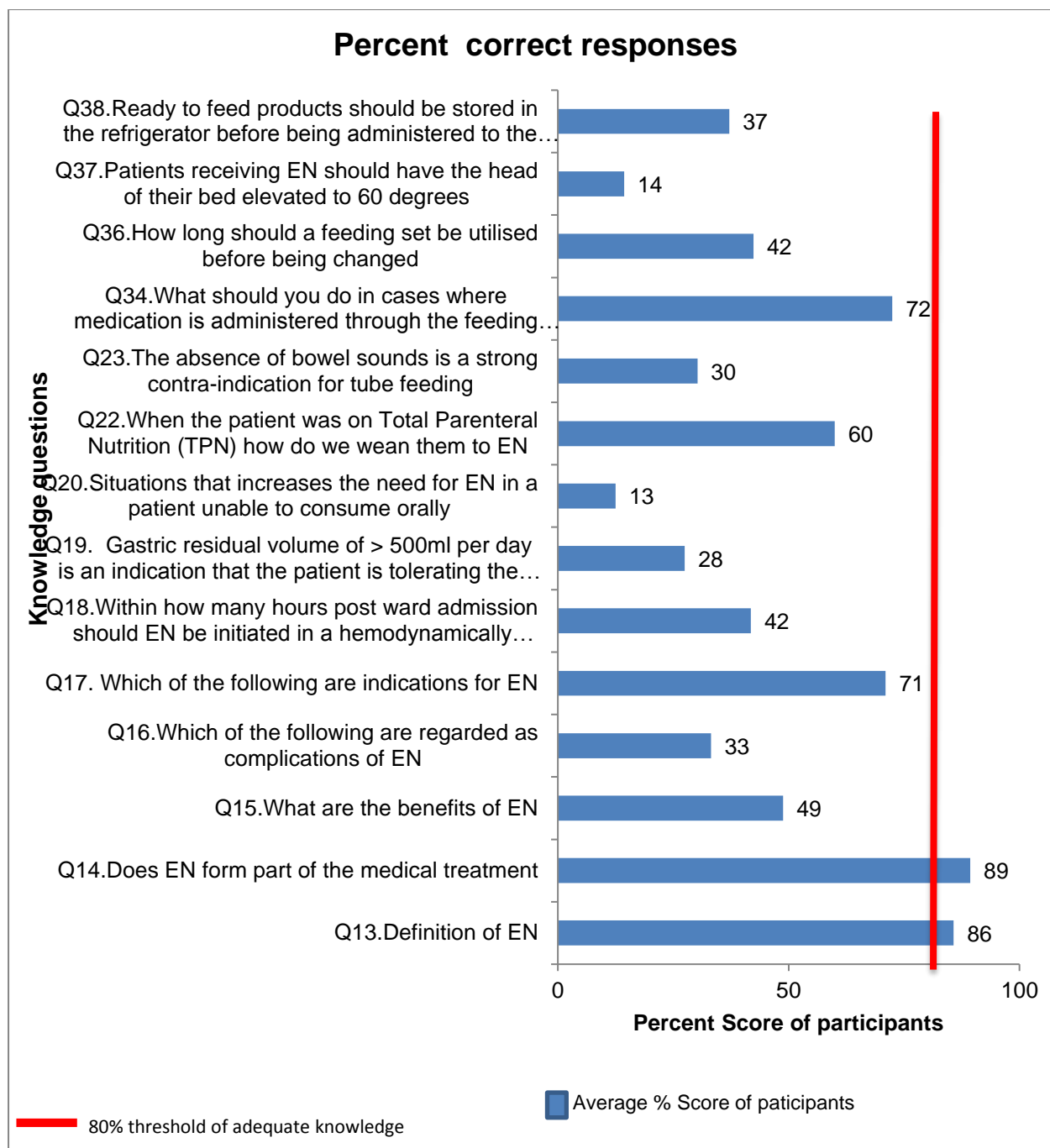
There was no significant difference between EN knowledge learnt at Military nursing college and the following variables: gender, nursing ranking category and institutional college where training was received. It should be noted that the EN/ENA group achieved a better score compared with the PN/PNS group ($48.1 \pm 14.3\%$ vs $45.2 \pm 13.3\%$) although it was not significant. There was no correlation between level of knowledge and years of experience ($r=-0.01$; $p=0.85$). Table 4.3 summarises the results.

Table 4.3: Association of knowledge by gender, ranking and Institution

Variables	Number (n)	Mean \pm SD, 95% CI	Min–Max %	p-value
Females	162	45.41 ± 13.32	6.25–81.0	p=0.06
Males	45	49.72 ± 14.35	18.75–75.0	
ENS/ENA Group	79	48.10 ± 14.35	6.25–81.25	p=0.14
PN/PNS	127	45.23 ± 13.28	12.50–75.0	
Civilian college	46	46.74 ± 14.70	12.50–81.25	p=0.88
Military college	158	46.40 ± 13.0	18.75–75.0	

PN/PNS = Professional nurses/ Professional nurses with speciality

ENS/ENA = Enrolled nurses/Enrolled nursing assistance



(EN = Enteral nutrition; TPN = Total parental nutrition)

Figure 4.3: Percentage of correct answers obtained

The results according to Figure 4.3 show that the majority of participants have a greater level of knowledge in defining EN (85.7%; n=174) and understanding that EN forms part of the medical treatment (89.3%; n=184). Furthermore (49%; n=99) answered correctly regarding the benefits of EN. In addition (48.8%; n=101) were able to associate the benefits of EN with both malnutrition reduction and symbol of care in comparison with the participants who indicated

reduction of malnutrition rate only (45.4%; n=94). Concerning complications of EN (33.1%; n=78) of the participants were able to identify complications of EN as hyperglycaemia, aspiration, tube dislodgement and diarrhoea. The majority of study participants (71%; n=147) correctly identified the indication for EN as being for patients with a functioning GIT who are unable to maintain oral nutrition, whereas (41.8%; n=84) correctly stated that EN should be initiated within 24–48 hours post admission in haemodynamically stable patients.

It is worth noting that (72.5%; n=148) of participants did not know that a GRV of >500 ml is a contraindication to EN, especially since GRV forms part of the screening prior to feeding and part of the monitoring of feeding tolerance. In response to situations that increase the need for EN, (13%; n=23) of participants were able to respond correctly that patients presenting with a BMI of <16, >30 and NPO for more than a day should all be given the same priority. Patients who are on TPN are weaned to EN by slowly reducing the TPN and at the same time, slowly introducing EN. This was mentioned by (60%; n=117) of participants. Interesting to note that (71.5%; n=149) indicated that the absence of bowel sound is a strong contra-indicator to initiate EN. In regard to HOB, (85.6%; n=173) did not show a good understanding that HOB should be between 30° and 45°.

The results showed that (72.4%; n=150) of participants understood that when medication is administered through the feeding tube, the health care worker should flush the tube before and after administration. With respect to the use of feeding sets, (42.4%; n=86) indicated that feeding sets should be changed every 24 hours. The results demonstrated that (62.4%; n=126) are of the opinion that ready-to-feed products should be refrigerated before administration to the patient. In relation to mixed products, (18.3%; n=37) responded correctly that feeds can stand for 4–6 hours after reconstitution at room temperature and still be safe. Safety of feeds refrigerated for 12–24 hours was correctly indicated by (21.7%; n=44) of participants.

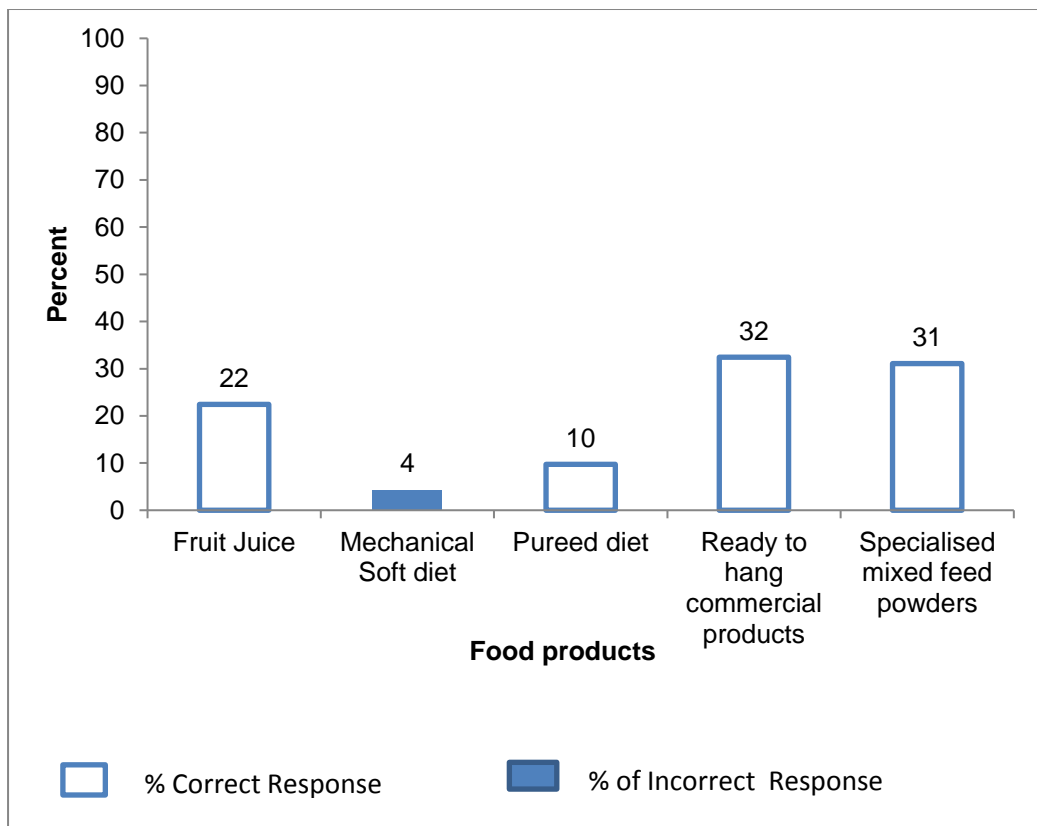
4.4.2 Practice of nurses with regard to EN

When asked what they would do to reduce the risk of aspiration in a patient receiving EN, an equal number of participants indicated that they would feed the patient in a Semi-Fowler's position/bed elevation (35.37%; n=58) and perform a litmus test (26%; n=43). At least (8%; n=13) indicated that the patient should be fed at a slower rate. In general, there was a great variation on how nurses reduce the risk of aspiration in patients receiving EN. Table 4.4 outlines the responses.

Table 4.4: Ways to reduce risk of aspiration in tube-fed patients

	Frequency(n)	Percentage
Elevate the bed above 30° or to 45°/Semi-Fowle r's position	58	35.37
Feed patient slowly	13	7.93
Stop the feeds	8	4.88
Place patient in upright position	34	20.73
Perform litmus test	43	26.22
According to dietician instructions	5	3.05
I do not know	3	1.83
Total	164	100

In responding to the different food products that can be administered through the feeding tube, (4.3%; n=16) of participants stated incorrectly that mechanical soft diet foods are food products that can be administered.

**Figure 4.4: Food products that can be administered through the feeding tube**

The most chosen method that scored above 50% was communication with the dietician to change the feed was regarded as the most-effective way of addressing a diarrhoea episode (68.1%; n=141). Administration of fluids and electrolyte therapy to prevent dehydration scored second (65.7%; n=136), checking the type of stools if it is similar to the feed as it might be malabsorption (61.3; n=127) and assessing and treating the cause (57%; n=118). About (16.4%; n=34) of participants opted to stop the feed immediately. It should be noted that in practice, the two least-chosen options (adjusting the feeding rate and stopping the feed immediately) are the most common ways for managing diarrhoea at ward level, as reflected in Figure 4.5.

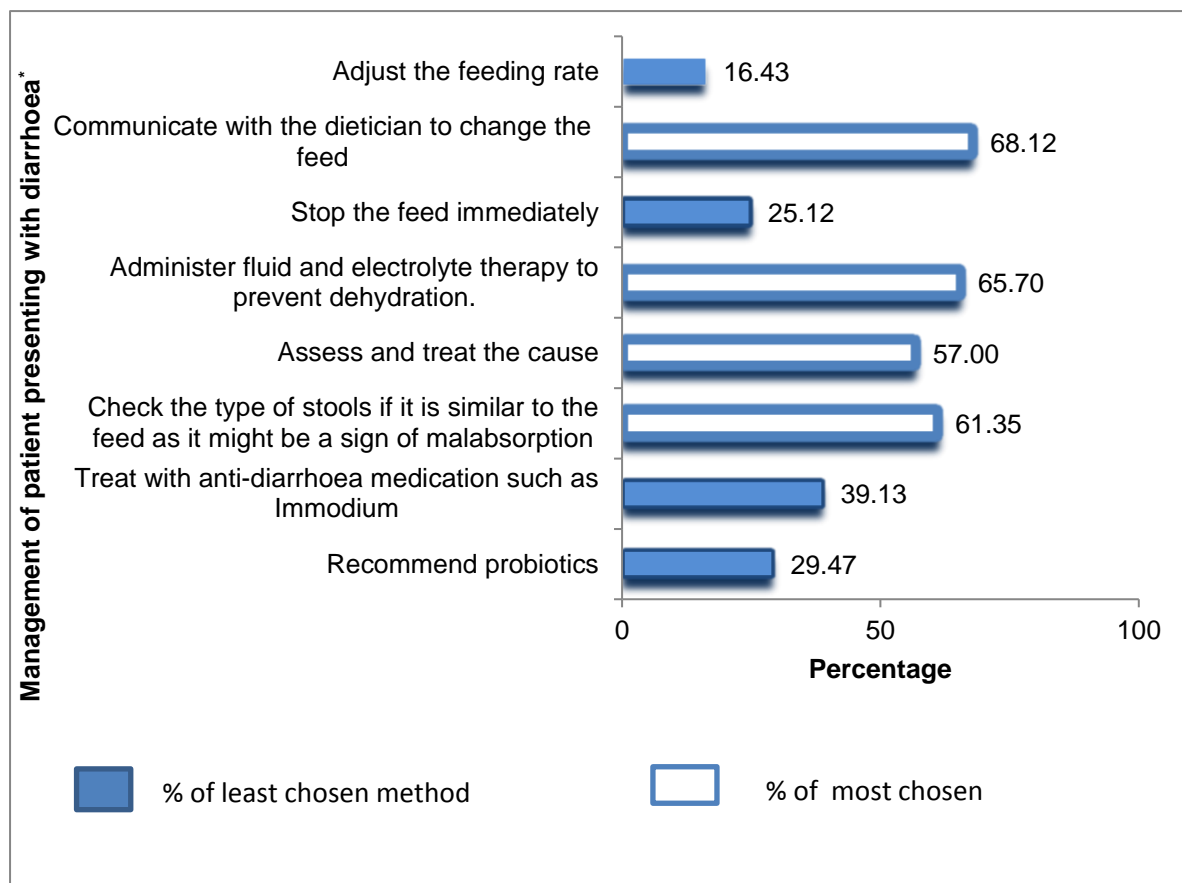


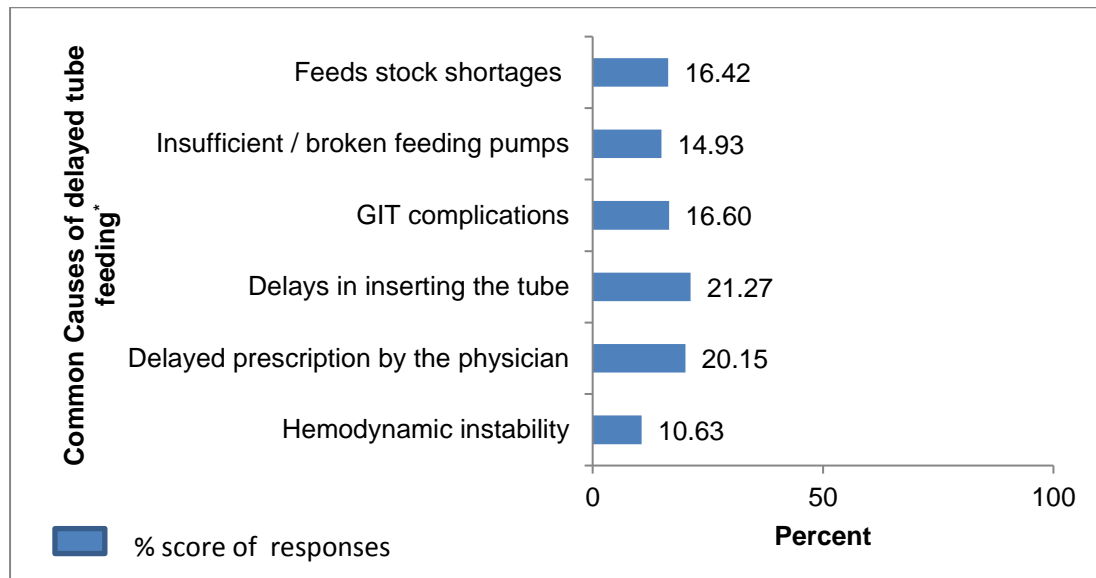
Figure 4.5: Management of enteral nutrition in patient presenting with diarrhoea

**Participant responded with more than one selection*

Participants were evaluated on the various ways that they unclog a blocked tube. Their responses revealed that to unclog a blocked feeding tube, it should be removed from the patient (3.9%; n=5) and the machine should be put on prime pump (1.6%; n=2), while (60.9%; n=78) indicated flushing with different solutions such as lukewarm water, sterile water and Coca-Cola or using bicarbonate of soda. The others preferred to call the dietician (3.1%; n=4), to discontinue feeding (3.9%; n=5) and to change the feeding tube (20.3%; n=26). A few participants (6.2%; n=8) did not remember how to unclog a blocked tube.

The participants reported the three most-common causes of delayed initiation of EN to be delay in inserting the tube (21.3%; n=115), delayed prescription by the physician (20.2%; n=114), followed by and lastly, GIT complications (16.6%; n=89). It is noted that participants selected multiple responses to this question. Of the participants who indicated 'Other', they indicated that: "[T]here are no delays at all (P24)", "[T]he department I am working in rarely administers EN (P26)", "[L]ittle knowledge for us hinders us to initiate it by ourselves (P43)", "[O]bserving

and trying to feed patient orally (P84)” and “[S]ee if she can tolerate oral feeds (P34)”. Figure 4.6 outlines the results.



GIT =Gastrointestinal tract

**Participants selected more than one option*

Figure 4.6: Most common causes of delayed initiation of EN in the workplace

4.4.3 Attitude and practice of nurses with regard to EN

The majority of participants (50.8%; n=128) perceived EN as a tool to reduce hospital stay, and (32.1%; n=81) of participants mentioned that it is cost effective. They regard EN to be unnecessary and is time consuming (7.54%; n=19) due to the great amount of recording that is required in patient feeding charts. This is reflected in Figure 4.7.

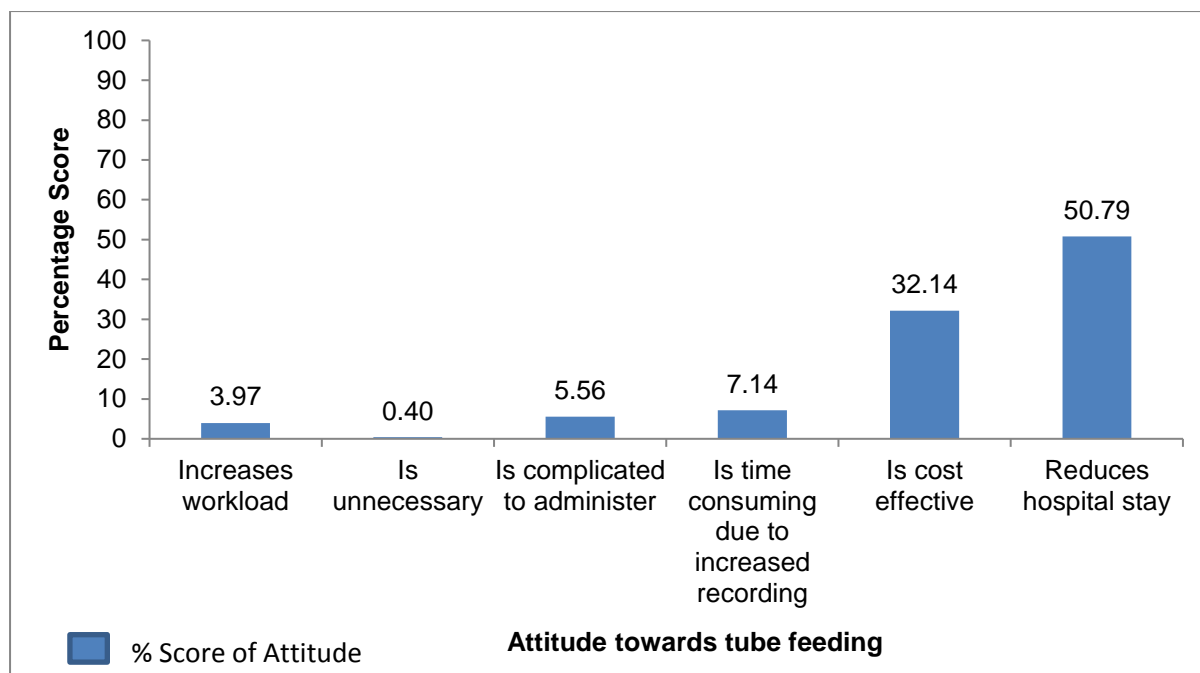


Figure 4.7: Participants' attitude towards Enteral Nutrition

Attitude towards preference, administration and instruction of EN

The perception of preference, administration and instruction of EN was assessed among nursing personnel, and it was shown that participants found difficulty in administering EN due to limited instructions from the dietitians versus those that did not find it difficult (35.8%; n=72 vs 64%; n=129; $p < 0.01$). The results indicated that (99.5% n=200) of participants agree that it is important for nursing personnel to understand administration of EN for the well-being of their patients. About (27%; n=55) did not consider EN as the first option in critically ill patients because they felt it causes discomfort. In comparison, (72.9%; n=148) of participants disagreed.

The majority of participants (90.5%; n=182) demonstrated a higher responsibility score regarding being accountable for the provision of nutrition for their patients all the time, with less than (9.4%; n=19) of participants indicating that they sometimes feel responsible.

In general, the majority of participants (67.1%; n=137) believe that it is easy to nurse patients who are on EN because it can be administered at the same feeding rate throughout the duration required by the patient. As shown in Figure 4.8, less than (4.5%; n=9) of participants believe that it is an expensive treatment that does not have an impact and does not benefit the critically ill patient.

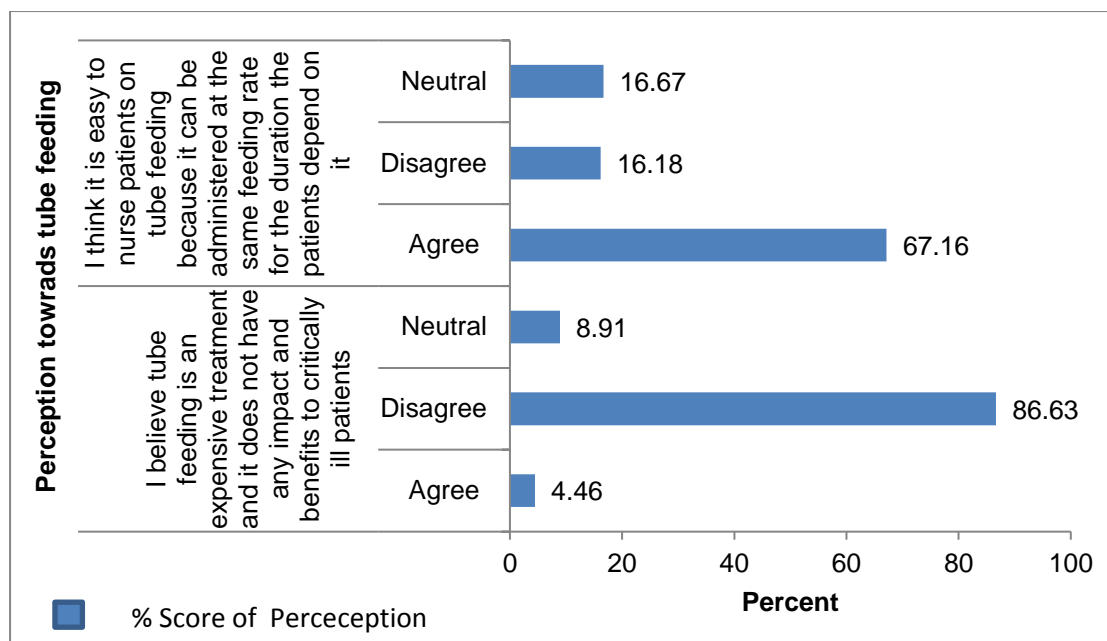


Figure 4.8: Participants' views of Enteral Nutrition

Competent in administering EN

In relation to competency to administer EN, (75.3%; n=153) believe that they are competent, as outlined in Figure 4.9.

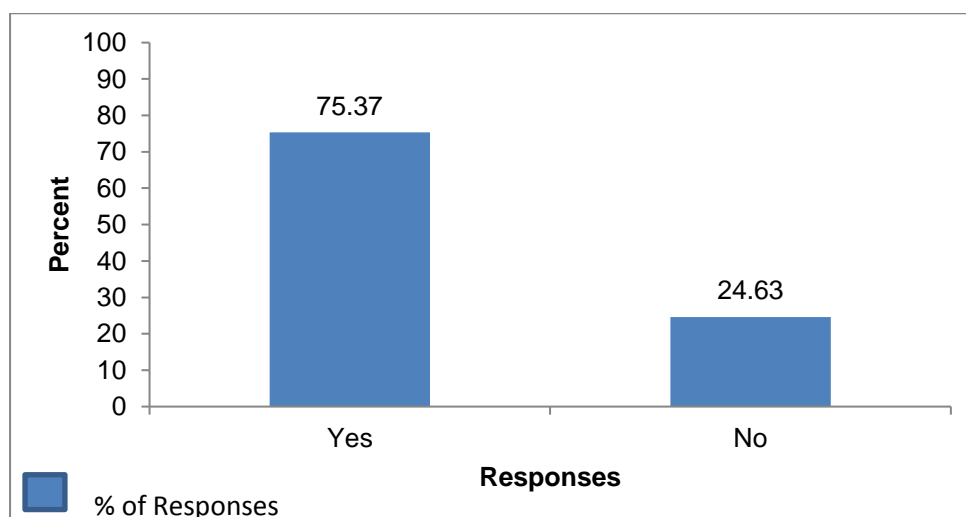


Figure 4.9: Self assessment of competence in administering Enteral Nutrition

4.4.4 Need to receive updates on EN

Regarding the need to update knowledge on EN continually, the results showed that (96.1%; n=197) would like to receive regular updates, as outlined in Figure 4.10. The frequency suggested was to receive updates on a monthly basis (35.5%; n=72).

Formal in-service training in the form of face-to-face lectures with dietitians was the most preferred method to upgrade knowledge (45.4%; n=94). Other methods indicated by less than 10% of participants were posters, EN awareness sessions, the Internet, newsletters, leaflets, magazines, workshops, booklets, emails, manuals, demonstrations, education and training, SMS messages, seminars, journal articles, WhatsApp communication groups and tutorials.

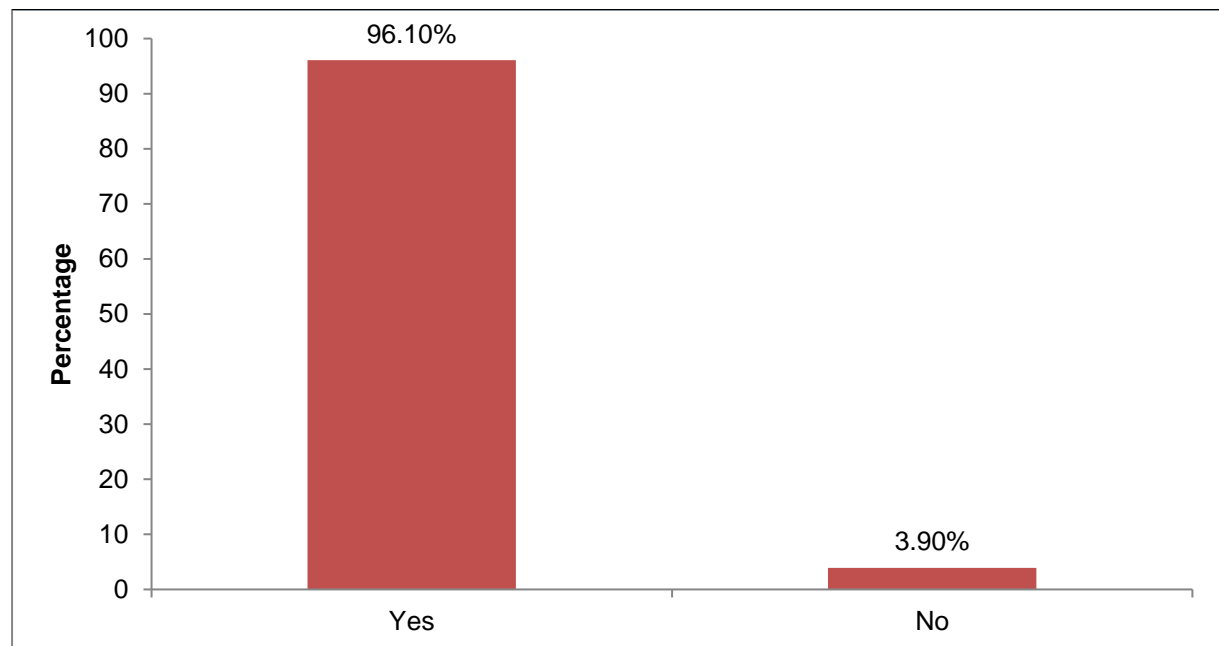


Figure 4.10: Need to receive enteral nutrition updates

4.5 ASSOCIATION BETWEEN KNOWLEDGE, ATTITUDE AND PRACTICE WITHIN THE STAFF CATEGORY OF NURSING PERSONNEL AND THE AVAILABILITY OF PROTOCOLS

This section presents the strength of the association observed between KAP within the professional ranking and the availability of protocols. The findings, as represented by Table 4.5 and Table 4.6, showed strong association between KAP and the manner in which participants

responded to the stipulated variables. This can be seen by the Chi-Square values being greater than expected and all the p-values being significant. All questions without the association were not included as part of the results.

4.5.1 Association of nurse category by knowledge and attitude

Table 4.5: Professional nurse category by knowledge and attitude

Variable	Chi-Square	df	p-value
Indications for EN	32.1335	4	0.0000
Food products that can be administered through the feeding tube	20.269	4	0.0004
I feel responsible for the adequate provision of nutrition for my patient	24.9844	8	0.0016
I do not consider EN as the first feeding option in critically ill patients since it causes discomfort to my patients	22.8986	12	0.0286
I believe that EN is expensive and is without benefits	12.3131	4	0.0152
Common causes of delayed initiation of EN in your workplace	13.0988	4	0.0108
How long a feeding set should be used before being changed?	26.5831	16	0.0464
Would you like to receive updates on EN?	14.8344	4	0.0051

EN =Enteral Nutrition

The professional nurse category was significantly associated with the variables in terms of knowledge and attitude (Table 4.5). This is demonstrated by the Chi-Square test achieving $p < 0.05$. The majority of participants have a clear understanding of the products that can be administered through EN. The respondents feel responsible for the provision of nutrition for their patients and do not believe that EN causes discomfort. Almost all participants would like to receive updates on EN. Though not in a satisfactory percentage, most participants indicated that EN is changed every 24 hours. In general, the majority of participants have a better understanding of the indications of EN, irrespective of their professional ranking.

Table 4.6: Association of knowledge and attitude with availability of protocols/policy documents

Protocols/policy documents available	Variables	Chi-Square	df	p-value
	I believe that EN is expensive and without benefits	6.6849	2	0.0354
	I feel competent in administering EN	8.6042	2	0.0135
	I think it is easy to nurse a patient on EN because it can be administered at the same feeding rate throughout the duration required by the patient	13.432	5	0.0093

EN=Enteral Nutrition

The results presented by Table 4.6 found that there is a strong association between availability of protocols/policy documents and the perception of competence in administering EN. This was due to the Chi-Square value achieving greater than expected and all the p-values for each statement shown in Table 4.6 being <0.05. Thus, there is sufficient evidence to conclude that knowledge and attitude regarding the statements in Table 4.6 have a strong association with availability of protocols/policy documents.

CHAPTER 5: DISCUSSION

5.1 INTRODUCTION

This study was designed to assess the KAP regarding EN among nursing personnel at a military hospital. This chapter discusses and compares the findings of this observational descriptive study in line with the set objectives with other studies. The main objective was to determine the KAP with regard to EN among nursing personnel. According to the author's knowledge, this is the first such study in the DoD.

5.2 GENERAL INFORMATION

The current study had a sample size of 207, of which 78% were female, indicating that the nursing profession is still a female-dominant profession. The level of experience in nursing ranging between 6 to >25 years were more than 60.2% and have a college degree or a diploma (46%) that was attained at the military nursing college (74.5%). Conversely, a study done in Malawi found males to be the most dominant in the nursing profession, with a 56.5% male-response rate compared with 43.5% female respondents.¹⁷⁷

5.2.1 Nursing qualification

In the current study participants that were qualified as professional nurses are dominant (42.9%). None of the participants have a Master's degree. Findings in the study by Mula showed that, 94% of nurses were in possession of a college diploma/university degree, and only 3% had obtained a Master's degree.¹⁷⁷ There is a considerable possibility that those who have a Master's degree are managers or are working in the academic field rather than at operational level.

5.2.2 Nursing experience

According to the military policy, after qualifying as a professional nurse, graduates are required to serve the department for at least four years in the hospital environment, after which they are released to work in an area of their choice (government or private organisation).¹⁷⁸ Furthermore, before they complete their community service and progress to advanced courses (e.g. primary

healthcare), they are not considered for external deployment.¹⁷⁸ Forty percent of nurses had less than five years' work experience. These findings were similar to the findings of Mula in which the average number of years of working experience among the participants was 4.74 years.¹⁷⁷ This is supported by the demographic findings regarding age group; the highest number of participants are still young and have recently qualified. This can have an influence on the management of patients since skill is perfected through practice. Those who are retained within the South African Armed Forces transfer back to their home towns in different provinces and are employed in different military sickbays. The DoD, similar to other departments (e.g. the Department of Health) is experiencing the challenge of a high turnover of nursing personnel because the nurses go abroad and join the private sector in search of better positions.^{177,179}

Perfecting skills and understanding various concepts requires continual practice. With most of participants being young nurses, they still have much to learn through mentoring. Less working experience has an effect on the confidence to implement certain tasks; young nurses are eager to learn and are a good group in which to enhance knowledge through in-service training. Bedier et al. reported an association of 2–4 years' experience with the highest score of practice in both pre- and post-educational programmes.¹⁸⁰ In addition, on completion of nursing diplomas, internships and community service, nurses return to their home towns in other provinces or are employed in other military sickbays.

5.2.3 Formal training received

Training of nurses with regard to EN can assist in minimising the associated complications such as GIT-related issues (vomiting, diarrhoea and constipation), tube occlusions, electrolyte imbalances and pulmonary aspirations.¹⁸⁰ The study by Bedier et al. that investigated the effects of an educational programme on nursing practice in relation to care of EN patients showed that training enhanced the nurses' knowledge and overall, improved their attitude and practice.¹⁸⁰

The military nursing college offers a nutrition module to first-year nursing students in the form of a one-day presentation by the dieticians. General physiology of the GIT is presented in the lecture. The main topics covered are the importance of nutrition, different feeding methods (TPN, EN and oral diet) and their role in the management of the patient. The current study found (74%) of the nursing personnel have received formal training in EN, mainly through a lecture/presentation (51.7%) at the college. In-service training sessions are conducted randomly at the hospital (mainly at ward level) through the initiative of the respective ward dietician or in

conjunction with representatives from the company that manufactures EN and TPN products. The main focus in relation to EN is on connecting a feed, operating a feeding pump and storing mixed-feed products. About were formally taught by the dietician (12.6%) and colleagues at work (31.2%). The fact that nutrition is taught in the first year of their four-year study course may be the reason that most participants cannot remember who taught them.

5.2.4 Availability of protocol in the workplace

This study found that 29.3% participants knew of the presence of a nutrition policy and/or protocol in their workplace and 43.4% do not know if they are available. Of these, 80% refer to the documents once or twice per month. There was a strong association between the availability of protocols / policy documents and competence in the administration of EN. In this study, participants considered themselves able to administer EN. This response is questionable when analysing the knowledge scores attained, which emphasise the need for protocols that can be used to improve practice in the workplace.

The presence of a protocol/policy in the workplace eliminates the misconception, assumption and misinterpretation of patient information.¹³ This lack of awareness of a protocol/policy is not appropriate. In addition, the monthly rotation to different units/wards in the hospital increases the need for protocols / policy documents. These findings conformed to reports by other researchers who found that despite the presence of a protocol/policy, there is still a lack of active implementation of the guidelines by nurses.^{181,177} In addition, studies by Darawad et al.¹³ and Leong et al.¹⁵ found that (59% and 68% respectively) of the nurses either had no knowledge of a protocol/policy in their workplace or knew that written policy guidelines regarding EN did not exist.

The adherence to evidence-based guidelines is of outmost importance in achieving the prescribed nutritional requirements and ultimately, improving the nutritional status of the patient. There appeared to be a general lack of EN protocols in the military hospital, and especially in public and educational institutions, compared with private facilities.^{13,15} Infrequent use of the available protocols/policy documents may be the result of a lack of competence and comfort in administering EN, which was clearly reflected in this study (75.4%). The evidence-based protocols/policy documents should be made available by the nutrition team during the rotation of staff from clinics and should be part of the orientation manual for new nurses.^{142,143} Nursing managers and the nutrition team should carry out routine checks for the presence of these protocols/policies and the implementation thereof.

5.2.5 Source of general nutrition knowledge

Various sources of knowledge were selected by nurses, with in-service training (24.9%) being the most frequently used, followed by nursing college education (20.6%) and the Internet (16%). There is limited access to the Internet for the majority of military personnel, including the nurses, thus making reliance on such resources questionable. The findings contradict the results by Darawad et al. who found that in-service training had the lowest mean score as a source of knowledge¹³ and agree with Mula who found the Internet to be a common and accessible source for obtaining nutrition-related information.¹⁷⁷ The vast number of available options for accessing information creates a challenge in the identification and selection of credible sources during clinical decisions.¹⁸²

The Intranet and scientific journals scored the least with a combined score of 3.0%. This trend was similar to the studies by Darawad et al.¹³, Moreno-Casbas et al.¹⁸¹ and Timmens et al.¹⁸³ This could be attributed to the limited Internet access allowed by the employer, the use of personal data and the preference of the old traditional method of consulting the text books that are available in the military hospital library. Lack of time, organisational support, knowledge and confidence and little participation in research activities were some of the barriers noted for the poor use of scientific journals in other studies.^{181,183} Eliminating these barriers will assist in improving evidence-based practice. The Intranet is limited to those on management level who have the privilege of a computer and the presence of local access network (LAN) points. Additionally, the presence of key personnel to mentor junior nurses is necessary, as illustrated by Darawad et al.¹³ and Mula.¹⁷⁷ The option of consulting colleagues is convenient and can yield good results, providing the individual who is a mentor is up-to-date with the practice of current, evidence-based guidelines. Morphet et al. found that dieticians and hospital protocols/policies were the main sources of EN knowledge although they were not consistently used.¹⁶² In the study in Jordaan, formal education, experience, interaction with colleagues, patient discussions with the physician and protocols/policies were the main sources of nutrition knowledge.¹⁶³

5.3 KNOWLEDGE, ATTITUDE AND PRACTICE OF NURSES WITH REGARD TO EN

5.3.1 Knowledge of nurses

As stipulated by the South African Nursing Council (SANC), nutritional care is one of the core responsibilities of nursing personnel.¹⁵⁷ Therefore, a basic knowledge of administering EN is expected. The EN method is an alternative feeding method in which a tube is inserted for

providing nutrition to haemodynamically stable patients who are struggling to consume oral diets.¹⁸⁴ It is, therefore, considered part of the medical treatment.^{32,149}

The study findings revealed that nurses in general possessed inadequate knowledge with regard to EN, as shown by the score level of 46.3%. This was consistent with findings by Morphet et al.¹⁶² and Darawad et al.¹³ who also determined a significant lack of EN knowledge among nursing personnel, with 60.1% of participants demonstrating good knowledge and only 10.3% demonstrating excellent knowledge. The most contributing factor in the current study may be poor utilisation of scientific journals and reliance on the in-service training, which is not provided regularly but planned for twice a year.

The benefits of EN have been specified well in the literature and include reducing the risk of infection, reducing hospital stay and reducing cost of the total management.^{22,30,45} It was found that 49% of participants in the current study clearly stated the benefits of EN. The study discovered that 45.4% indicated only malnutrition reduction as a benefit of EN, which concurred with the findings of Morphet et al.¹⁶² The indications for EN are that the patient should have a good swallowing reflex and be haemodynamically stable, reported correctly by 71% of participants. This may be influenced by the fact that it is easier to insert an NG tube if the patient has a good swallowing reflex compared with inserting a tube with a comatose patient.¹⁸⁵ The process to determine the suitability of feeding can delay the provision of nutritional support. Proper assessment of all patients should be done, and appropriate feeding strategies should then be implemented as soon as possible.¹⁸⁶

Early EN may have positive outcome in hospitalised patient.¹⁸⁷ The ACG clinical guidelines recommend that EN nutrition should be initiated within 24–48 hours post admission in patients who are haemodynamically stable but are struggling to tolerate food and liquids orally.²² Enteral nutrition maintains the GIT integrity and functioning, minimising bacterial translocation.^{45,64} In spite of this well-documented, evidence-based recommendation, this is not a common practice in most hospitals.^{84,188} In this study, 42% of participants have an understanding that EN should be initiated within 24–48 hours. Conversely, the Gupta et al. study revealed that all nurses shared the same opinion that early initiation of EN is essential and should be performed within 48 hours.¹² The Gupta et al. sample size was small (42 participants), and all participants worked in the ICU, which may have influenced their understanding of the critical window period of feeding and the benefits attained in the first 24–72 hours.¹² In the study in Jordaan¹⁶⁸, the findings were similar to those of Mula¹⁷⁷ in which the majority of nurses practised early EN in line with the ACG guidelines.²²

The need for EN should not be prioritised on the basis of a patient's anthropometric status.⁴¹ All patients should receive adequate nutrition to enhance their recovery because for each day that the patient is not fed, their nutritional storage is depleted and their recovery process is negatively affected.³⁴ Both under- and overnutrition have been identified as types of malnutrition and if not adequately attended, may have serious consequences.²¹ The current study revealed a lack of understanding of this concept, with 37.5% of the nurses associating underweight with the increased need for EN and associating a high BMI with sufficient nutrition (4.9%). This was acknowledged as a good practice to reduce the risk of starving patients that are obese/overweight due to the perception of nurses that such patients have optimal nutrition reserves.

As much as EN is considered safe and cost effective, if not properly administered and monitored, it can lead to complications such as hyperglycaemia, aspiration, diarrhoea and tube dislodgement.²⁶ In the findings of a Jordanian study, diarrhoea followed by abdominal pain, vomiting, tube dislodgement and weight loss were the most common EN complications.¹¹ It is troubling to note that in the current study, 66.8% of participants could not identify the potential EN complications. Poor assessment and management could lead to EN failure.

In previous years, the absence of bowel sounds was a strong contraindication of EN. Current evidence has ruled this concept as a contraindication to feeding,^{26,64} but 71.5% participants still consider the absence of bowel sounds as a barrier to feeding. This corresponds with findings from the studies of Gupta et al¹² and Hammad et al¹⁶⁸ in which (86% and 68% respectively) considered the passage of stools as mandatory before initiating EN.

In the current study, the three main factors that contributed to delayed initiation of EN were: (1) delayed tube feed insertion (21.3%); (2) delayed prescription for tube feed insertion by the physician (20.2%); and (3) GIT complications (16.6%). Tube feed insertion falls within the nursing scope of practice, especially within the ranks of professional nurses and above, and only when there are difficulties should the medical officer be consulted.¹⁸⁹ For the most part, physicians are responsible for the prescription of EN, and the dietician motivates and prescribes after patient assessment. The findings of Darawad et al.¹³ revealed that physicians were responsible for the prescription of EN and the rate and the type of feeding. Similar to the findings of Hammad,¹⁶⁸ prescription in the current study was associated with the role of the dietician by 12% of respondents. Nurses have the role of advocate for the patient, and in situations where the nurses have assessed feeding difficulties, they should speak louder and re-inforce that a tube for feeding should be inserted. With regard to complications, the current study findings differ from Pasinato et al. who reported GIT complications as the most common (35.3%) delay to feeding, followed by haemodynamic instability (32.3%).¹⁹⁰ Prolonged delayed feeding has a

negative impact on reaching the target nutritional goal of the patient.¹⁹⁰ The slight difference in results between Pasinato et al.¹⁹⁰ and the current study could be due to the fact that these studies focused mainly on patients in an ICU where the rates of haemodynamic instability and GIT complications are higher compared with patients in a general ward.

Hammad et al.¹⁶⁸ found that delays for early EN were mainly due to high GRV, nausea, vomiting and post-GIT surgery (88%, 76% and 70% respectively). Leong et al. identified a slightly different pattern of barriers to the initiation and continuation of EN in a paediatric population and mentioned a rise in lactates between >2 mmol/L and <4 mmol/L, high GRV, CT/MRI scans and hypoplastic left heart syndrome.¹⁵ Other barriers identified by literature include consideration by nurses of other procedures deemed more important than feeding, insufficient feeding pumps in the hospital setting, poor availability of formula at ward level, the challenge of accessing the small bowel in patients in whom the stomach is not available for EN and lack of dietician substitution on weekends and public holidays.¹⁹¹

Due to the nature and the different characteristics of the patient receiving EN, close monitoring of feed tolerance is mandatory. One of the easiest and most cost-effective methods used in hospitals is the measurement of GRV.¹⁹² The current general threshold ranges between 250 ml and 500 ml, which is accepted by most guidelines as the safety zone for continuation of feeding.^{26,64,77} Gastric residual volume should be monitored in conjunction with other signs of feeding intolerance (e.g. abdominal distention to avoid unnecessary cessation of feeding).⁶⁴ The current study found a lack of knowledge among nursing staff relating to the cut-off volume used as a guide in practice. With regard to GRV 72.5% responded incorrectly indicated that a GRV above 500 ml is an indication that the patient is tolerating the feed well. Conversely, in the findings of Hammad et al.¹⁶⁸ the majority of nurses (80%) indicated a GRV of <250 ml as an indication of feeding intolerance that warranted cessation of feeding. The uncertainty of GRV can contribute to inadequate nutritional intake, which could affect the overall well-being of the patient. Mula¹⁷⁷ found that the majority of nurses assess GRV before administering EN, with 400–500 ml being the cut-off value to start feeding.⁶⁴

Ready-to-hang EN products are convenient and reduce the risk of infection and contamination compared with reconstituted products and, therefore, should be considered as the first option for EN.^{41,75,76} Storage of the reconstituted product is the most challenging since the product ideally needs to be consumed immediately or within four hours of reconstitution if not refrigerated to minimise the risk of infection. This is difficult to achieve when considering the time required for preparation in the kitchen to the time the product is finally administered to the patient.^{26,77} This process increases the opportunity for contamination and thus, the first choice in product selection for EN in the hospital is a ready-to-hang product, followed by a specialised

mixed-feed product. In this study 63.2% respondents could identify with the EN products. Reconstituted products are usually given to patients who need oral supplementation at 1 Military hospital.

Storage instructions from the manufacturer are provided with each product. Enteral nutrition products are not an exception. Proper handling and storage prevents the risk of contamination and ensures that the product maintains its quality and nutritional value until the time of administration. Ready-to-hang feed products do not need to be refrigerated, providing they are not opened.^{26,41,77} Of note is that 62.4% of respondents in the current study were aware of this practice/guideline.

Reconstituted products may stand for 4–6 hours at room temperature before being administered to the patient and still be safe.^{26,41,77} Beyond this time, the product should be discarded, 18.3% showed good knowledge regarding this concept. This provides an explanation for the reconstituted feeds that are found unadministered and unconsumed on the bedside tables.

Oral or enteral feeding is impossible in critically ill patients presenting with haemodynamic instability and gut inaccessibility, and in such cases, TPN is recommended.^{64,77} The process of weaning the patient from TPN to EN should be done gradually by reducing the TPN and at the same time, slowly introducing EN until the patient can tolerate >60% of the EN.^{51,77} Even though TPN is administered mainly in the surgical and ICU wards, it is impressive to note that most nurses (60%) comprehend the process of weaning patients from TPN. The large percentage of participants who do not know this process may be due to lack of exposure through working in clinics for a long time and thus, lack of opportunities to rotate at ward level.

5.3.2 Nursing practice

The ACG guidelines state that for patients on EN, their beds should be elevated between 30° and 45° to reduce the risk of aspiration.²² This also include chlorhexidine mouthwash and continuous feeding with regular monitoring of GRV every 4 to 6 hours. If it persist to be high feeds should be stopped and TPN considered. In high risk patients consideration should be made to feed patients post-pyloric.^{22,64,77} Blue food colouring and colouring agents are not recommended as markers of aspiration.⁴¹ There appears to be a contrast in practice and knowledge regarding the position for bed elevation. Nurses seem to have knowledge of how to reduce the risk of aspiration, but they struggle to deduce the correct bed elevation.

A high GRV is also associated with an increased risk of aspiration pneumonia and thus, maintaining the GRV to <500 ml is recommended for patients receiving EN.^{64,105} Strategies for

reducing high GRV include the use pro-kinetic agents.^{22,64} About 89% in the study of Ahmad et al. stated that feeding is withheld when the GRV is <300ml to reduce the aspiration risk.¹⁹² This study found that the three most-common methods used to reduce the risk of aspiration is Semi-Fowler's positioning/HoD elevation of 30-45° (35.4%), use of the litmus paper test (26.2%) and placing the patient in an upright position (20.7%). Other methods described in the current study include feeding the patient slowly and stopping feeds. In contrast, Hammad et al. found that almost two-thirds of nurses place patients in a Semi-Fowler's position when the patients are on EN.¹⁶⁸

Diarrhoea has been well reported as the most common complication of EN and the reason for stopping EN.¹⁶⁸ The cause and management of diarrhoea should be established before reduction or cessation of the feed.⁵¹ In the current study, stopping feeds was the least-chosen strategy (21.5%) to manage episodes of diarrhoea. This concurred with the findings of Majid et al. in which the majority of nurses would continue with EN despite the patient experiencing diarrhoea and would rather reduce the feeding rate.¹⁹³ The three most-common methods preferred in this study are liaising with the dietician to determine if there is a possibility of changing the feed (68.1%), administering fluid and electrolyte therapy to prevent dehydration (65.7%) and checking if the stool is similar to the type of feed in order to eliminate malabsorption (61.3%) and variation was observed in other studies that demonstrated the most common management actions by nurses to include sending faecal samples for microbial analyses, monitoring hygiene practices, communicating with other professionals such as the physician and stopping EN.^{155,193} Stopping EN or reducing the feeding rate can exacerbate malnutrition in patients.¹⁸⁴ Rather, the feed choice can be adjusted to include a mix of soluble and insoluble fibre, and for those with persistent diarrhoea associated with malabsorption, ischemia or a lack of response to fibre, the initiation of a peptide-based formula rich in MCT oil can be beneficial.^{41,22}

Administration of drugs through the tube feed

The benefit of having an enteric tube in is not limited to feeding. The enteric tube can also be used to administer drugs. Guidelines indicate that when the tube is used for both feeding and drug administration, it should be flushed with 15–30 ml water before and after medication, and the feed should be temporarily put on hold and resumed immediately after medication.^{26,41,77,112} Despite this guideline, 48.5% of participants indicated that there is no need to flush the tube. This clarifies the observed clogging of tubes in certain wards. Regular flushing is recommended at least every four hours between the feeds to prevent clogging.^{26,41,77,112} In the event of a clogged tube, water is the first recommended solution to be used. If the clog does not dissolve, pancreatic enzyme dissolved in a sodium bicarbonate solution is the second option.^{22,112}

Thereafter, mechanical de-clogging devices can be used and failing this, the tube must be removed and replaced with a new one.^{22,112} This study found that to resolve a clogged tube, flushing (no indication of solution used but assumed to be water) is the most common (60.9%) practice. This was inconsistent with the findings of Hammad et al. in which 93% of the nurses resolved the issue of blocked tube feeds with sterile water or their alternative option of Coca Cola.¹⁶⁸ Others methods described in the current study include changing of the feeding line, disconnecting the feed, removing the tube from the patient, setting the feeding pump on prime and feeding on gravity flow.

Duration of utilising the feeding set

Enteral feeding sets should be replaced every 24 hours.⁷⁷ This practice is understood by (42.4%) of respondents. This knowledge does not reflect the practice currently observed at ward level because in most cases, feeding sets are found in the kitchen drawers of the ward, demonstrating a possibility that they are not changed as per the recommendation.

5.3.3 Attitude and practice of nurses with regard to EN

Attitude towards EN

In this study, the way in which nurses responded showed a general agreement that they feel responsible for the provision of nutrition to their patients. About 71% nursing personnel are more likely to recommend EN when the patient is not able to swallow and presents with a functioning GIT.

Overall, nursing personnel have a positive attitude towards EN. Generally 50.8% of participants believe that EN reduces hospital stay and can be cost effective (32.1%). Nonetheless 22.3% feel that it increases the workload, that it is complicated and unnecessary and that it prolongs hospital stay since the patient is not able to eat orally. They are aware that EN is necessary for the patient's well-being and prevents malnutrition in patients who are unable to swallow. The findings of Martin et al. revealed that 89% felt the importance of addressing nutrition while caring for their patients.¹⁴ Bryon et al. noted that the good attitudes of nurses towards EN were overshadowed by complications such as the unpleasant odour of diarrhoea and the increased workload due to frequent nappy changes.¹⁸⁴

In the current study 86.6% of respondents believe that EN is a cost-effective treatment and is easy to administer (67.2%). The fact that the participants rely on colleagues for guidance may have influenced the responses since if they encounter difficulties, there is someone who can

assist. The respondents prefer EN because they believe that it does not cause discomfort to the patients. It has been established that EN is not considered an invasive procedure.¹⁹⁴

Perceived competency to administer EN

In general, the nursing personnel (99.5%) agree that it is important to understand how to administer EN, and they feel competent (75.3%) and responsible for the provision of adequate nutrition for the well-being of the patient (90.5%). This was similar to a study on Australian nurses in which the majority of participants reported a clear obligation to provide nutrition care.¹⁴ This study found that 35.8% of the respondents depend on instructions from the dietician in order to administer EN compared with the participants who are able to work independently.

5.4 NEED TO UPDATE NUTRITION KNOWLEDGE

5.4.1 Upgrade nutrition knowledge

The aspects of medical-intervention strategies, including EN, are constantly changing. Therefore, it is crucial that healthcare personnel keep themselves updated with the current recommendations and implement these in their practices.¹⁹⁵ This study identified a gap in knowledge that is affecting the way nurses manage patients on EN. Nursing personnel showed a good attitude towards updating their nutrition knowledge and stated that this should be enhanced through training. This was reflected by 96.1% of participants who stated that they require regular nutrition updates on a monthly basis. These findings are similar to the findings of Gupta et al. in which all of the participants felt the need to upgrade their knowledge through protocol manuals.¹² In addition, the findings of the current study are consistent with the findings of Martin et al. who determined that 89% of the clinical nurses perceived that continual education on nutrition would assist them manage chronic patients better.¹⁴

5.4.2 Methods preferred to update knowledge

This study found that the preferred method of updating knowledge is in-service training presented by the dietician (45.4%). This preferred method differed with the findings of Gupta et al. in which the protocols of manuals and nursing tutorials were included as ways to upgrade knowledge.¹² The preferred method should be edified with improved content of the nutrition module at the college.

5.5 ASSOCIATION BETWEEN KAP WITHIN THE PROFESSIONAL RANKING OF NURSING PERSONNEL

5.5.1 Association of knowledge and attitude with level of experience

The association with experience comes the understanding of the methods that work best for the patient and the ability to determine the possible complications that may occur with patients on certain methods of feeding. Cost-effective strategies are more the concern of senior nurses and those who are at management level.¹⁹⁶ Managing diarrhoea is a challenge and in most cases, feeds are being ceased without investigating the cause¹⁵⁴, although in the current study, stopping feeds immediately was only done by 25% of participants. In order to achieve adequate knowledge across the ranks and experience levels, it is important that in-service training be conducted for all nurses.

5.5.2 Association of knowledge and attitude with staff category

The study by Yalcin et al. found that nurses with a graduate degree had higher scores of nutrition knowledge.¹⁹⁷ According to SANC, one of the roles of nurses is to provide nutrition to patients.¹⁵⁷ Due to the manner in which participants responded to most of the questions in the current study, the findings suggest an inadequate knowledge within nursing personnel. In practice, at the military hospital, enrolled professional nurses and speciality nurses are more interactive when a patient is on EN. The fact that their working environment does not have access to feeding protocols may disadvantage the less qualified because they do not have a reference in practice. It was expected that the higher the rank and qualification, the more the understanding of the holistic management of the patient, but this was not always the case in this study. Overall, there is a need for regular nutrition updates across all nursing personnel.

5.5.3 Association of knowledge and attitude with in-service training

The implementation of an educational programme among nursing personnel with regard to EN enhances their working skills and knowledge.¹⁸⁰ The nursing personnel who qualified at the military college received training on nutrition, including EN, during their first year. The physiology section is presented by the resident lecturer and the feeding section by the dietician. There is random in-service training that is conducted at the hospital at ward level by the dietician of the respective unit and company representatives.

The relationship among nursing personnel and their thorough communication with the nutrition team is encouraged. Instructions should be elaborated on detail by the dietician who plays an important role in the management of patients. Dietitians have a role to educate and ensure that nursing personnel understand EN and are confident to administer EN and to identify the delays to feeding that must be addressed. Topics such as flushing of the tube when medication is administered showed poor understanding, and this needs attention.

Colleagues contribute towards knowledge and enhance the practice of most procedures in the workplace. A great deal of knowledge and many perceptions of roles and responsibilities are learnt at ward level. More experienced nurses and those with advanced and speciality training play a role in supporting the young nurses with the implementation of evidence-based guidelines and their adherence. The study by Marshall et al.¹⁹⁸ showed that registered nurses had a high preference for colleagues as a source of information when confronted with clinical decisions. Experience, clinical role, trust and approach are factors considered in the colleague to justify the information as credible.¹⁹⁸ With the findings in the current study of deficient knowledge across the nurses it creates a challenge if this method can be effective. As observed in this study and others, colleagues comprise a significant support system, and with regular nutrition updates, the colleagues' reliability as sources of nutrition information will be improved and thus, this will build confidence and improve the competence of mentors.

5.5.4 Association of knowledge and attitude with availability of protocols/policy documents

An organisation needs to establish a clear system by providing employees with clinical guidelines and subsequently supporting the implementation thereof in order to improve the knowledge and attitude regarding the desired change.¹⁹⁹ The availability and implementation of protocols optimise nutrition outcomes.^{142,143} The findings of this study show that in total, 70.7% of nurses are not aware of the EN protocols in their workplace. In addition, the nurses believe that EN has potential benefits for the patient (86.6%), and they feel competent to administer it. These findings suggest that the availability of protocols would address the technique and give guidelines on how the feed should be administered.

5.5.5 Association of knowledge and attitude with referring to protocols/policy documents

Individual perceptions, beliefs and attitudes have an impact on how health professionals manage patients. Availability of the guidelines does not necessarily mean that all nurses refer to them and practise accordingly because some may believe that new recommendations do not necessarily achieve better outcomes. Knowledge alone is not enough to produce competency. Knowledge needs to be in conjunction with regular training to effect change and a better outcome for the patient's health status. Protocols should be made available in all general wards where EN is administered since they assist in eliminating discrepancies in the practices of nursing personnel.¹⁷ Of the nurses who have EN protocols in their workplace, 80% refer to them once or twice per month or when necessary. This rate of referral may be influenced by the frequency of tube-fed patients in their ward and by their confidence in administering EN. The findings showed a strong association between referring to available protocols/policy documents and the manner in which the participants responded to certain knowledge and attitude questions such as definition, indications, complications of EN, competency to administer the tube feed and common delays in administering the tube feed.

5.5.6 Association of knowledge and attitude with main source of nutrition knowledge

The Internet is an information resource centre that can provide reliable evidence-based clinical guidelines to which nurses can refer, provided the guidelines are given in terms of reliable source of information.²⁰⁰ There should be careful consideration regarding the source, the organisations that sponsor the sites and their intentions before the information is utilised.²⁰¹ In general, credible websites are those that are nationally accredited by universities and colleges, non-profit organisations such as the Heart and Stroke Foundation of South Africa, national health organisations and government agencies.²⁰¹

The Intranet is a communication tool that is used in the military to disseminate information. The Dietetic Department has a bulletin slot that discusses general nutrition information such as healthy eating guidelines, nutrition and oral health. To accommodate all members of the DoD, the idea is not to discuss scientific information. Access to the Intranet is also limited to personnel with computers and LAN points, which makes it an ineffective tool for nursing personnel since there are only two computers per ward. One computer is used by the secretary for general administration and medical information of the patients and the other is used by the unit manager.

In general, popular magazines are not considered reliable sources of evidence-based guidelines and clinical information because they lack the peer-review process and scientific scrutiny.²⁰⁰ Therefore, such information can be easily influenced by the author and is prone to be faulty.²⁰¹ In addition, certain information extracted from scientific journals can demonstrate a gap in reporting, leading to an unbalanced view.²⁰¹

Scientific journals are publications in which scientific data is reported and published by learned societies or commercial publishers.²⁰⁰ Although they are written with a certain audience in mind, they can consist of medical language that is easily understood.²⁰⁰ The data/information that scientific journals contain has credibility because the articles are research based and are often subject to peer-review processes.²⁰⁰

Nutrition textbooks at the university/college are specialised books with accredited information based on scientific research.¹⁹⁸ They address a specific topic with specific information. The challenge is that the information they contain takes time to be upgraded compared with most scientific journals.²⁰⁰ Reliance on scientific and evidence-based sources is highly recommended.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 INTRODUCTION

This chapter highlights the main findings of the study and includes the results and their implications in clinical practice in relation to patient outcome. The researcher acknowledges the limitations that may result from the study design, the methodology and the statistical analysis tests, which could affect the generalisation of the findings to the general population of nursing personnel. Recommendations to improve clinical practice are outlined at the end of the chapter.

6.2 OVERALL CONCLUSION

Enteral nutrition is a vital component of the medical treatment for managing critically ill patients. In line with the stated objectives, the overall conclusion is summarised as follows:

- For EN as learnt during undergraduate training, the findings revealed a lack of knowledge in regard to the critical time for initiating EN, the ways of reducing the risk of aspiration, the management of patients on EN presenting with diarrhoea and the fact that feeding can resume in the absence of bowel sounds and that all patients are considered a priority regardless of their anthropometrical status.
- For the attitude and practice of nurses with regard to EN, the findings show that nurses have positive attitudes and consider EN a cost-effective treatment that reduces hospital stay. However, the nurses' perception of EN is that it is acceptable to administer the feed at the same feeding rate throughout the duration required by the patient. This understanding should be clarified to prevent risk of hypocaloric feeding. According to the nurses, the most common method of unclogging a tube is flushing with water, and failing this, inserting a new feeding tube. The most commonly identified delays in initiation of EN were delays in tube insertion, prescription by the physician and GIT complications.
- The differences in KAP within the professional ranking of nursing personnel are not statistically significant. It is noteworthy that the enrolled and assistant nursing groups responded better and showed a superior understanding of EN administration.
- In terms of the availability and adherence to EN protocols by nursing personnel, it was found that there is a lack of evidence-based protocols/policy documents in their workplace, minimising the usage thereof. The availability of evidence-based protocols/policy documents can reduce the risk of complications, address and embrace

techniques for controlling GRV, attend to HOB (elevation 30-45°), manage feeding patterns and provide instructions for the correct storage of mixed formulas on arrival at the ward and before administration to the patient.

- Frequent in-service training and awareness regarding EN in nursing personnel were considered necessities. Nurses demonstrated a desire to update their nutrition knowledge on a regular basis through in-service training and face-to-face lectures/presentations by the dietician.
- The need to update the content of nutrition-training guidelines regarding EN at the SAMHS Nursing College was investigated. The study results show inadequate knowledge with regard to EN among nursing personnel, irrespective of professional ranking. Nurses have positive attitudes towards EN although their current practice is not in line with the latest available guidelines in the literature. Most participants reported the lack of access to nutrition protocols or guidelines in their workplace. Therefore, there is a need to update nursing personnel regularly through in-service training and to update the content of the nutrition-training module that is provided at the nursing college to address the gaps in knowledge identified in this study.

6.3 IMPLICATIONS FOR CLINICAL PRACTICE

The study provided insight into the KAP with regard to EN among nursing personnel within their rankings since there are no studies that have been conducted in the SANDF of this nature. Most studies in the literature assessed a component of nursing personnel (e.g. ICU or surgical nurses). The current study identified the gaps in knowledge of EN and the strengths and weaknesses in the practices of nurses. Nurses presented with positive attitudes and an understanding of the importance of EN but have difficulty in approaching all dimensions surrounding this issue. Speciality and professional nurses and those with more years of experience should possess a basic understanding of all the core elements surrounding EN (benefits, complications, measurement of GRV, HOB, storage of feeds, use of feeding sets, etc.) as learnt during training and clinical practice. Although the results show otherwise. The study provided a baseline for the practice of evidence-based guidelines by military nurses with regard to EN and posed solutions to the inherent problems. The study reactivated the need for regular in-service training in order to strengthen nutrition training at the military college. The study also highlighted the importance of health workers involved in the provision of nutrition (dietitians, physicians) to have a good working relationship in order to minimise delayed feeding. The provision of regular nutrition updates was specified.

6.4 LIMITATIONS

The study was conducted at the military hospital with the assumption that most of the nursing personnel qualified from the military college. However, it should be noted that a percentage of nurses were appointed after completion of their studies at civilian institutions or were transferred from other sectors (government or private). Thus, the details of their nutrition knowledge were not well understood. This is in comparison with rural hospitals where such services may be limited, thus influencing the daily practice of EN. Hence, future studies should compare the KAP within different sectors and between rural and urban areas. The large sample size accommodated a wider population of nurses, adding to the credibility and the richness of the description enhancing study. This created challenges and difficulties in consolidating the results. In this study, participants were from various clinics and wards, and some have been out of bedside nursing for a number of years, placing them at a disadvantage in comparison with those who are in ICU and general wards and manage EN on a daily basis. Self-reporting methods create a bias, especially in practice-based questions, increasing the risk of respondent error.

6.5 RECOMMENDATIONS

According to the study findings, the following recommendations are outlined. These are based on the assumptions that adherence to the evidence-based EN guidelines will produce improved health outcomes.

- An evidence-based protocol should be established for each ward, and nurses should be encouraged to adopt and implement the EN guidelines in their daily practice. This will assist in the better management of the measurements of GRV and HOB and a better understanding of the complications, the weaning of patients off TPN, the storage of mixed products, the use of feeding sets and the administration of drugs through the feeding tube. Nursing managers should monitor the availability of these protocols and carry out routine checks to ensure they are implemented.
- Nutrition education through college is of outmost importance but is insufficient and needs to be enhanced with regular in-service training to bridge the gap between limited training and expected performance. This should focus on the knowledge gap identified by the study regarding staff category and qualification level, and due to this deficiency in knowledge, continuing education should be planned for all nursing personnel.
- With the high turnover rate experienced at hospital level by the nursing department, more emphasis should be placed on education at the nursing college so that by the time nurses are working, they have adequate skills to administer EN.

- Nutrition textbooks in the library should be upgraded to include the latest evidence-based guidelines.
- Workplace Internet services should be available to all staff members to enhance their access to scientific journal articles and international guidelines.
- The nutrition training manual should be updated to include all the basic topics pertaining to EN that are relevant to nursing personnel. This should be followed by an annual review of nurses' knowledge and in-service training by the dietician. Future research should focus on whether regular and continual in-service training regarding EN improves knowledge and practice.

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ADDENDA

ADDENDUM A: QUESTIONNAIRE

Enteral Nutrition – Healthcare Workers Questionnaire

FORM NO:

Participant number	
Date	

Questionnaire: NURSING PERSONNEL

Thank you for agreeing to participate in this research study.

Instructions:

- Please complete this questionnaire honestly. Remember your identity is kept completely confidential.
- Answer all the questions below by making a tick (✓) in the **relevant** box/es.
- Do not leave any questions unanswered.
- If you are unsure of the meaning of any question, you may ask the researcher for assistance.

SECTION A: Demographic Information

1. Please indicate your gender.

		Tick (✓)
A	Male	
B	Female	

2. Please indicate your age.

		Tick (✓)
A	Less than 20 years	
B	20 -29 years	
C	30 – 39 years	
D	40 – 49 years	
E	50 – 59 years	
F	Above 60 years	

3. Please indicate your highest level of qualification attained.

		Tick (✓)
A	Less than Grade 12 (Standard 10)	
B	Grade 12 (Standard 10)	
C	Nursing Certificate	
D	College degree/ diploma	
E	University degree	
F	Master's degree	
G	Other (please specify)	

4. Institutions where qualification was obtained.

		Tick (✓)
A	Military Nursing College	
B	Civilian Nursing college	
C	University	
D	Other (please specify)	

5. Please indicate your staff category.

		Tick (✓)
A	Enrolled nursing assistant	
B	Enrolled nurse	
C	Professional nurse	
D	Professional nurse with Speciality	
E	Other (please specify)	

6. How long have you been working as a nurse professional.

		Tick (✓)
A	< 1 year	
B	1 - 5 years	
C	6 – 10 years	
D	11 – 15 years	
E	16 – 20 years	
F	21 – 25 years	
G	> 25 years	

7. Have you received formal training at the institution you specified in question 4 above on how to administer Enteral Tube Feeding (ETF)?

		Tick (✓)
A	Yes	
B	No	

If you answered YES, please answer questions 8, 9.

If you answered NO, please skip questions 8, 9 and continue with question 10

8. Please indicate the format of formal training that you received on ETF. (You can tick more than one answer).

		Tick (✓)
A	Half-day workshop	
B	Full day workshop	
C	Lecture/presentation	
D	Tutorial	
E	Other (please specify)	

9. Who trained you on ETF? (You can tick more than one answer).

		Tick (✓)
A	Lecturer at University/College	
B	Dietician	
C	Colleagues at the workplace	
D	Other (please specify)	

10. Are protocols/policy documents available regarding ETF in your workplace?

		Tick (✓)
A	Yes	
B	No	
C	I do not know	

If you answered **YES**, please answer question 11.

If you answered **NO** or **I DO NOT KNOW**, please skip question 11 continue with question 12.

11. How often do you refer to these protocols/policy documents?

		Tick (v)
A	Daily	
B	Weekly	
C	1 -2 times per month	
D	Never	

12. What is your main source of nutrition knowledge? (You can tick more than one answer).

		Tick(v)
A	In - service training	
B	Nursing college training	
C	Internet	
D	Intranet	
E	Nutrition text book	
F	Magazine	
G	Scientific Journal Article	
H	Consulting colleagues	
I	Other (please explain)	

**SECTION B: Knowledge, Attitude and Practices questionnaire:
Health Care Workers**

13. Enteral Tube Feeding-(ETF) is defined as “feeding through the gastrointestinal tract (GIT) via a tube, catheter, or stoma that delivers nutrients distal to (or beyond) the oral cavity”.

		Tick(v)
A	True	
B	False	
C	I do not know	

14. Does ETF form part of the medical treatment?

		Tick(v)
A	Yes	
B	No	
C	Unsure	

15. What are the benefits of ETF?

		Tick(v)
A	It increases length of hospital stay	
B	It increases risk of mortality	
C	It promotes bacterial growth	
D	Reduce the risk of malnutrition in hospitalised patients	
E	It symbolises care for the patient from the medical team	
F	D and E are correct	
G	A, B, C and D are correct	
H	None of the above are correct	

16. Which of the following are regarded as complications of ETF?

		Tick(v)
A	Hyperglycaemia	
B	Aspiration	
C	Tube dislodgement	
D	Diarrhoea	
E	A, B and C	
F	All the above correct	
G	None of the above are correct	

17. Which of the following are indications for ETF?

		Tick(v)
A	Patient presenting with adequate oral food and beverages intake	
B	Patient presenting with no feeding difficulties	
C	Patients whose GIT is not functioning	
D	Patent with good swallowing reflex	
E	Patients with a functioning GIT unable to maintain oral intake	

18. Within how many hours post ward admission should ETF be initiated in a hemodynamically stable patient?

		Tick(v)
A	24 – 48 hours	
B	48 – 72 hours	
C	90 – 120 hours	
D	I do not know	

19. Gastric residual volume of > 500ml per day is an indication that the patient is tolerating the feed well.

		Tick(v)
A	Agree	
B	Disagree	
C	I do not know	

20. Indicate which of the following situations increases the need for ETF in a patient unable to consume orally.

		Tick(v)
A	BMI < 16	
B	BMI > 30	
C	Nil per os > 1 day	
D	All of the above	
E	Only A and C	

21. What do you do to reduce the risk of aspiration in a patient that is on tube feed?

22. When the patient was on Total Parenteral Nutrition (TPN) how do we wean them to ETF?

		Tick(v)
A	Stop TPN and start the ETF at full feeding rate	
B	Slowly reduce the TPN at the same time slowly introducing ETF	
C	Slowly reducing the TPN and start ETF on full feeding rate	
D	I do not know	

23. The absence of bowel sounds is a strong contra-indication for tube feeding?

		Tick(v)
A	True	
B	False	

24. What are the food products that can be administered through the feeding tube?
You can tick more than one.

		Tick(v)
A	Fruit Juice	
B	Mechanical Soft diet	
C	Pureed diet	
D	Ready to hang commercial products	
E	Specialised mixed feed powders	
F	Other (please specify)	

25. It is difficult to administer tube feeding because limited instruction is provided by the Dietician.

		Tick(v)
A	Strongly agree	
B	Agree	
C	Disagree	
D	Strongly disagree	

26. I feel responsible for the adequate provision of nutrition in my patient.

		Tick(v)
A	Always	
B	Sometimes	
C	Never	

27. I think it is important for nursing personnel to understand how to administer tube feeding for the well - being of the patient.

		Tick(v)
A	Strongly agree	
B	Agree	
C	Disagree	
D	Strongly disagree	

28. I do not prefer tube feeding as the first feeding option in critical ill patients as it causes discomfort to my patients.

		Tick(v)
A	Strongly agree	
B	Agree	
C	Disagree	
D	Strongly disagree	

29. I believe that tube feeding..... : (You can tick more than one answer)

		Tick(v)
A	Increases workload	
B	Is unnecessary	
C	Is complicated to administer	
D	Is time consuming due to increased recording	
E	Is cost effective	
F	Reduces hospital stay	
G	Other (please specify)	

30. I feel competent in administering tube feeding?

		Tick(v)
A	Yes	
B	No	

31. I believe tube feeding is an expensive treatment and it does not have any impact and benefits to critically ill patients.

		Tick(v)
A	Agree	
B	Disagree	
C	Neutral	

32. I think it is easy to nurse patients on tube feeding because it can be administered at the same feeding rate for the duration the patients depend on it.

		Tick(v)
A	Agree	
B	Disagree	
C	Neutral	

33. Tick the three most common causes of delayed initiation of tube feeding in your workplace.

		Tick(v)
A	Hemodynamic instability	
B	Delayed prescription by the physician	
C	Delays in inserting the tube	
D	GIT complications	
E	Insufficient / broken feeding pumps	
F	Feeds stock shortages	
G	Other (please specify)	

34. What should you do in cases where medication is administered through the feeding tube?

		Tick(v)
A	Flush the tube prior to administration	
B	Flush the tube after the administration	
C	Nothing as it is not necessary	
D	Flush the tube before and after administration	
E	Stop the feed for some time and administer medication	
F	Other (please explain)	

35. How do you manage patients on ETF presenting with diarrhoea (passing of more than three loose or watery stools in a day)? You can choose more than one option.

		Tick(v)
A	Recommend probiotics	
B	Treat with anti-diarrhoea medication such as Immodium	
C	Check the type of stools if it is similar to the feed as it might be a sign of malabsorption	
D	Assess and treat the cause	

E	Administer fluid and electrolyte therapy to prevent dehydration.	
F	Stop the feed immediately	
G	Communicate with the dietician to change the feed	
H	Adjust the feeding rate	
I	Other please specify	

36. How long should a feeding set be utilised before being changed?

	Tick(v)
A 12 hours	
B 24 hours	
C 48 hours	
D It does not matter as long as it is not blocked	

37. Patients receiving ETF should have the head of their bed elevated to 60 degrees?

	Tick(v)
A Yes	
B No	

38. Ready to feed products should be stored in the refrigerator before being administered to the patients.

	Tick(v)
A Yes	
B No	

39. How long can mixed feed powders products stand after reconstitution at room temperature and still be safe for use by patients?

	Tick(v)
A 4 – 6 hours	
B 6 – 8 hours	
C At least 12 hours	
D 12 – 24 hours	
E 24 – 48 hours	
F I do not know	

40. How long can a mixed feed powder product stay in a refrigerator and still be safe to be administered in a patient?

		Tick(v)
A	Immediately	
B	0 - 12 hours	
C	12- 24	
D	24 – 48	
E	I do not know	

41. How do you unclog a blocked feeding tube?

42. Would you like to receive updates on ETF?

		Tick(v)
1	Yes	
2	No	

If yes, how often?

43. Which method would you prefer to upgrade your nutrition knowledge?

Thank you for offering your time to participate in this research study!

FOR OFFICE USE ONLY:

Please double-check that all sections are fully completed!

Checked by:	
Date:	

ADDENDUM B: INFORMED CONSENT

PARTICIPATION INFORMATION AND INFORMED CONSENT:

Principal Investigator: Ramuada Londolani Goodness

Contact Number (W): 012 314 0743/ Cell: 0824109397

Email: londo@telkomsa.net

Dear Participant

Title of the project: Assessment of knowledge, attitude and practice of nurses regarding Enteral Nutrition (EN) at a Military hospital.

Introduction

You are invited to volunteer for a research study. This information leaflet is to help you decide if you would like to participate. Before you agree to take part in this study you should fully understand what is involved. If you have any questions, which are not fully explained in this leaflet, do not hesitate to ask the researcher. You should not agree to take part unless you are completely happy about all the procedures involved.

Purpose of the study

Malnutrition is a common health problem affecting hospital patients and it is associated with longer hospital stay, prolonged rehabilitation, diminished quality of life, higher rates of morbidity, high usage of medication, and mortality^{3, 4}. Good nutrition plays a vital role in promoting quality of life and recovery of patients. When a patient condition limits his or her nutrients intake orally, enteral nutrition becomes the next alternative method¹. This study aims to assess the knowledge, attitude and practice of nursing personnel regarding EN. To determine the need to update the content of nutrition training module regarding EN at the South African Military Health Training Formation (SAMHTF) nursing college. To identify the need to update the EN feeding protocols, determine the frequency of in-service training and awareness regarding EN in nursing personnel.

This is a quantitative study utilising the questionnaire as a data collection tool. I would like you to complete a questionnaire which may take about 30 minutes. When you are done I will collect the questionnaire from you before I leave the ward/clinic. It will be kept

in a safe place to ensure confidentiality. Please do not write your name on the questionnaire for confidentiality reasons. I will be available to answer any questions that you might have when completing the questionnaire.

Ethics Approval

This research protocol was submitted to the Faculty of Research Ethics and Development committee, University of Stellenbosch, and written approval has been granted by the committee. The study has been structured in accordance with ethical considerations such as the identity of all participants are kept anonymous.

Your participation in this research is entirely voluntary and you can refuse to participate or stop at any time without stating any reason. The investigator retains the rights to withdraw you from the study if considered to be in your best interest. The study does not include any procedures that may results in discomfort.

The benefits involved in the study

The participant contribution will assist the researcher in developing in service training program regarding Enteral Nutrition tailored to bridge the gap between knowledge, attitude and practice. The participant will contribute in the upgrade of the nutrition module of nursing student contributing in the quality of future nurses. The results will assist in improving nursing care with regard to nutrition management of patients.

Confidentiality

All information obtained during the course of this research is strictly confidential. Data that may be reported in scientific journals will not include any information which identifies you as a participant in this study. Data or information will be published anonymously.

INFORMED CONSENT CLAUSE

I hereby confirm that I have been informed by the researcher **Ramuada L.G** about the nature, conduct, benefits, and risk of the proposed research. I have also received, read and understood the above written information (informed consent) regarding the study. I will receive a signed and dated copy of this Informed Consent document.

I am aware that the results of the study, including personal details regarding sex, age, and qualification etc. of myself will be anonymously processed into the research report.

I may, at any stage, without prejudice, withdraw my consent and participation in the study. I have had sufficient opportunity to ask questions and of my own free will declare myself prepared to participate in the study.

Participant's name: _____

Participant's signature: _____

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Investigators name: _____

Investigator's signature: _____

Print name of witness: _____

Signature of witness: _____

Date: _____

Day/month/year

ADDENDUM C: ETHICS APPROVAL – STELLENBOSCH UNIVERSITY



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Approval Notice Response to Modifications- (New Application)

02-Feb-2016
Rammada, Londolani LG

Ethics Reference #: S15/10/247

Title: Assessment of knowledge, attitude and practice of nurses regarding Enteral Nutrition (EN) at a Military hospital.

Dear Ms Londolani Rammada,

The **Response to Modifications - (New Application)** received on 17-Dec-2015, was reviewed by members of Health Research Ethics Committee 2 via Expedited review procedures on 02-Feb-2016 and was approved.

Please note the following information about your approved research protocol:

Protocol Approval Period: 02-Feb-2016 -01-Feb-2017

Please remember to use your **protocol number** (S15/10/247) on any documents or correspondence with the HREC concerning your research protocol.

Please note that the HREC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

After Ethical Review:

Please note a template of the progress report is obtainable on www.sun.ac.za/rds and should be submitted to the Committee before the year has expired. The Committee will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly for an external audit.

Translation of the consent document to the language applicable to the study participants should be submitted.

Federal Wide Assurance Number: 00001372

Institutional Review Board (IRB) Number: IRB0005239

The Health Research Ethics Committee complies with the SA National Health Act No.61 2003 as it pertains to health research and the United States Code of Federal Regulations Title 45 Part 46. This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki, the South African Medical Research Council Guidelines as well as the Guidelines for Ethical Research: Principles Structures and Processes 2004 (Department of Health).

Provincial and City of Cape Town Approval

Please note that for research at a primary or secondary healthcare facility permission must still be obtained from the relevant authorities (Western Cape Department of Health and/or City Health) to conduct the research as stated in the protocol. Contact persons are Ms Claudette Abrahams at Western Cape Department of Health (healthres@pgwc.gov.za Tel: +27 21 483 9907) and Dr Helene Visser at City Health (Helene.Visser@capetown.gov.za Tel: +27 21 400 3981). Research that will be conducted at any tertiary academic institution requires approval from the relevant hospital manager. Ethics approval is required BEFORE approval can be obtained from these health authorities.

We wish you the best as you conduct your research.

For standard HREC forms and documents please visit: www.sun.ac.za/rds

If you have any questions or need further assistance, please contact the HREC office at 219389819.

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1MH/302/6/02.02.2016

Tel: 012 314 0013
Facsimile: 012 314 0013
Enquiries: Prof / Lt Col
M.K. Baker



1 Military Hospital
Private Bag X1026
Thaba Tshwane
0143
7 April 2016

CLINICAL TRIAL APPROVAL: "ASSESSMENT OF KNOWLEDGE, ATTITUDE AND PRACTICE OF NURSES REGARDING ENTERAL NUTRITION AT A MILITARY HOSPITAL."

1. The 1 Military Hospital Research Ethics Committee (1MHREC) registered in South Africa with the National Health Research Ethics Council (NHREC) (REC-111208-019-RA) adhering to GCP/ICH and SA Clinical Trial guidelines, evaluated the above-mentioned protocol and additional documents.
2. The following members approved the study:
 - a. Lt Col M.K. Baker: Neurologist, male, chairman 1 MHREC.
 - b. Lt Col C.S.J. Duvenage: Specialist physician, female, member 1 MHREC.
 - c. Lt Col S. Hassim: Medical Doctor, male, member 1 MHREC.
 - d. Lt Col A.D. Moselane: Urologist, male, member 1 MHREC.
 - e. Lt Col E.J. Venter: Periodontist, male, member 1 MHREC.
 - f. Maj M.L. Kekana: Specialist physician, female, member 1 MHREC.
 - g. DR T.J. Maré: Advocate, independent of the organization, male, member 1 MHREC.
 - h. Mrs. C. Jackson: Layperson, independent of the organization, female, member 1 MHREC.
3. The following documents were evaluated:
 - a. Research Proposal
 - b. Participation information and informed consent document
 - c. Questionnaire
 - d. Curriculum Vitae:
 - i. L.G. Ramuada
 - ii. R. Blaauw
 - iii. L. Veldsman
 - e. Approval from Stellenbosch University Ethics Department
4. The recommendations are: The study was ethically approved on 7 April 2016. The principal investigator, Maj. L.G. Ramuada, will be supervised by Prof. R. Blaauw. Report backs are to be made to the 1MHREC six monthly, in the event of any serious adverse events and on completion or termination of the study. Should publications result from the study the relevant manuscripts will also need to be approved by Military Counter Intelligence.

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5. The 1 MHREC wishes you success with the study.

1MH/302/6/02.02.2016



(M.K BAKER)

CHAIRMAN 1 MILITARY HOSPITAL RESEARCH ETHICS COMMITTEE:
LT COL / PROF

DIST

For Action

Major L.G. Ramuada

ADDENDUM D: APPROVAL LETTER FROM DEFENCE INTELLIGENCE

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defence intelligence

Department:
Defence
REPUBLIC OF SOUTH AFRICA

Telephone: 012 315 0125
Fax: 012 326 3246
Enquiries: Brig Gen M. Sizani

DI/R/202/3

Defence Intelligence
Private Bag X367
Pretoria
0001

17 May 2016

PERMISSION TO CONDUCT RESEARCH AT 1 MILITARY HOSPITAL FOR THE DURATION OF MAY TO AUGUST 2016: 94006426MC MAJ L.G. RAMUADA

1. Research document SG/D ANC/R/104/32 has reference.
2. The request to conduct research on Enteral Nutrition at 1 Military Hospital is hereby granted as there is no observed disclosure that can be to the detriment of the Military Health Profession.
2. According to the proposal, the confidentiality of the nurses participating will be ensured by providing them with a number per individual as opposed to their names being published. The hard copy questionnaires will be kept in lockable cabinets and stored for a period of five years thereafter will be destroyed through shredding or other prescribed means. This process as outlined in the proposal is encouraged strongly and is to be ensured.
3. For your further action.

(G.S. SIZANI)

CHIEF DIRECTOR COUNTER INTELLIGENCE: MAJ GEN
MS/GS

Internal

File: DI/R/202/3



In terms of the Public Information Act (No. 64 of 2000), the following information is being disclosed to the public. The disclosure of this information is subject to the provisions of the Act. The disclosure of this information is subject to the provisions of the Act. The disclosure of this information is subject to the provisions of the Act.



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