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INVESTIGATING THE PROVISION OF NUTRITIONAL SUPPORT TO CRITICALLY  
ILL HOSPITALISED PATIENTS BY REGISTERED NURSES IN EAST LONDON  
PUBLIC AND PRIVATE HOSPITALS IN THE EASTERN CAPE

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## DECLARATION

I, Nomaxabiso Mildred Mooi, declare that this dissertation is my own work and the sources of information used in this study have been appropriately acknowledged. It is submitted for the Degree of Masters in Nursing (Medical - surgical) at the University of Fort Hare, South Africa and has not been submitted before, for any degree or examination in any other university.



09/01/2014

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Candidate: N.M.Mooi

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Date:

## DEDICATION

I dedicate this study with love to my family, who, though deprived of the attention of a mother, daughter and sister, gave me space to do my work without putting undue pressure on me.

- My children, Bongo, Inam, Yongama and Yomelela
- My parents, Zama and Nogcinile
- The spirits of my late mother Nokuzola Nofikile, born Notshe, my aunt who brought me up, Cikizwa Nobutho and her husband Chief Menziwa John Makinana (AH! NGWENYATHI!) continue to be the fire that lights and inspire me.
- Lastly, my dear sisters and brothers.

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The following authorities for allowing me to conduct the study in their institutions

- East-London Hospital Complex Research Ethics Committee.

- Frere hospital
- Cecilia Makiwane hospital
- The Life Healthcare Research Committee
  - St Dominic's Life Healthcare Hospital
  - East London Private Life Healthcare Hospital
  - Beacon Bay Life Healthcare Hospital

## ABSTRACT

Critical illness is typically associated with a catabolic stress state in which patients commonly demonstrate a systemic inflammatory response that brings about changes in their body systems. Changes in the body systems make the critically ill dependent on mechanical ventilation and inotropic support for longer periods in order to survive. However, this inflammatory response can be attenuated by the timely introduction of nutritional support to provide energy and nutrients to diminish catabolism and promote anabolism. The result could be a decrease in the morbidity and mortality rates, as well as the financial burden on the patients, institutions and the state.

Since registered nurses initiate and utilise feeding protocols to achieve target goals, there is a strong need for nurse-initiated feeding protocols. These protocols should be coupled with a comprehensive nurse-directed nutritional educational intervention that will focus on their safe and effective implementation. This focus on nursing nutrition education represents a major shift away from traditional education which has focused on dieticians and physicians. Evidence suggests that incorporating guideline recommendations into nurse-initiated protocols for starting and advancing enteral feedings is an effective strategy to improve the delivery of nutritional support.

The study was aimed at exploring the provision of nutritional support to critically ill hospitalised patients by registered nurses to identify and describe possible gaps in the practice, through determining the potential relationship between the provision of nutritional support and characteristics of its providers.

A quantitative, descriptive correlational study was undertaken. Seventy registered nurses working in neonatal/paediatric and adult critical care units in two public and three private hospitals in East London in the Eastern Cape participated in the study. The sample also included public critical care students.

The results showed that registered nurses in private hospitals have more knowledge about the importance of nutritional support than their public hospital counterparts and students. The mean score was on the question was 80.3% with the highest score of 91% which was for the private hospital nurses, followed by 77.2% for public and 71.4% for students. Again, the mean score for knowledge on timing of initiating

nutritional support was 48%, the highest score being 69.4% for students followed by private hospital nurses with 49.6%.

Close to 63% (n = 44) of these nurses were either unsure about the availability of nutritional protocols or clearly attested to their non-availability. This is seen as an issue of concern because a protocol is meant to be a standard document with which all members of the ICU should be familiar. It is meant to guide and facilitate the manner of working in the unit. While facilitation of maintenance of nutritional support to patients is the responsibility of registered nurses, according to Regulation 2598(1984) section 45 (1) (q) of the South African Nursing Council, 68% (n = 48) of the respondents felt that this was in the practising scope of doctors and dieticians.

The study concluded that the nurses are knowledgeable about the importance of nutritional support but knowledge gaps have been identified as far as the timing of initiating nutritional support is concerned. Some attested to unavailability of standard guidelines that are tailored into protocols guiding the provision of nutritional support by registered nurses in the critical care units.

Nutrition should be prioritised as an important therapy for improving the outcomes of critically ill patients. Nurses need to analyse its provision, identify barriers to nutritional strategies and engage in nutritional education to empower themselves regarding the practice. Most importantly, there is a need for nurse-initiated nutritional protocols that are tailored from the broad nutritional guidelines and aligned with the local context and ways of practising. Nutritional support should be included as a key component of the curriculum in academic programmes that specialise in critical care nursing.

**Key words:** nutritional support, critical illness, critical care units, registered nurses.

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# CHAPTER 1

## INTRODUCTION OF THE STUDY

### 1.1 BACKGROUND TO THE STUDY

The significance of nutrition in the hospital setting cannot be overstated, particularly in the intensive care units (Martindale et al., 2009:1). Motivating for the above statement, the authors write that critical illness is typically associated with a catabolic stress state in which patients commonly demonstrate a systemic inflammatory response. The inflammatory response is coupled with complications of increased infectious morbidity, multi-organ dysfunction, prolonged hospitalisation, and disproportionate mortality. Nutritional status screening, assessment and monitoring is essential in the critically ill patient to reduce morbidity and mortality and to decrease hospitalisation costs (Prins, 2010:11).

There is a consensus across the world that nutritional support is an important practice in the management of critically ill patients and it determines better outcomes (Prins, 2010:11). However, despite its importance in the management of the critically ill, nutritional support remains inadequate in critical care units, with prevalence as high as 40% (Seron-Arbeloa, Puzo-Foncillas & Garces-Gimenez, 2011:346). The metabolic response to injury or stress brings about dramatic changes in the cardiovascular, respiratory and central nervous system. Over the years metabolic changes and malnutrition that occur with critical illness have been differentiated from those that occur with malnutrition associated with starvation (Carlson, 2009:111).

Joffe, Anton, Lequier, Vandermeer, Tjosvold, Larsen and Hartling (2009:1) state that nutritional support in the critically ill child has not been well investigated and is a controversial topic within paediatric intensive care and this was a call for many research studies around the matter. The other concern was that there were no clear guidelines as to the best form or timing of nutrition in critically ill infants and children.

To address the concerns around the management of the nutritional status of critically ill patients, practice guidelines for incorporating nutritional support have been

published by several organisations in several countries (Carlson, 2009:111). Martindale *et al.* (2009:1) report that these guidelines were to address expressed concerns regarding patients starved for more than seven days. Critical care nurses in collaboration with doctors and dieticians are supposed to further specify the broad guidelines mentioned earlier into clear protocols (Kreymann, 2010:29). This should be done according to different critical care units and respective hospitals. Bell (2010:11) supports the suggestion that nutritional support should be initiated within two to three days of admission to a critical care unit to reduce the adverse outcomes associated with malnutrition.

Evaluating the effects of nutritional support on clinical outcomes requires a multidisciplinary approach, however, the nurse as a member of the team who has the most constant contact with the patient, is uniquely qualified to evaluate feeding tolerance and adequacy of delivery (Urden, Stacy & Lough, 2010:131). Critical care nurses are therefore expected to calculate caloric requirements and analyse daily caloric delivery, advocate for early nutritional support, and minimise feeding interruptions through careful patient and interruption analysis (Lough *et al.*, 2010:131).

Nutrition is so important in human bodies that it is even stated in the Constitution of the Republic of South Africa (1996) section 27 that 'everyone has the right to have access to sufficient food and water'. Mosby's pocket dictionary (2010:533) defines food as any substance consisting of carbohydrates, proteins, fats and supplementary elements such as minerals and vitamins that is taken into the body and assimilated to provide energy and maintenance essential for sustaining life. Looking at this definition, the terms food and nutrition have the same meaning. In the regulatory framework of the nursing practice, Regulation 2598(1984) section 45 (1) (q) of the South African Nursing Council it is stated that facilitation of the maintenance of nutrition of a patient is one of the important responsibilities of a registered nurse.

Adequate nutritional support is important for critically ill patients. It prevents malnutrition, corrects macro-and micronutrient deficiencies, attenuates catabolic response to critical illness, promotes wound healing and improves outcomes. The researcher supports the statement made by Bell (2010:269) that important outcomes

such as rates of infection, lengths of stay, and costs can be decreased by early initiated and sustained nutritional support.

Kreymann (2010:29-32) adds that major nutritional societies of America, Europe and Canada have published revised practical guidelines for nutritional support of critically ill patients. The aim of these guidelines is to promote safe and adequate nutritional support for those who need it. According to Carlson (2009:122) South Africa supports and uses the same guidelines.

This study was conducted in East London critical care units in the Eastern Cape Province in South Africa. Ten critical care units were involved; four in two public hospitals and six in three private hospitals. The purpose was to explore the provision of nutritional support in critically ill hospitalised patients by registered nurses, so as to identify and describe possible gaps in the practice. The expectation was that identification and description of possible gaps would help to develop strategies to improve nutritional support, speed up recovery and shorten the length of stay of patients in critical care units. The expected result was improvement in the economy of the patients and that of the state. This study also looked at the relevant literature exploring the relationship between nutritional support and critical illness, as well as at guidelines for the assessment, provision, monitoring and evaluation of the adequacy of delivery of nutritional support.

Registered nurses working in the study setting were identified as the population of interest to the researcher as they were the ones administering nutritional formulas to critically ill patients. A quantitative research approach and a non-experimental descriptive correlational design were used. The planned sampling method was a probability simple random sampling, but circumstances in the critical care environment meant that this would not be practical, therefore data were collected from all registered nurses that the researcher could access at the time of data collection.

## 1.2 PROBLEM STATEMENT

Lough, Stacy and Urden (2010:110) report that as many as 12% to 50% of critically ill hospitalised patients are at risk of malnutrition. In support of the above statement, McClave (2009:277) states that, across the world, malnutrition in patients following admission to critical care units is estimated to be 43%. Nutritional status screening, assessment and monitoring is essential for the critically ill patient to reduce morbidity and mortality and to decrease hospitalisation costs. In South Africa, Prins (2010:11) calls for introspection as far as hospital-acquired malnutrition is concerned, gap analysis and a strategy to correct shortcomings in the provision of nutritional support in critically ill patients.

The researcher was motivated to conduct this study in response to the above statement and due to the observations she has made as lecturer and clinical accompanist of critical care students. The observations included delays and interruptions of nutritional support in critically ill patients in the study setting. Reasons given by the registered nurses for the delay in initiating nutritional support included that 1) it had not been prescribed by the doctor in charge of the patient, and 2) unavailability of dieticians especially during weekends. Reasons for nutritional support interruption would be due to differences in the opinions of doctors, where one doctor would order nutritional therapy and the other would come and stop it. The researcher also noted with concern the unavailability of standardised feeding protocols in some critical care units. Some of the patients with delayed or interrupted nutritional support were noted to have signs similar to those of refeeding syndrome within a few days following the initiation of nutritional support. Others presented with electrolyte imbalances; alterations in the level of consciousness; persistent muscle weakness; and oedema, which the researcher associated with malnutrition. Some were noted to take long to be ready for weaning off mechanical ventilation and inotropic support. As a consequence, these types of patients were noted to be staying longer in the critical care units, or even dying. Prolonged bed occupancy resulted in some of the patients dying in the wards because they were unable to get beds in the critical care units and some died immediately following admission to these units due to increased waiting times.

The researcher's main concern was that the patients' prolonged stay in the critical care units and increased morbidity and mortality might impinge on their financial status, that of the institution, as well as on that of the country. Critical care facilities are expensive and limited in South Africa, as stated by De Beer, Brysiewicz and Bhengu (2011:1). As delays and interruptions of nutritional support to these patients continued with no intervention, some of them died. The result was an increase in morbidity and mortality rate.

### 1.3 PURPOSE OF THE STUDY

The purpose of this study was to explore the provision of nutritional support to critically ill hospitalised patients, so as to identify and describe the predicted gaps in the practice. This was done through determining the potential relationship between the provision of nutritional support and the characteristics of its providers, as well as other patient specific variables.

### 1.4 OBJECTIVES OF THE STUDY

The main objectives of the study included:

1.4.1 Explore the provision of nutritional support in critically ill patients by registered nurses in East London public and private hospitals.

1.4.2 Identify possible gaps in the practice (provision of nutritional support).

1.4.3 Describe the identified gaps.

1.4.4 Describe the identified relationship between the practice (provision of nutritional support) and the demographic characteristics of the population.

### 1.5 RESEARCH QUESTIONS

The questions that were asked were:

1.5.1 Is nutritional support provided according to the nutritional guidelines in terms of availability of protocols, indications and routes, timing, quality, monitoring and evaluation?

1.5.2 Are there knowledge gaps in the provision of nutritional support?

1.5.3 Is there a relationship between the practice itself (provision of nutritional support) and the demographic characteristics of the population?

## 1.6 SIGNIFICANCE OF THE STUDY

This study might make a considerable contribution in the expansion of the body of knowledge on the value of timely and adequate provision of nutritional support during critical illness. It could also provide a clear understanding of the relationship between nutritional support and critical illness, as well as other patient-specific variables and the impact of such in the management of critically ill patients. This might lead to improvement of the provision of nutritional support and positively influence the clinical outcomes of critically ill patients. The ultimate consequence would be substantial relief in the economies of the patients themselves, their families, the health institutions and the state. The information obtained through this study might guide policy makers on the formulation and revision of nutritional policies and protocols. The study might also serve as a form of reference for other researchers engaged in similar studies.

## 1.7 THEORETICAL FRAMEWORK

Myra Levine's Conservation theory framework was used to guide the study. This theory was chosen because it focuses on promoting adaptation and maintaining wholeness by nurses using the principles of conservation (Newman, 2009:1). The principles of conservation include conservation of energy, structure, and personal and social integrity through, amongst other things, nutritional support. Levine's theory was seen as a relevant theory to guide this study because it supports the notion that there is a relationship between nutritional support and illness and the study was investigating the provision of nutritional support in critically ill hospitalised patients. According to Myra Levine's Conservation theory, nutritional support changes or influences the human body's ability to adapt and maintain wholeness during illness.

## 1.8 DEFINITION OF CONCEPTS

Following is the operational definition of terms that are used in this study which emanate from the research question or research topic.

### 1.8.1 Nutritional support

Nutritional support is defined as enteral or parenteral provision of calories, protein, electrolytes, vitamins, minerals, trace elements and fluids indicated for patients who cannot take them orally (Seres, 2012:1). It can also be defined as the provision of oral, enteral or parenteral nutrients which is an essential adjunct in the prevention and management of malnutrition in critically ill patients (Lough *et al.*, 2010:123). However, Mosby (2010:118) defines the concepts nutrition and support separately by indicating that nutrition is the sum of processes involved in the taking in of nutrients, their assimilation and use for proper body functioning whilst support means to sustain, hold up, or to maintain in a desired state. For the purpose of this study, nutritional support means provision of oral, enteral as well as parenteral feeding to patients admitted to a critical care unit.

### 1.8.2 Critically ill patient

McKinley (2007:2) defines a critically ill patient as that patient who is physiologically unstable or in danger of dying and needs critical care. According to Gupta (2010:1), critically ill patients are those that, by dysfunction or failure of one or more organs/systems, depend on survival from advanced instruments of monitoring and therapy. However, in this study, critically ill patients are those individuals who are admitted to the critical care unit.

### 1.8.3 Registered nurse

A registered or professional nurse is an individual who is qualified and competent to practice comprehensive nursing, that is, general nursing, community nursing, midwifery and psychiatric nursing, independently in a prescribed manner according to the Nursing Act, 2005 (Act 33 of 2005) section 30 (1). This is an individual who has completed training and is registered with a nursing council, in this case, the South African Nursing Council (1984) under section 31 of the Nursing Act.

#### **1.8.4 Critical care nurse**

A critical care nurse is a registered nurse with a diploma in critical care nursing as an additional qualification, registered under section 34 of the Nursing Act (Act No 33 of 2005). De Beer *et al.* (2011:1) define a critical care nurse as a registered nurse with additional critical care qualifications. For the purpose of this study, the term critical care nurse will be referring to a registered nurse who is trained in critical care nursing.

#### **1.8.5 Critical care unit**

A critical care unit, according De Beer *et al.* (2011:1), is a specialised area in a hospital that is highly technological. It requires nurses with a broad knowledge base and high decision making skills for looking after patients suffering from life threatening illnesses or injuries. These are the units in which critically ill patients are placed and where the population of interest in the study was accessed.

#### **1.8.6 Hospitalisation**

Blackwell's Nursing Dictionary (2010:220) defines hospitalisation as the placement of an individual in a hospital for observation, diagnostic tests, or treatment for some disease or disorder. Hospitalisation in this study means placement of the critically ill patient in a critical care unit.

#### **1.8.7 Public hospital**

A public hospital is a health care facility which is owned by the state and is funded by tax payers' money. In the case of South Africa, such hospitals serve about 20% of the population, consume 40% of the health care expenditure and employ 30% of the medical specialists (De Beer *et al.*, 2011:1). In the current study, the term public hospital refers to the two hospitals that are governed by the state that serve the middle and low socio-economic class of the East London population.

#### **1.8.8 Private hospital**

Private hospitals are not owned by the state, they are profit driven, and render care to 80% of the working class population in South Africa (De Beer *et al.*, 2011). According to the same authors these hospitals use about 60% of the South African health care expenditure and employ 70% of the medical specialists. Private hospital in this study means any of the three hospitals that are owned by Life Health Care.

## 1.9 DELINEATION OF CHAPTERS

### **Chapter 1**

The introduction, background, problem statement, the purpose and research objectives, research questions, significance of the study, definition of concepts, and delineation of chapters are presented in this chapter.

### **Chapter 2**

Contained in this chapter is the introduction, theory base, context of the research problem and summary.

### **Chapter 3**

Chapter 3 is composed of the introduction, research design, research instrument, data collection and analysis, limitations of the study, ethical considerations and summary.

### **Chapter 4**

Presentation of research findings is done in this chapter.

### **Chapter Five**

This chapter entails the discussion of findings, limitations and recommendations of the study.

## 1.10 SUMMARY

This chapter has covered the introduction and background of the investigation of the provision of nutritional support in hospitalised critically ill patients in East London public and private hospitals. The focus has been on all steps of the research process which are required for inclusion in Chapter 1. The definition and operationalisation of terms, delineation of chapters have been described. Furthermore, the research title, background, problem, aim, objectives and questions have already been presented to a multidisciplinary audience of professionals.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 INTRODUCTION

In Chapter 1, a framework of the planned study was given and its orientation has been explained. This chapter focuses on the review of literature which is regarded by authors like Bell (2011:17) as an important aspect of any research project. The literature review is an organised written presentation of what has been published on a topic by scholars and it includes presentation of research conducted in the selected field of study (Burns & Grove, 2009:92). However, Polit and Beck (2010:558) define the literature review as a critical summary of research on a topic, often prepared to put a research problem in context or to summarise existing evidence. The authors further add that 'a thorough review can determine how best to contribute to the existing evidence base' (Polit & Beck, 2010:170).

##### **2.1.1 The purpose of literature review**

Literature reviews can help to lay down the foundation for studies and can help in a quantitative study to shape research questions, contribute to the argument about the need for a new study, suggest appropriate methods, and point to a conceptual or theoretical framework (Polit & Beck, 2010:170). Hofstee (2010:91) aligns himself with Polit and Beck by stating that the literature review helps to show how the researcher's work fits in with what has already been done. Burns and Grove (2009:92) further state that literature reviews may be written for various purposes including determining the strength of evidence on which to base clinical nursing practice. In the current study, the researcher's intentions were to gather related literature and identify opportunities for nutritional practice improvement in the critically ill and opportunities to improve nurses' knowledge relating to nutritional support.

The search was guided by the available international and national literature, which captured knowledge about the role of registered nurses in the provision of nutritional

support in critically ill patients. Perspectives and practices of registered nurses working in critical care units with regard to provision of nutritional support have been described. However, when reviewing the literature, the researcher found that there is limited published literature on registered nurses as primary providers of nutritional support to the critically ill. Besides exploring the provision of nutritional support by registered nurses and the relationship between nutritional support and critical illness, the literature review also looked at the relevant guidelines for the provision of and assessment of nutritional support in critically ill hospitalised patients.

To search for studies that had already been undertaken on the research topic and related concepts, a search strategy was employed. The strategy to collect information for this literature review began by identifying relevant keywords. The keywords that guided the search of literature related to the provision of nutritional support for critically ill hospitalised patients which were derived from the research objectives in Chapter 1 included:

#### Nutritional support

- Critical illness
- Registered nurse or critical care nurse
- Critical care unit or intensive care unit

Using these keywords, a process of identifying databases with the material related to the study was performed, initially with the guidance of the supervisor. Later the researcher continued independently to access literature resources. The following databases were used in searching for literature: Cumulative Index to Nursing and Allied Health Literature (CINAHL), which contains citations from nursing journals and journals of allied disciplines; EBSCO HOST, which is a database with a wide range of data providing full text material, citations and abstracts of journals. EBSCO HOST databases that were accessed included Medical Literature Analysis and Retrieval System on Line (MEDLINE), PubMed and Cochrane. The electronic sources were searched by entering the keywords and the Boolean operators (AND, OR, NOT). On the basis of the results of these searches, several articles, journals and abstracts were included as a result of their relevance to the research topic. To limit the search, sources published before the year 2006 were excluded, with the exception of those

containing information related to the theory guiding the study, and the laws or regulations governing the scope of practice of registered nurses. Textbooks that are of particular relevance were also included.

## 2.2 THEORETICAL UNDERPINNINGS OF THE STUDY

Foy *et al.* (2011:453) explain that theories from a wide range of disciplines are potentially relevant to research. They can be used to explain clinical and organisational behaviour, to guide development and interventions, and in evaluating their implementation and mechanisms of action. Theories provide a way of understanding and predicting the effects of most nursing interventions or nursing practices intended to promote the health of patients. The authors further write that “one key recommendation from an expert consensus process is that researchers should describe the theoretical basis for chosen intervention components or provide an explicit logic model for ‘why a particular intervention should work’. Future theory-driven evaluations would enhance generalisability and help build a cumulative understanding of the nature of change” (Foy *et al.*, 2011:453).

### 2.2.1 Myra Levine’ Conservation Theory

This study is guided by the framework of Myra Levine’s Conservation Theory.

According to Alligood and Tomey (2010:229), conservation is from the Latin word *conservatio*, meaning “to keep together”. Conservation describes the way complex systems are able to continue to function even when severely challenged (Alligood & Tomey, 2010:229). Through conservation, individuals are able to confront obstacles, adapt accordingly, and maintain their uniqueness. The goal of conservation is health and the strength to confront disability as the rules of conservation and integrity hold in all situations in which nursing is required. The nurse accomplishes the goals of this model through nursing interventions which include the provision of nutritional support.

Alligood and Tomey (2010:229) further write that, although nursing interventions may deal with one particular conservation principle, nurses must also recognise the influence of other conservation principles. The model guides the nurse to focus on the influences and the responses at the organismic level. Every individual has a

unique range of responses. According to these authors, the responses vary by heredity, age, gender or challenges of illness experiences. While responses are the same, the timing and manifestations of organismic responses are unique for each individual pulse rate. Levine's Conservation Model is focused on promoting adaptation and maintaining wholeness using the principles of conservation. Conservational principles include:

- Conservation of energy
- Conservation of structure
- Conservation of person
- Conservation of social integrity

According to this theory, nutritional support changes or influences the human body's ability to adapt and maintain wholeness during illness. Levine's theory is a relevant theory to guide this study because it supports the notion that nutritional support influences critical illness.

#### **2.2.1.1 Conservation of energy**

Critical care nurses play a key role in the delivery of nutritional support and education to critically ill patients. They are responsible for providing patients with energy-yielding nutrients like carbohydrates, proteins and fats (Urden, Stacy & Lough, 2010:108). Glucose provides the energy needed to maintain cellular functions. Most of the energy produced from carbohydrate metabolism is used to form adenosine triphosphate (ATP), the principal form of immediately available energy within all body cells. The authors go further to state that in the early phases of myocardial infarction, nutrition interventions and education are designed to reduce angina and cardiac workload. To add on energy conservation, cardiac failure and cancer patients should be served with small and frequent, rather than three large meals daily, which may overwhelm the patient. Patients should be encouraged to consume calorie-dense foods and supplements (Urden *et al.*, 2010:116).

There seems to be an association between the above statements and a case study conducted by Remo (2012), of a patient that was admitted for a sudden severe chest pain. In their nursing management, Remo and her group applied Levine's principles

of conservation that mentioned assisting the patient in feeding and other activities for energy conservation.

#### **2.2.1.2 Conservation of structure**

Urden *et al.* (2010:108) reason that, in critically ill individuals, many of the amino acids released by tissue breakdown may be used for gluconeogenesis (a process of manufacturing glucose from non-glucose precursors). To preserve lean body mass, adequate energy must be supplied by diet (nutrition) so that most of the amino acids from the diet and from tissue breakdown can be used for tissue synthesis rather than gluconeogenesis.

Nursing can help to limit the amount of tissue destruction that occurs in critical illness through detailed assessment and being alert to risk factors on admission (Alligood & Tomey, 2010). Conservation of structure can thus be achieved through thorough assessment of a patient on admission as that facilitates early initiation of nutritional support. “The goals of nutrition support for intensive care unit patients are to reduce or treat malnutrition contributing to loss of lean body mass, maintain the gut barrier, stimulate immune function, lessen the inflammatory state and support wound healing” (Ros, McNeill & Bennett, 2009:2407). With registered nurses having the above-mentioned statement in mind when providing nutritional support, they have all the reasons to avoid its delay and interruption.

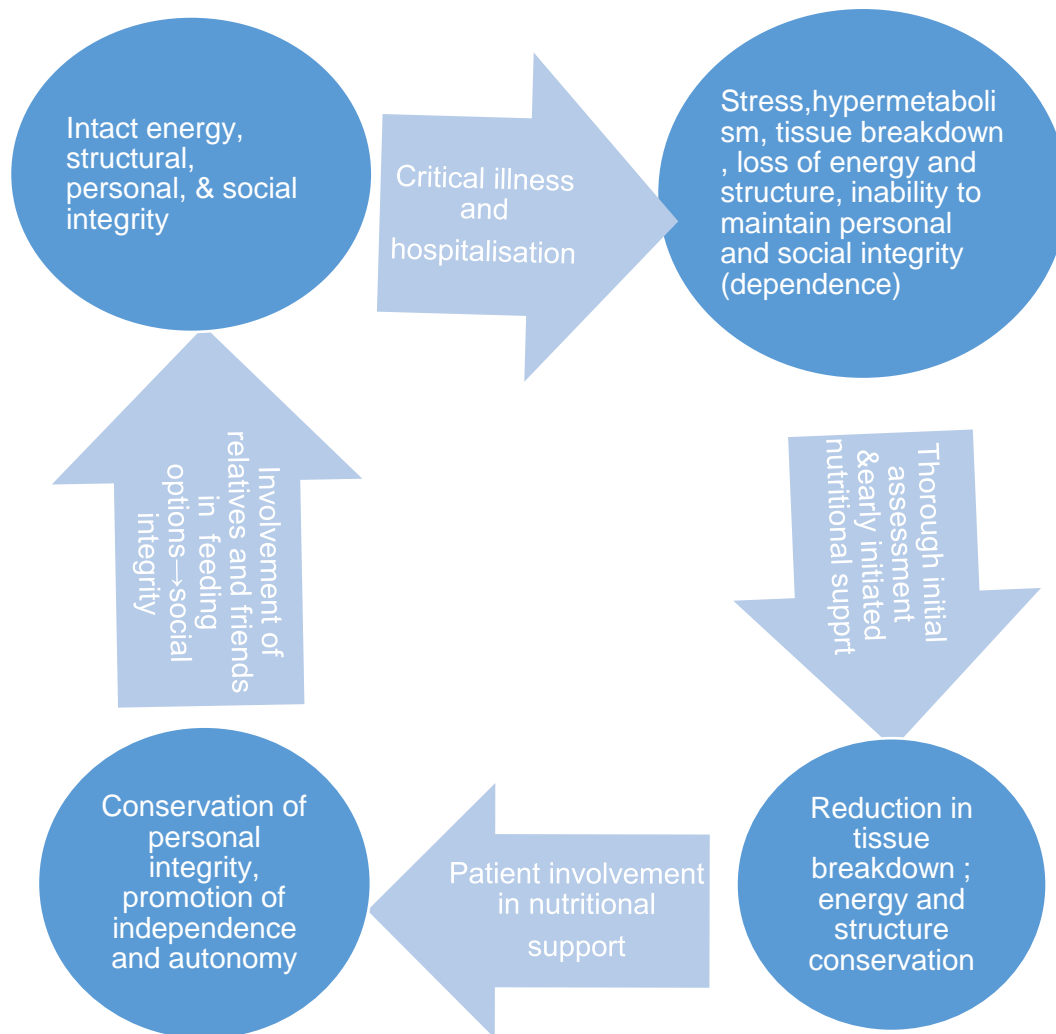
#### **2.2.1.3 Conservation of personal integrity**

Remo (2012:1) again highlights that hospitalisation is a great stressor to the well-being of an individual. Relief of anxiety and wellbeing can be promoted by providing the patient an opportunity to explore concerns and to identify alternative methods of coping as necessary. Promoting a positive attitude and active participation of the patients in their care during their stay in the hospital contributes a lot in the conservation of personal integrity. In the view of the writers, constructive nurse-patient relationships, the use of an empathic approach when caring and dealing with the patient as a person with specific needs rather than a patient requiring merely medical help can help a patient regain self-worth. Patients can feel that they are respected and treated with dignity when they are involved in decisions made regarding their nutrition. This promotes independence and autonomy in the course of

their hospitalisation (Remo, 2012). For the purpose this study, the researcher associates the empathic approach of nursing with anticipating the patients' nutritional needs and advocating for their initiation and sustenance.

#### **2.2.1.4 Conservation of social integrity**

Encouraging friends and relatives to visit the patient and provide information about the patient's eating habits and food preferences is very important in the conservation of social integrity (Remo, 2012). This provides the critically ill patient with a sense of security in an unfamiliar environment and would relieve the anxiety brought about by present hospitalisation. Figure 2.1 below illustrates how conservation of energy, structure, personal and social integrity restores wholeness in a critically ill patient.



**Figure 2.1: A model illustrating the correlation of nutritional support with illness** (Adopted from Myra Levine’s model and modified by the researcher)

## 2.2.2 The major concepts of Levine’s conservation model

Although conservation is fundamental to the outcomes expected when the model is used, Levine discussed two important concepts critical to the use of her model: adaptation and wholeness (Alligood & Tomey, 2010:229).

### 2.2.2.1 Adaptation

Adaptation is described as a process of change, and conservation is the outcome of adaptation. It is a process whereby the patient maintains integrity within the realities of the environment, critical illness, in the case of the study. Adaptation is achieved through the ‘frugal’, economic, contained, and controlled use of environmental resources by the individual in his or her best interest (Remo, 2012:1). The

researcher believes that adaptation can be achieved through early initiated and sustained nutritional support relating to the above and previous statements.

#### **2.2.2.2 Wholeness**

Levine stated that the unceasing interaction of the individual organism with its environment does represent an 'open and fluid' system, and a condition of health or wholeness, exists when the interaction or constant adaptations to the environment permit ease (the assurance of integrity) in all the dimensions of life (Alligood & Tomey, 2010:229). This continuous dynamic, open interaction between the internal and external environment provides the basis for holistic thought, the view of the individual as a whole (Alligood & Tomey, 2010:229).

When patients enter the healthcare system, they have come to terms with the fact that they are in need of help due to a health disparity and also that, with this decision to receive assistance, some personal independence must be set aside as a patient. A collaborative approach between the patient and nursing will improve outcomes, while using Levine's model to help understand the importance of interventions "intended to promote adaptation and maintain wholeness".

The primary focus of conservation is keeping together the wholeness of the individual (Alligood & Tomey, 2010:229).

The nurse is challenged in providing the individual with appropriate care without losing sight of the individual's integrity while respecting the trust that the patient has placed in the nurse's hands. The application of this theory, according to Myra Levine, is about nurses, which, in the case of this study, are registered nurses working in critical care units and having a duty to help patients to protect and maintain their integrity. Conservation of energy and structure, in this study, means restoring or maintaining the structure of the body, preventing tissue breakdown and promoting healing through, among other nursing interventions, nutritional support. The theorist affirmed that restoring and balancing energy input and output can be achieved by provision of adequate nutritional support. The goal of nursing is to promote wholeness and realising that it requires a unique and separate cluster of activities. The patient's integrity is his/her abiding concern and it is the responsibility of a nurse to help him or her to defend and seek its realisation (Alligood & Tomey, 2010:229).

## 2.3 EMPIRICAL REVIEW

Cronin, Ryan and Coughlan (2008:38) view the empirical literature review as presenting and discussing findings from the literature. This is where the literature that is central to the topic should be analysed in depth and where a critical review of the methodologies used should be included.

### **2. 3.1. An overview of critical care nursing**

In the critical care units, nurses are expected to work according to many standards, guidelines, protocols and current evidence-based practices that are related to patient care (Elliot, Aitken & Chaboyer, 2007:187). During implementation of the plan, the nurses need cognitive, interpersonal and technical skills. The cognitive skills include problem solving, decision making, critical thinking and creativity. Interpersonal skills comprise all the activities, both verbal and non-verbal, that are used to interact with one another.

Good communication and multi-professional collaboration are vital in providing holistic care to the patient in the intensive care unit. Technical skills are purposeful skills such as operating equipment. Nurses choose one or more actions that will be effective to achieve the goals that are set. These decisions are usually based on knowledge and experience (Elliott *et al.*, 2007:187).

In the case of this study, the above statements relate to the registered nurses working in the selected critical care units who are expected to effectively communicate with other members of the multidisciplinary team to advocate for nutritional support of the critically ill.

### **2.3.2 Nursing management of nutritional support**

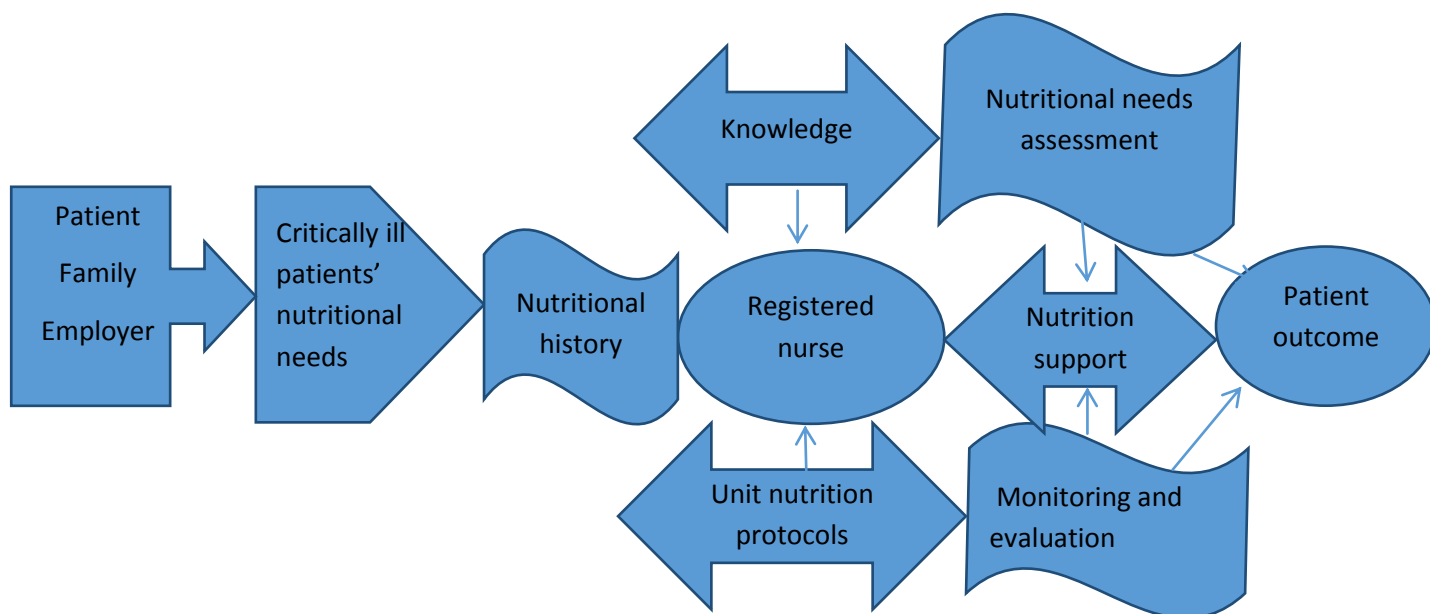
The patients in an intensive care unit experience life-threatening conditions and are in need of highly specialised nursing care that is implemented by critical care nurses. Critical care nurses (CCNs) are expected to understand the clinical patient's health situation and respond with adequate decision making to further improve the quality of patient care and increase the safety of the patient (Elliot *et al.*, 2007:5). Critical care nursing is defined by the World Federation of Critical Care Nurses (WFCCN) as

nursing critically ill patients with life-threatening conditions in a highly specialised unit, providing care to restore health or to offer palliative care (WFCCN, 2007:1). Thus, the profile of a critical care nurse is that of a nurse with strong skills in decision making, comprehensive knowledge and the ability to cope in a highly technical environment (De Beer *et al.*, 2011:6).

Carlson (2009:111) views critical care nurses as important in nutritional support because they are the ones who administer nutritional formulas to critically ill patients. Evaluating the effects of nutritional support on clinical outcomes requires a multidisciplinary approach, however; as mentioned before, the nurse as a member of the team who has the most constant contact with the patient, is uniquely qualified to evaluate feeding tolerance and adequacy of delivery (Urden, Stacy & Lough, 2010:131). These authors further state that critical care nurses should calculate caloric requirements and analyse daily caloric delivery, advocate for early nutritional support, and minimise feeding interruptions through careful patient and interruption analysis. They must have a broad understanding of nutritional support, including the indications, prevention and management of associated complications (Urden *et al.*, 2010:123).

Most importantly, facilitation of the maintenance of nutrition of a patient is one of the responsibilities of a registered nurse as stated in Regulation 2598(1984) section 45 (1) (q) of South African Nursing Council (2004 – 2013, under the provisions of the Nursing Act, (Act No. 33 of 2005). Elliot *et al.*, (2012:2406), in their interpretation of the scope of practice of the South African critical care nurse, state that a critical care nurse (CCN) ought to have sufficient knowledge about feeding, either oral or parenteral, and should have understanding of the risks involved.

The following diagram (Figure 2.2) has been adopted from Bell's (2011:13) study on the scope of practice of critical care nurses. In the study, it denotes the role of a critical care nurse as expected by the three stakeholders: the patient, the patient's family and the employer.



**Figure 2.2: The role of registered nurses towards nutrition of the critically ill**  
(Adopted from Janet Bell (2011:13) and modified by the researcher)

Nutrition of the critically ill patient is of the utmost importance. Elliot *et al.* (2012:509) add that there is increasing evidence that such patients should be fed as quickly as possible. The authors further state that it is better to feed the patient enterally than parenterally, for it is more natural and there is a lower risk of complications. When enteral feeding is chosen, patients can be fed continuously or with bolus feedings. Ros *et al.* (2009:2406), in their study on nurses' knowledge regarding enteral feeding in ICUs, reported that delivery of nutrition to the critically ill varies widely. Patients were frequently underfed and, less frequently, overfed.

Both under- and overfeeding have been linked with unacceptable consequences, including infections, extended weaning from mechanical ventilation, increased length of stay and increased mortality. Underfeeding was related to slow initiation and advancement of nutrition support and avoidable feed interruptions. The most common reasons for interrupting feeds were gastrointestinal intolerance and fasting for procedures. Certain nursing practices such as the management of gastric residual volumes contributed to underfeeding (Ros *et al.*, 2009).

A prospective observational study of fifty-nine consecutive patients who required mechanical ventilation and were receiving enteral nutrition was done in an eighteen-bed medical intensive care unit of an academic centre. Data were collected

prospectively on standardised forms. Steps involved in the feeding process from admission to discharge were recorded, each step was timed, and delivery of nutrition was quantified (O'Meara, Mireles-Cabodevila, Frame, Hummell, Dweik & Orroliga, 2008:53). Results of the study showed that patients received approximately 50% of the prescribed caloric needs. Enteral nutrition was interrupted 27.3% of the available time. A mean of 1.13 interruptions occurred per patient per day; enteral nutrition was interrupted a mean of 6 hours per patient each day. Prolonged interruptions were mainly associated with problems related to small-bore feeding tubes (25.5%), increased residual volumes (13.3%), weaning (11.7%), and other reasons (22.8%). Placement and confirmation of placement of the small-bore feeding tube were significant causes of incomplete delivery of nutrients on the day of admission (O'Meara *et al.*, 2008:53).

According to the conclusions of an observational study that was conducted by O'Meara *et al* (2008:53), delivery of enteral nutrition in critically ill patients receiving mechanical ventilation is interrupted by practices embedded in the care of these patients. Evaluation of the process reveals areas to improve the delivery of enteral nutrition.

Marshall, Cahill, Gramlich, MacDonald, Alberda and Heyland (2012:186) debate that observational studies have consistently revealed wide variation in nutritional practices across intensive care units and indicated that the provision of adequate nutrition to critically ill patients is suboptimal. To date, the potential role of critical care nurses in implementing nutritional guideline recommendations and improving nutritional therapy has received little consideration, as stated by Marshall *et al.*, (2012:186).

Nutrition is often promoted as an important supportive component of fundamental nursing care, that is, nutrition is important for metabolism, growth, and repair. Enteral nutrition is an important therapeutic strategy for improving the outcomes of critically ill patients, and critical care nurses play an important role in ensuring that set nutritional targets are met for patients. The development of evidence-based enteral feeding guidelines is one important step to a consistent approach in practice to

ensure adequate prescription and delivery of nutritional therapy (Marshall *et al.*, 2012:186).

Different feeds are available, none of which has been proved to be superior. Whichever feed or method of feed is chosen, the CCN should know the advantages and disadvantages involved. If the patient is going to receive long-term enteral alimentation, a thin, soft nasogastric tube should be considered. Its correct position should be monitored while it is in place. Absorption should be checked according to the unit's policy. Bolus alimentation should be given after bronchial toilet, and endotracheal cuff pressure monitoring should be done with the patient in a slightly elevated position, if his or her condition permits (Elliott *et al.*, 2012:509).

To manage diarrhoea as a complication in enterally fed critically ill patients, the nurse must provide adequate fluid and electrolyte replacement, maintain skin integrity, and administer antidiarrheal agents (Lough *et al.*, 2010:128). According to these authors, stools must be checked for infection, especially *Clostridium difficile* before antidiarrheal drugs are administered. The nurse must ensure adequate fluid and fibre intake, promote optimal mobility and administer laxatives and stool softeners as necessary to manage and prevent constipation in enterally fed patients.

Elliott *et al.* (2012:509) recommend that the CCN should be aware of the complications involved in total parenteral nutrition and should take the necessary nursing actions to prevent them. The speed of infusion should be monitored hourly. A slow infusion will result in the patient not receiving enough glucose. On the other hand, a too rapid infusion of glucose is detrimental to the unstable critically ill patient, because increased insulin secretion may lead to a period of low blood glucose, especially if the alimentation completed is premature and hours pass before the next day's parenteral feed is commenced.

Total parenteral feeding should not be stopped abruptly when enteral feeding is to be commenced. A one- or two-day period of overlap to ensure that the patient is tolerating the enteral feeding may solve many problems. The CCN should be aware

of clinical situations, such as renal failure, which necessitate specific dietary limitations (Elliott *et al.*, 2012:509).

### **2.3.3 Challenges in the provision of nutritional support**

Several factors potentially limit enteral intake in critically ill patients. These include lack of feeding protocols; gastrointestinal intolerance of enteral tube feeding; displacement or obstruction of the feeding tube; and interruption of tube feedings for tests and procedures. Gastrointestinal intolerance of tube feeding (e.g. large gastric residual volumes, nausea and vomiting, ileus, abdominal distension, and diarrhoea) is a major factor limiting adequate enteral intake in patients. In order to reduce the risk of aspiration of enteral formula, feeding is routinely withheld in patients with unstable haemodynamic parameters and in preparation for surgical or diagnostic procedures, weaning, and various nursing care activities (MacDougall, 2012:159).

Carlson (2009:720) mentions some special needs regarding nutritional care of critically ill neuroscience patients that a critical care nurse must be aware of. These include the risk of aspiration due to altered level of consciousness. The author also mentions medication commonly prescribed for neuroscience patients that influence nutritional needs. The examples she gives include phenytoin which has been shown to interfere with enteral feeding; as a result the feed is stopped two hours before and two hours after the administration of phenytoin.

Factors that influence nurses' nutritional practices include: 1) the lack of guidelines or conflicting evidence-based recommendations pertaining to nurses' practice; 2) strategies for implementing guidelines that are not tailored to barriers faced by nurses when feeding patients; 3) strategies to communicate best evidence that do not capitalise on nurses' preference for seeking information through social interaction, prioritisation of nutrition in initial and continuing nursing education; and 4) a lack of interdisciplinary team collaboration in the intensive care unit when decisions on how to feed patients are made (Marshall *et al.*, 2012:186). Future research and quality improvement strategies are required to correct these deficits and successfully empower nurses to become nutritional champions at the bedside. Using nurses as agents of change will help standardise nutritional practices and ensure that critically ill patients are optimally fed (Marshall *et al.*, 2012:186).

### **2.3.4 The relationship between nutritional support and critical illness**

A number of research studies have proved that critically ill patients are characterised by increased metabolism and accelerated catabolism, leading to rapid malnutrition. The prevalence of malnutrition among hospitalised patients is as high as 50%. It is agreeable that inadequate nutritional support in critically ill patients can result in increased morbidity and mortality (Prins, 2010:11).

The metabolic response to illness leads to impaired immune function, impaired ventilatory drive, and weakened respiratory muscles, resulting in prolonged ventilator dependence and increased infectious morbidity (Prins, 2010:11). Seron-Arbeola *et al.* (2011:350) state that benefits of nutritional support in critically ill patients include reduction in complication rates and lengths of stay (LOS), with accompanying cost savings.

There appears to be fairly strong evidence that nutrition plays an important role in improving the outcomes of critically ill patients. The inflammatory response to stress or illness can be attenuated by the timely introduction of nutritional support to provide energy and nutrients to diminish catabolism and promote anabolism (Carlson, 2009:111). Nutritional support therefore should be initiated within two to three days of admission in a critical care unit to reduce the adverse outcomes associated with malnutrition (Bell, 2010:11).

MacDougall (2012:159) sees malnutrition as associated with poor wound healing; muscle weakness; reduced immunity; hypothermia; impaired gut integrity and immunity; reduced cardiac output; a fall in metabolic rate; depression and lethargy; marked muscle weakness. When critical illness, with or without organ failure, is superimposed on malnutrition, a complex and deleterious situation arises, which makes it essential to feed critically ill patients. Gastroparesis and ileus are common in the critically ill and lead to poor absorption of feed. Sepsis, sympathetic nervous system stimulation and the systemic inflammatory response lead to an increase in oxygen consumption and resting energy expenditure. A third of energy requirements are met by breakdown of muscle protein, leading to a significant loss of muscle bulk, which is exacerbated by inactivity. This occurs despite the provision of adequate

nutrition in previously healthy as well as malnourished patients, but is much worse in the latter group” (MacDougall, 2012:159)

Critical illness is typically associated with a catabolic stress state in which patients commonly demonstrate a systemic inflammatory response. Changes in critically ill patients’ respiratory, cardiovascular and central nervous systems make them dependent on mechanical ventilation and inotropic support for longer periods in order to survive (Carlson, 2009:111).

The inflammatory response to stress or illness can be attenuated by the timely introduction of nutritional support to provide energy and nutrients to diminish catabolism and promote anabolism (Carlson, 2009:111). Seron-Arbeloa *et al.* (2011:350) support Carlson by adding that benefits of nutritional support in critically ill patients include reduction in complication rates and lengths of stay (LOS), with accompanying cost savings. Critical care facilities are limited and expensive in South Africa (De Beer *et al.*, 2011:1).

Mehta (2011:2204) suggests that nutrition delivery is generally inadequate in mechanically ventilated children across the world; as a result, he and his team undertook several studies on nutritional support in critically ill children. The results were as follows: intake of a higher percentage of prescribed dietary energy target via enteral route was associated with improved sixty-day survival; conversely, parenteral nutrition use was associated with higher mortality. Paediatric intensive care units that utilised protocols for the initiation and advancement of enteral nutrient intake had a lower prevalence of acquired infections. The conclusion was that optimising nutrition therapy is a potential avenue for improving clinical outcomes in critically ill children. Skillman and Mehta (2012:192) are of the opinion that critically ill children are at high risk for energy and protein imbalance. The conclusion is that early enteral nutrition improves nutrition outcomes and adherence to nutrition guidelines can overcome barriers to optimal nutrition therapy.

However, another study was undertaken, by means of randomised or quasi-randomised controlled trials that assessed the effect of slow (up to 24 ml/kg/day) versus faster rates of advancement of enteral feed volumes upon the incidence of necrotising enterocolitis (NEC) in very low birth weight (VLBW) infants. Data

collection and analysis was performed in accordance with the standard methods of the Cochrane Neonatal Review Group.

Four randomised controlled trials were identified in which a total of four hundred and ninety six infants participated. Few participants were of extremely low birth weight or were growth restricted. The trials defined slow advancement as daily increments of 15 to 20 ml/kg and faster advancement as 30 to 35 ml/kg. Meta-analyses did not detect statistically significant effects on the risk of necrotising enterocolitis (typical relative risk 0.91, 95% confidence interval 0.47 to 1.75) or all caused mortality (typical relative risk 1.43, 95% confidence interval 0.78 to 2.61). Infants who had slow rates of feed volume advancement took significantly longer to regain birth weight (reported median difference 2 to 6 days) and to establish full enteral feeding (reported median difference two to five days) (Morgan, Young & McGuire, 2013:1).

The conclusion was that current data do not provide evidence that slow advancement of enteral feed volumes reduces the risk of necrotising enterocolitis (NEC) in very low birth weight (VLBW) infants. Increasing the volume of enteral feeds at slow rather than faster rates results in several days' delay in regaining birth weight and establishing full enteral feeds, but the long-term clinical importance of these effects is unclear. Further randomised controlled trials are needed to determine how the rate of daily increment in enteral feed volumes affects clinical outcomes in VLBW infants (Morgan *et al.*, 2013:1).

Carlson (2009:111) affirms that nutritional support has become a routine component in the treatment of critical care patients to address the varied components of managing their nutritional status. Practice guidelines for incorporating nutritional support have been published by several organisations. Skillman and Mehta (2012:192) are of the opinion that critically ill children are at high risk of energy and protein imbalance. However, early enteral nutrition improves nutrition outcomes and adherence to nutrition guidelines can overcome barriers to optimal nutrition therapy.

Canadian Nutrition support guidelines (adults) (2012:1) add that critically ill patients have complex nutritional needs and require intensive nutritional input. As part of the metabolic response to injury, resting energy expenditure may be raised, leading to extensive catabolism; hyperglycaemia, and progressive lean body mass loss; changes in serum trace element levels; fluid retention; and reduced synthesis of

visceral proteins such as albumin. Contributing to poorer outcome is the previously reported high prevalence of malnutrition (40%) in Intensive Care Unit (ICU) patients. Catabolism combined with malnutrition can lead to several unwanted clinical sequelae: 1) impaired wound healing; 2) impaired immune response; 3) impaired coagulation capacity; 4) impaired gut function; 5) muscle wasting; and 6) reduced respiratory muscle function.

### **2.3.5 Benefits of nutritional support during critical illness**

Most studies have shown that important outcomes such as rates of infection, lengths of stay, and costs can be decreased by early initiated and sustained nutritional support. While Bell (2010:269) believes that important outcomes such as rates of infection, lengths of stay, and costs can be decreased by early initiated and sustained nutritional support, Bozzetti and Forbes (2009:359), to the contrary, reported on a study that revealed that parenteral nutrition led to increased infectious complications. A randomised study conducted on fifty-one (51) acute respiratory distress syndrome patients however demonstrated that nutrition supplemented by antioxidants, vitamins and amino acids improved oxygenation and reduced both the duration of ventilator support and critical care unit stay (Bell, 2012:1).

Benefits of early nutritional support include: 1) maintenance of gastrointestinal tract barrier function; 2) Increased secretion of mucous, bile, IgA; 3) maintenance of peristalsis and blood flow; 4) attenuated oxidative stress and inflammation; 5) support of GALT; and 6) activation of vagal afferents (cholinergic anti-inflammatory pathways) (Capatos, 2012:16). Other benefits of adequate nutritional support in critically ill patients include prevention of malnutrition; correction of macro and micronutrient deficiencies; attenuation of catabolic response to critical illness; promotion of wound healing; and improvement of outcomes. Important outcomes such as rates of infection, lengths of stay, and costs can be decreased by early initiated and sustained nutritional support (Bell, 2010:269).

Urden *et al.* (2010:123) seem to agree with Capatos when they write that the gastrointestinal (GI) tract plays an important role in maintaining immunological defences, which is why nutrition by the enteral route is thought to be more physiologically beneficial than parenteral route. Some of the barriers to infection in the GI tract include neutrophils, the normal acidic gastric pH; motility, which limits the

GI tract colonisation by pathogenic bacteria, the normal flora which inhibit growth of or destroy some pathogenic organisms; rapid desquamation and regeneration of intestinal epithelial cells; the layer of mucus secreted by GI tract cells; and bile which detoxifies endotoxin in the intestine and delivers immunoglobulin.

### **2.3.6 International nutritional guidelines**

International nutritional guidelines published by different societies in different countries will be discussed under various concepts, including indications for nutritional support; time of initiation; quality in terms of formularies; as well as monitoring strategies.

Kreymann (2010:1) reports that revised clinical practice guidelines have been published during the last four years by the major nutritional societies: The American Society of Enteral and Parenteral Nutrition (ASPEN), the European Society for Clinical Nutrition and Metabolism (ESPEN) and the Canadian Critical Care Clinical Practice Guidelines Committee (CCPG). The aim of these guidelines is to provide the safe and effective care of patients who need nutritional support as part of their overall management. All the guidelines are based on 'best evidence' in order to assist nutrition professionals in making decisions on the appropriate and cost-effective nutritional practices.

Nutrition is now viewed as a vital part of ICU management and proper administration of nutritional therapy has been shown to impact outcomes in critically ill patients. The Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (ASPEN) published new guidelines for nutrition support of critically ill patients in 2009 (Allen, John & Kinasewitz, 2011:1).

The guidelines agree on most points concerning the nutritional support of the critically ill and will be outlined briefly. Bozzetti and Forbes (2009:359) state the ESPEN (European Society of Parenteral and Enteral Nutrition) guidelines address the influence of the underlying disease on the patient's nutritional status, and that of malnutrition on the outcome of the disease. Contraindications to and complications of PN are considered, together with comparative analyses of the roles of the parenteral and enteral routes in different illness states.

### **2.3.6.1 Nutritional assessment and requirements for nutritional support**

Nutrition assessment is defined as a comprehensive approach to diagnosing nutrition problems that uses a combination of medical, nutrition, medication histories; physical examination, anthropometric measurements and laboratory data (Mueller, Compher & Druyan, 2011:1). Mirtallo *et al.* (2011-2012) recommend that all intensive care unit admissions should be screened to assess their need for nutrition support and recommend nutrition support within twenty-four to forty-eight hours of ICU admission (or once haemodynamically stable) for:

- Undernourished or hypercatabolic patients
- Ill patients expected to stay in intensive care unit for three days or more
- Patients not expected to commence diet within next five days or more

Vanderheyden *et al.* (2013:1) report that a 'nutrition risk in the critically ill score' (NUTRIC Score) has recently been validated for screening intensive care unit patients. Further validation studies are needed. The NUTRIC Score indicates the following:

Before initiation of feeding, nutritional assessment should consider:

- Recent weight loss
- Nutrient intake prior to admission
- Level of disease severity
- Co-morbid conditions
- Function of gastrointestinal tract

In the critical care setting, the traditional protein markers such as albumin, prealbumin, transferrin and retinol binding protein are a reflection of the acute phase response and do not accurately represent nutritional status in the intensive care setting. Requirements should be assessed individually and provided according to tolerance. Overfeeding critically ill patients can have detrimental effects on outcomes. Conversely, persistent underfeeding has been associated with increasing complications. Over aggressive feeding during the acute phase of injury may also promote adverse outcome effects (Vanderheyden *et al.*, 2013:1).

Wellesley (2007:1) reveals that there is evidence suggesting that nutrition support can slow catabolism in critically ill patients. According to the author, this can improve patient outcome and reduce subsequent duration of recovery, thereby leading to a reduced length of hospital stay and reduced overall hospital costs. A number of studies have shown that survival from intensive care was improved with better nutritional adequacy and with the use of evidence-based nutrition support guidelines.

The overall goal of feeding critically ill patients is to provide nutrition support to those who need it, consistent with their medical condition, nutritional status, metabolic capability and available route of administration. Compared to other countries, malnutrition in hospital patients in the United Kingdom is estimated up to 60%, which can either involve patients that are already malnourished or those at risk of becoming malnourished (Wellesley, 2007:1).

#### **2.3.6.2 Indications for routes used for nutritional support**

Situations that require nutritional support are presented in Table 2.1.

**Table 2.1: Indications for routes used for nutritional support**

ENTERAL NUTRITION	TOTAL PARENTERAL NUTRITION
1. Adaptive phase of short bowel syndrome	1. High-output proximal fistula
2. Burns greater than 25% total body surface area (TBSA) in adults and children and larger than 15% in infants	2. Intractable emesis and diarrhoea
3. Malnourishment after major surgery or severe trauma	3. Non-functioning GI tract
4. Normally nourished patients with expected non-oral intake for more than 7-9 days	4. Severe acute pancreatitis
	5. Inability to meet nutritional requirements with enteral or oral intake
	6. Unobtainable enteral access

Source: Carlson, 2009:114

### 2.3.6.3 Management of enteral nutrition

Enteral nutrition refers to feeding provided through the gastrointestinal tract via a tube, catheter, or stoma that delivers nutrients distal to the oral cavity. The term is used in preference to "enteral feeding" (Mirtallo *et al.*, 2011-2012). Either gastric or small bowel feeding is acceptable in the intensive care unit (ICU) setting. Critically ill patients should be fed via an enteral access tube placed in the small bowel if at high risk for aspiration or after showing intolerance to gastric feeding (high gastric residual volumes).

According to the ESPEN (European Society of Parenteral and Enteral Nutrition), jejunal feeding is likely to be the best option when it can be easily implemented (post abdominal trauma or elective abdominal surgery). The CCPG, on the other hand, recommends the routine use of small bowel feedings in units where obtaining small bowel access is feasible (Bozzetti & Forbes, 2009:359).

The feedings should be advanced toward the patient's goal over the next forty-eight to seventy-two hours. Energy requirements may be calculated by predictive equations or measured by indirect calorimetry. Efforts to provide > 50%–65% of goal energy should be made in order to achieve the clinical benefit of EN over the first week of hospitalisation. No general amount can be recommended as EN therapy has to be adjusted according to the progression/course of the disease and to gut tolerance. During the acute and initial phase of critical illness an exogenous energy supply in excess of body weight per day may be associated with a less favourable outcome. During recovery (anabolic flow phase), the aim should be to provide 25 to 30 total kcal/kg BW/day (Mirtallo *et al.*, 2011-2012).

There is some controversy between ASPEN and the CCPG; the former suggests that if the patient is unable to meet energy requirements (100% of target goal energy) after seven to ten days by the enteral route alone, initiating supplemental parenteral nutrition (PN) should be considered. On the other hand, the latter debates that initiating supplemental PN prior to this seven to ten day period in the patient already receiving EN does not improve outcome and may be detrimental to the patient.

Kreymann (2010:1) is of the opinion that the use of enteral feeding protocols increases the likelihood of overall attainment of percentage of goal energy provided and should be implemented. For example, patients placed on EN should be assessed for risk of aspiration and steps to reduce this risk should be employed. In all intubated ICU patients receiving EN, the head of the bed should be elevated 30° to 45°. Use of chlorhexidine mouthwash twice a day should be considered to reduce risk of ventilator-associated pneumonia.

Blue food colouring and glucose oxidase strips, as surrogate markers for aspiration, should not be used in the critical care setting. Development of diarrhoea associated with enteral tube feedings warrants further evaluation for aetiology. If there is evidence of diarrhoea, small peptide or soluble fibre containing formulations may be utilised (ASPEN). According to ESPEN and the CCPG, intravenous administration of metoclopramide or erythromycin should be considered in patients with intolerance to enteral feeding, e.g. those with high gastric residuals (Kreymann, 2010:32).

ASPEN recommends that soluble fibre may be beneficial for the fully resuscitated, haemodynamically stable critically ill patient receiving EN who develops diarrhoea. Insoluble fibre should be avoided in all critically ill patients. Both soluble and insoluble fibre should be avoided in patients at high risk for bowel ischaemia or severe dysmotility. Meanwhile, the CCPG suggests that there are insufficient data to support the routine use of fibre (pectin or soy polysaccharides) in enteral feeding formulae in critically ill patients (Kreymann, 2010:33).

#### **2.3.6.4 Timing of initiation of enteral nutrition**

Enteral nutrition should be started within the first twenty-four to forty-eight hours following admission (MacDougall, 2010:157). Enteral nutrition (EN) is the preferred form of nutrition support in the critical ill patient who is unable to maintain volitional intake (Kreymann, 2010:32). It should be given to all patients who are not expected to be on a full oral diet within three days. MacDougall (2010:157) argues that the provision of enteral nutrition to critically ill patients early upon admission to the intensive care unit (within 24 to 48 hours of resuscitation) exerts beneficial physiological effects such as down-regulated systemic immune responses, reduced

oxidative stress and improved patient outcomes in terms of mortality and infectious complications.

### **2.3.6.5 Monitoring of enteral nutrition**

ASPEN's recommendations according to Kreymann (2010:1) include the fact that in the ICU setting, evidence of bowel motility (resolution of clinical ileus) is not required in order to initiate EN in the ICU. In the ICU patient population, neither the presence nor absence of bowel sounds nor evidence of passage of flatus and stool is required for the initiation of enteral feeding. Patients should be monitored for tolerance of EN (determined by patient complaints of pain and/or distention, physical exam, passage of flatus and stool, abdominal radiographs). Another way of checking intolerance, according to Makic, Rauen and Von Rueden (2013:1), is assessing gastric residual volume (GRV). Current evidence shows high GRV ranges from 150 to 500 mL of aspirate. But a single elevated GRV requires no action, only ongoing monitoring. At the same time Kreymann (2010:1) suggests that inappropriate cessation of EN should be avoided. Holding EN for gastric residual volumes < 500 mL in the absence of other signs of intolerance is not necessary.

### **2.3.6.6 Management of parenteral nutrition**

Parenteral Nutrition is the term for intravenous administration of nutrients which used in preference to 'parenteral feeding'. Administration can be central: parenteral nutrition delivered into a large-diameter vein, usually the superior vena cava adjacent to the right atrium or peripheral; or parenteral nutrition can be delivered into a peripheral vein, usually of the hand or forearm (Mirtallo *et al.*, 2011-2012).

According to the American Society of Enteral and Parenteral Nutrition (ASPEN), a critically ill ICU patient may be an appropriate candidate for PN under the following circumstances: (1) The patient is well nourished prior to admission, but if after seven days of hospitalisation EN has not been feasible or target energy goal has not been met consistently by EN alone; (2) On admission, the patient is malnourished and EN is not feasible, (3) A major surgical procedure is planned, the preoperative assessment indicates that EN is not feasible through the perioperative period, and the patient is malnourished (Kreymann, 2010:1).

According to ESPEN, all patients who are not expected to be on normal nutrition within three days should receive PN within twenty-four to forty-eight hours, if EN is contraindicated or if patients cannot tolerate EN. The society therefore recommends that all patients who do not meet their nutritional needs after two days should receive supplemental PN. In the setting of haemodynamic compromise (patients requiring significant haemodynamic support including high dose catecholamine agents, alone or in combination with large volume fluid or blood product resuscitation to maintain cellular perfusion), EN should be withheld until the patient is fully resuscitated and/or stable (Kreymann, 2010:1).

#### **2.3.6.7 Timing of initiation of parenteral nutrition**

There is a controversial debate between the three nutritional societies ASPEN, CCPG and ESPEN around parenteral nutrition as supplementary to enteral nutrition. 1) A critically ill ICU patient may be an appropriate candidate for PN under certain circumstances: 1) The patient is well nourished prior to admission, but after seven days of hospitalisation, EN has not been feasible or the target energy goal has not been met consistently by EN alone (ASPEN); 2) ESPEN suggests that all patients receiving less than their targeted enteral feeding after two days should be considered for supplementary PN; 3) CCPG on the other hand, recommends that PN not be started at the same time as enteral nutrition. Regarding the patient who is not tolerating adequate enteral nutrition, there are insufficient data to put forward a recommendation about when PN should be initiated (Bonet Saris, Márquez Vácaro & Seron Arbeloa, 2011:18).

In a study conducted by Vanderheyden *et al* (2013:1), which was an experimental study which, it was discovered that postponing the initiation of parenteral nutrition (PN) in intensive care patients to beyond the first week (late PN) enhanced recovery as compared to early PN. This was mediated by fewer infections, accelerated recovery from organ failure and reduced duration of hospitalisation. This conclusion is seen as a contradiction to the requirements of nutrition guidelines stating that nutritional support should be initiated within forty-eight to seventy-two hours.

#### **2.3.6.8 Supplementary parenteral nutrition**

If early EN is not feasible or available for the first seven days following admission to the ICU, no nutrition support therapy (i.e. standard therapy) should be provided. In the patient who was previously healthy prior to critical illness with no evidence of protein-energy malnutrition, use of PN should be reserved and initiated only after the first seven days of hospitalisation, when EN is not available (ASPEN). In patients who tolerate EN and can be fed approximately to the target energy values, no additional PN should be given. In patients who cannot be fed sufficiently enterally, the deficit should be supplemented parenterally. In patients intolerant to EN, PN may be proposed at a level equal to but not exceeding the nutritional needs of the patient. Overfeeding should be avoided (ESPEN) (Kreymann, 2010:31).

Kreymann (2010:31) writes that, according to ASPEN, if there is evidence of protein-energy malnutrition on admission and EN is not feasible, it is appropriate to initiate PN as soon as possible following admission and adequate resuscitation. ESPEN's recommendation is that patients with severe undernutrition should receive EN up to 25 to 30 total kcal/kg body weight a day. If these target energy values are not reached, supplementary PN should be given (Kreymann, 2010:31).

#### **2.3.6.9 The addition of immune-modulating nutrients**

Recent studies on the modulation of host defences and inflammation by fish-oil emulsions have yielded consistent data, which indicate that these emulsions may provide a tool to beneficially alter the course of immune-mediated conditions (Wanten & Calder, 2007:1).

##### **2.3.6.9. (i) Supplements added to enteral formulas**

Kreymann (2010:33) supports the use of immune-modulating enteral formulations (supplemented with agents such as arginine, glutamine, nucleic acid,  $\omega$ -3 fatty acids, and antioxidants) for the appropriate patient population (major elective surgery, trauma, burns, head and neck cancer, and critically ill patients on mechanical ventilation), with caution in patients with severe sepsis. All countries agree on the addition of enteral glutamine to an EN regimen (not already containing supplemental glutamine) that should be considered in thermally injured, trauma, and mixed ICU

patients (Kreymann, 2010). Miller, Miller and Hill (2013:1) add that a combination of antioxidant micronutrients might be associated with improved clinical outcome in the critically ill.

ICU patients not meeting criteria for immune-modulating formulations should, according to ASPEN and ESPEN receive standard enteral formulations. Based on some studies, the CCPG recommends that diets supplemented with arginine and other select nutrients should not be used for critically ill patients. All guidelines agree on the fact that patients with acute respiratory distress syndrome (ARDS) and severe acute lung injury (ALI) should be placed on an enteral formulation characterised by an anti-inflammatory lipid profile (i.e.  $\omega$ -3 fish oils, borage oil) and antioxidants (Kreymann, 2010:1).

#### **2.3.6.9.(ii) Supplements added to parenteral formulas**

Kreymann (2010:1) states that ASPEN and the CCPG are in agreement that patients should be given a PN formulation without soy-based lipids in the first week of hospitalisation in the ICU when PN is required and EN is not feasible. Lipid emulsions should be an integral part of PN for energy and to ensure essential fatty acid provision in long-term ICU patients. Intravenous lipid emulsions (mixed emulsions) can be administered safely at a rate of 0.7 g/kg up to 1.5 g/kg over twelve to twenty-four hours. To receive optimal therapeutic benefit from the immune-modulating formulations, at least 50% to 65% of goal energy requirements should be delivered daily (Kreymann, 2010:33).

The tolerance of mixed lipid emulsions in standard use is sufficiently documented. According to these guidelines, several studies have shown specific clinical advantages over soybean alone, but require confirmation by prospective controlled studies. Olive oil-based PN is well tolerated in critically ill patients. Addition of EPA and DHA to lipid emulsions has demonstrable effects on cell membranes and inflammatory processes. Regarding lipids and nutrition, ESPEN raises the point that fish oil-enriched lipid emulsions probably decrease length of stay in critically ill patients.

Debating the recommendations by ESPEN and the CCPG, Kreymann (2010:1) writes that when PN is indicated, a balanced amino acid mixture should be infused at approximately 1.3–1.5 g/kg ideal body weight per day in conjunction with an adequate energy supply (the former). In critically ill patients who are receiving PN, there are insufficient data to make a recommendation regarding the use of branched chain amino acids (the latter).

It has been stated by ASPEN that administration of probiotic agents has been shown to improve outcome (most consistently by decreasing infection) in specific critically ill patient populations involving transplantation, major abdominal surgery, and severe trauma. Having stated this, the society points out that no recommendation can currently be made for the use of probiotics in the general ICU population due to a lack of consistent outcome effect. It appears that each probiotic species may have different effects and variable impacts on patient outcome, making it difficult to make broad categorical recommendations. Similarly, no recommendation can currently be made for the use of probiotics in patients with severe acute necrotising pancreatitis, based on the disparity of evidence in the literature and the heterogeneity of the bacterial strains utilised. However, the CCPG has declared that there are insufficient data to make a recommendation on the use of prebiotics/probiotics/synbiotics in critically ill patients.

ASPEN and the CCPG agree on the fact that a combination of antioxidant vitamins and trace minerals (specifically including selenium) should be provided to all critically ill patients receiving specialised nutrition therapy (Kreymann, 2010:10). Having said that, the author adds that there are insufficient data to make a recommendation regarding intravenous or parenteral selenium supplementation alone, or in combination with other antioxidants, in critically ill patients. However, when PN is indicated in ICU patients, the amino acid solution should contain 0.2 to 0.4 g/kg/day of L-glutamine (e.g. 0.3 to 0.6 g/kg/day alanyl-glutamine dipeptide (Kreymann, 2010:10).

In support of the use of antioxidants, Heyland (2012:1) states that critically ill patients experience a degree of hyper inflammation; cellular immune dysfunction; and oxidative stress. Supplementation with key nutrients, like glutamine and antioxidants,

is most likely to have a favourable effect on these physiological parameters and lead to an improvement in clinical outcomes. The results of two separate meta-analyses suggested that glutamine and antioxidants may be associated with improved survival.

#### **2.3.6.10 Management of nutritional support related hyperglycaemia**

ESPEN recommends that the minimal amount of carbohydrate required is about 2 g/kg of glucose per day. A protocol should be put in place to promote moderately strict control of serum glucose when providing nutrition support therapy. A range of 6 to 8 mg/dL may be most appropriate. Hyperglycaemia (glucose > 10 mmol/L) contributes to death in the critically ill patient and should also be avoided to prevent infectious complications. Reductions and increases in mortality rates have been reported in ICU patients when blood glucose is maintained between 4.5 and 6.1mmol/L. No unequivocal recommendation has been reported in ICU patients when blood glucose is maintained. There is a higher incidence of severe hypoglycaemia in patients treated to the tighter limits (Kreymann, 2010:1).

Kreymann (2010:1) further states that the CCPG makes the same recommendations as ASPEN regarding avoiding hyperglycaemia (blood sugars > 10mmol/L) in all critically ill patients. The guidelines recommend a blood glucose target of around 8.0 mmol/L (or 7 to 9 mmol/L), rather than a more stringent target range (4.4 to 6.1 mmol/L) or a more liberal target range (10 to 11.1 mmol/L), basing that on the NICE-SUGAR study and a meta-analysis that was recently done.

MacDougall concurs with Kreymann by stating that critical illness is associated with catabolic hormonal and cytokine responses which lead to increased glycogenolysis and gluconeogenesis, causing a net breakdown of skeletal muscle and enhanced lipolysis. Although plasma substrate levels may be increased, their availability for use by the peripheral tissues may be blunted (because of factors such as insulin resistance). The role of hyperglycaemia in morbidity and mortality in ICU patients is complex, but most investigators agree that a blood glucose value exceeding 180 mg/dL (10 mmol/L) may be associated with increased rates of death and complications (MacDougall, 2010:158). Davila (2010:32) seems to be in support of

the previous authors when she recommends that changes in patients' nutrition need to be incorporated among other interventions that aim at controlling hyperglycemia.

### **2.3.7 National (South African) nutritional management**

MacDougall (2010:158) reports on a case study that was discussed at the recent South African Society for Parenteral and Enteral nutrition (SASPEN) Congress held at Spier Estate, Stellenbosch, South Africa. According to this case study, SASPEN promotes the same guidelines as the other countries but makes a few different or additional recommendations. In critically ill patients who experience feed intolerance (high gastric residuals, emesis), 1) a chest X-ray (CXR) is required to check and confirm the position of the nasogastric tube; 2) an abdominal X-ray (AXR) should be taken to check whether the patient is developing ileus; 3) the administration rate of the feeding solution might be reduced; and 4) the use of agents to promote motility such as prokinetic drugs (metoclopramide and erythromycin) or narcotic antagonists (naloxone and alvimopan) should be initiated where clinically feasible (MacDougall, 2010:158).

MacDougall continues to debate that parenteral nutrition (PN) represents an alternative and often an additional approach when other feeding routes are not succeeding or when it is not possible or unsafe. The main goal of PN is to deliver a nutrient mixture closely related to nutritional requirements safely, and to avoid complications. This nutritional approach has been subject to debate over the past decades.

About the time of initiation of nutritional support, MacDougall (2010:158) writes that the recommendation in terms of the time frame for starting supplementary PN is controversial. Some advocate that all patients receiving less than their target enteral feeding after two days should be considered for supplementary PN. It is further stated that all patients who are not expected to be on normal nutrition within three days should receive PN within twenty-four to forty-eight hours if EN is contraindicated, or if they cannot tolerate EN. Others recommend that, if early EN is not feasible or available for the first seven days following admission to the ICU, no nutrition support therapy should be provided. In the patient who was healthy prior to critical illness, use of PN should be reserved and initiated only after the first seven to ten days of hospitalisation (MacDougall, 2010:159).

Allen *et al.* (2011:1) report on a study which reviewed 51 patient charts with a median APACHE II on admission of 30 (range 13 to 46). The study showed variable compliance with ASPEN/SCCM guidelines. The median time to start feeding was 27 hours (range 0 to 114), with 90% of patients' feed based on recommendation from a clinical nutritionist. Enteral nutrition was held for low residuals in 12 patients (23%). There was poor disease-specific nutrition supplementation, as 19% received glutamine supplementation and 11% received anti-inflammatory lipid supplementation (Allen *et al.*, 2011:1). The study showed increasing recognition of the importance of nutrition in critically ill patients. However, the wide variability among patients showed areas for improvement in patient management. Given the wide variation, ICU patients may benefit from feeding protocols.

Discussions in MacDougall's report indicate that SASPEN supports the Canadian guidelines in their argument against early parenteral nutrition. Kutsogiannis *et al.* (2011:2691), in their report on an international multicenter observational study on early use of supplemental parenteral nutrition in critically ill patients, concluded that the supplemental use of parenteral nutrition may improve provision of calories and protein but is not associated with any clinical benefit. The authors opened their argument by stating that early enteral nutrition (EN) is the preferred strategy for feeding the critically ill, and initiating EN within twenty-four to forty-eight hours has been endorsed by multiple organisations.

Later in their discussion, Kutsogiannis *et al.* (2011:2691) mention that proponents of the use of early supplemental PN have focused on data demonstrating that the cumulative energy deficit or caloric debt is associated with adverse clinical outcomes in critically ill patients. Opponents cite the literature demonstrating increased adverse events in patients who receive PN during their intensive care unit (ICU) stay. MacDougall (2010:159) and Kutsogiannis *et al.* (2011:2691) seem to be in agreement that early parenteral nutrition is not of benefit to critically ill patients; it can instead be detrimental.

### **2.3.8 Complications of nutritional support**

Nutritional support, like any intervention, is not without complications. Delayed or interrupted nutritional support that is seen in many critical care units causes patients to suffer from refeeding syndrome (De Beer *et al.*, 2011).

#### **2.3.8.1 Refeeding syndrome**

Carlson (2009:118) defines refeeding syndrome as a complication associated with the infusion of nutrition in previously starved patients, which makes them reject or unable to tolerate nutrition. According to McDougall (2012:159), severely malnourished patients are at risk of the refeeding syndrome. According to the author, when the body's metabolism shifts from the free fatty acid metabolism of starvation back to utilisation of carbohydrate, acute deficiencies of thiamine and phosphate are precipitated, along with disruption of electrolyte and insulin metabolism. These changes cause intracellular shifts of potassium, magnesium and phosphate; sodium and fluid retention; and several adverse clinical effects. These include diarrhoea, arrhythmias, pulmonary oedema, respiratory muscle weakness, hypotension, immune dysfunction, lactic acidosis, and in extreme cases coma and seizures due to cerebral oedema.

McDougall (2012:159) recommends the following for prevention of refeeding syndrome 1) identification of patients at risk, 2) the administration of Pabrinex (one pair daily intravenously) prior to feeding for ten days (this may be changed to thiamine orally, 300 mg daily), 3) and careful monitoring of fluid and electrolyte balance with urgent replacement of phosphate, magnesium and potassium, as required. Feeding should be started at a maximum of 15 kcal/kg/24 hours. If serum electrolyte levels remain low, the feeding rate should be kept low until these stabilise.

#### **2.3.8.2 Complications related to routes and quality of nutritional support**

MacDougall (2012:159) mentions the following in reporting on complications of nutritional support: 1) Overfeeding can lead to lactic acidosis, 2) raised triglycerides, and fatty liver, 3) It also increases carbon dioxide production (and hence the respiratory quotient) which may become clinically significant in patients with severe respiratory compromise, 4) Insulin resistance is a feature of critical illness and

overfeeding worsens hyperglycaemia, which is associated with increased infection rates. Both under- and overfeeding have been linked with unacceptable consequences including infections, extended weaning from mechanical ventilation, increased length of stay, and increased mortality (Ros *et al.*, 2009:2406).

Urden *et al.* (2010:129) discuss the complications of nutritional support under two headings; gastrointestinal and parenteral complications. Diarrhoea is common in patients receiving enteral nutrition. Causes of diarrhoea in enterally fed critically ill patients include medications, malabsorption, formula contamination or low fibre formulas. Constipation as a complication of nutritional support may result from dehydration, bed rest, opioid administration, or lack of adequate fibre in enteral formulas. Total parenteral nutrition complications include catheter-related sepsis and occlusion, air embolism, pneumonia, central venous thrombosis, hypo or hyperglycaemia (Urden *et al.*, 2010:129).

## 2.4. SUMMARY

An analytical and summative literature review has been presented. Relevance of the theory used to guide the study has been discussed at length. An introduction that served as a mind map has been laid, possible reasons for similarities and differences between studies have been considered in the body rather than mere identification of them. The findings of the studies that were reviewed relate to the purpose and objectives of the proposed study.

This chapter has highlighted several studies conducted on the provision of nutritional support in different types of hospitalised critically ill patients. The discussions in the studies show that there is a relationship between nutritional support and critical illness and that nutritional support plays an important role in the management of critically ill patients. The focus has also been on the guidelines for the provision of nutritional support in all types of critically ill patients which the registered nurses should be familiar with in order to be able to provide adequate nutrition for the critically ill patient. Similarities and controversies between international and national nutritional guidelines have also been highlighted.

## CHAPTER 3

### METHODOLOGY

#### 3.1 INTRODUCTION

Finlay and Ballinger (2006:260) define research methodology as the general approach to the research endeavour, underpinned by theoretical and philosophical ideas, determining the focus of the study, methods to be employed, form of analysis and how the researcher views his or her own position and role. Saks and Allsop (2007:413), on the other hand, state that methodology relates to the broader principles and philosophies governing research. This chapter provides an in-depth discussion of the research approach and design, as well as of the processes that were implemented in the data collection and analysis.

A quantitative approach was utilised for this study. Within this approach, a descriptive correlational design provided the broader framework for the study. The population for this study comprised registered nurses working in critical care units in the identified hospitals. Quantitative data regarding the knowledge of registered nurses of the importance of nutritional support in critical illness were collected. The data were collected by means of a questionnaire with the aim to determine the knowledge of registered nurses regarding the importance of nutritional support during critical illness and the right timing of initiating nutritional support. To address the time constraints related to the academic requirements and to accommodate the circumstances in critical care units, non-probability convenience sampling was used to select the participants and hospital

#### 3.2 THE RESEARCH APPROACH

Burns and Grove (2009:808) define a quantitative research approach, as employed for this study, as a formal, objective, systematic process to describe and test relationships, and to examine cause-and-effect interactions among variables. Maree (2008:145) concurs that a quantitative research is a process that is systemic and objective in its

way of using numerical data from only a selected subgroup of a population to generalise the findings to the rest of the population that is being studied. The approach was chosen because the study was meant to describe the provision of nutritional support and test the relationship between the practice and the demographic characteristics of the registered nurses. In order to do that, the current clinical practices relating to how nutritional support to hospitalised critically ill patients is provided, monitored and evaluated by registered nurses were explored. The study population, study sample, instrument for collecting data, data collection procedure and ethical considerations are also described. In addition, systemic and objective statistical ways were used to analyse data.

### 3.3 STUDY DESIGN

As stated by Burns and Grove (2009:795), a study design is a blueprint for conducting a study that maximises control over factors that could interfere with the validity of the findings. A descriptive correlational design was therefore used to conduct the study. Correlational designs, according to Sousa, Driessnack and Mendes (2007:504), involve the systematic investigation of the nature of relationships or associations between or among variables rather than cause-effect relationships. These authors further state that correlational studies predict the variance of one or more variables based on the variance of another variable(s). This study predicts the variance (effectiveness or ineffectiveness of the provision of nutritional support) based on another the variance (adequate or inadequate knowledge of its providers). McBride (2010:192) affirms that correlational designs are usually used to explore the relationships between multiple dependent variables, without manipulating any of the variables.

Brink and Wood (1998:161) concur that a correlational design is used when the investigators have a reason to suspect a relationship between variables and can support their suspicion through literature or previous research. The researcher had a suspicion that the way nutritional support is provided is related to the knowledge, skills and other demographic characteristics of the providers (registered nurses). The suspicion was supported by previous studies and the theoretical framework on which

the study was based. The available research and literature support that best practices related to the provision of nutritional support in the critical care units positively influence the clinical outcomes of hospitalised critically ill patients.

### **3.3.1 Variables**

Variables are defined by Burns and Grove (2009:814) as qualities, properties or characteristics of persons, things or situations that change or vary and are manipulated, measured, or controlled in research. Some variables can be manipulated; others can be controlled. Some are identified, but not measured; others are measured with refined measurement devices (Brink, Van der Walt & Van Rensburg, 2012:90). Two types of variables that are pertinently relevant to the current study are discussed, namely independent (registered nurses) and dependent (nutritional support) variables. The adequacy or effectiveness of nutritional support is believed to be influenced by the demographics of the providers. In this study, nutritional support was measured by the provider's knowledge, experience, the type of hospital or unit and the availability of nutritional protocols. Mention of confounding variables was also made as these types of variables may influence the results of the study.

#### **3.3.1.1 Confounding variables**

A confounding variable is a type of variable that is not a variable of interest to a researcher, but that may influence the results of a study (Brink *et al.*, 2012:212). However, this having been stated, these variables have been found significant in this particular study because, if no attempt was made to control them, they could influence the outcomes of the study.

Examples of confounding variables are patient's age, preadmission nutritional status and diagnosis or seriousness of the patient's condition. These variables are significant because the provision of nutritional support can be effective or ineffective because of a variation in any of the confounding variables instead of the independent variable. Old age, preadmission malnutrition and multiple organ failure can prevent critically ill patients from improving or failing to respond to nutritional support. These conditions can be interpreted as gaps in the knowledge of registered nurses and the way they provide nutritional support while the reason meanwhile may be the effect of the confounding variable.

### 3.5 STUDY SETTING

A setting is the physical location and conditions under which data collection takes place in a study (Polit & Beck, 2007:510). Burns and Grove (2004:35) add that there are three common settings for conducting research: natural, partially controlled and highly controlled. Natural settings are uncontrolled real-life settings usually preferred for descriptive and correlational types of quantitative research. Since this study is a quantitative descriptive correlational study, the researcher chose a hospital setting, which is a natural setting of her population of interest. The study took place in five hospitals in East London in the Eastern Cape. It was conducted in an adult critical care unit and one neonatal/paediatric critical care unit in both hospitals constituting the East London public hospital complex. Three adult critical care units in the main private hospital, two (neonatal and an adult) in the other and one in the third private hospital were utilised as the study setting. The five hospitals are situated in the urban area of East London, a few kilometres apart. The public hospitals are referral hospitals and the biggest in the province, getting referrals from five (5) districts of the Buffalo City Municipality, urban and rural areas. The districts are Amathole, Chris Hani, Joe Gqabi, O.R Tambo and Alfred Nzo.

The main private hospital receives patients from nine (9) private hospitals, including the two in East London, and eight (8) private clinics in the Eastern Cape. The public hospital complex gets patients from seventy-six (76) hospitals and fifty (56) clinics in the Eastern Cape. The setting was selected because it seemed to have potential to represent South African hospitals.

### 3.6 STUDY POPULATION

Polit and Beck (2012:738) define a population as the entire set of individuals or subjects having some common characteristics in which the researcher is interested. McBride (2010: 315) defines the study population as a group of individuals about whom a researcher seeks to learn something in a research study.

In the current study the population comprised registered nurses working in the critical care units in East London public and private hospitals, as well as public critical care students. The group of individuals was chosen because they are the ones who assess patients' nutritional status on admission, administer nutritional formulas recommended and prescribed by the other members of the multidisciplinary team, and monitor tolerance and adequacy of nutritional support.

### **3.6.1 Target population**

The target population is the entire population in which the researcher is interested (Polit & Beck, 2010:307). Mouton (2003:13) explains further that once the target population has been defined, it helps to provide practical means of drawing up a study sample. The researchers in this study focused on registered nurses in the ten (10) critical care units of private and public hospitals in East London in the Eastern Cape. The public hospital has five (5) registered nurses in a shift three (3) operating teams, as well as fourteen (14) critical care students. There are five (5) registered nurses in a shift in a private hospital. The total number of the target population was estimated at one hundred and forty (140), but only seventy (70, 50%) responded to the questionnaires.

### **3.6.2 Accessible population**

The accessible population, according to Polit and Beck (2010:307), is composed of cases from the target population that are accessible to the researcher as subjects and respondents. Gravetter and Forzano (2009:130) define accessible population as a portion of the target population consisting of individuals who are accessible to the researcher as participants in the study. In this study, one hundred and fifteen registered nurses (115) were accessible, but only seventy (70) completed and returned their questionnaires and this was attributed to the unpredictable routine in the units.

## **3.6 SAMPLING PROCESS**

Sampling is a process of selecting a portion of the population to represent the entire population (Polit & Beck, 2010:307). De Vos, Strydom, Fouche and Delport (2005:192) assert that sampling is important in conducting research; researchers therefore need to

seriously consider this concept before embarking on a sampling plan, conducting a pilot or the main study.

### **3.6.1 The sample**

The study sample is often set and static before a study commences in quantitative studies (Jones, Torres & Arminio, 2006:72). Its choice is guided by the design which is used in a particular study (Brink *et al.*, 2009:134). The sample in this study was derived from registered nurses working in the ten (10) critical care units chosen as the study setting.

### **3.6.2 Sampling method**

The sampling method was non-probability and convenience sampling was used in the study. Convenience sampling is also referred to as 'accidental or 'availability sampling' and it involves the choice of readily available subjects or objects for the study (Brink *et al.*, 2012:132). The authors further state that samples chosen by this method are convenient for researchers in terms of time and costs. The method should be used where probability sampling is not possible or samples are unobtainable by other means, especially in quantitative studies (Brink *et al.*, 2012:133). In the case of this study, circumstances in the critical care units meant that probability sampling was not possible and all the registered nurses available at the time of data collection were selected.

### **3.6.3 Sampling frame**

The sampling frame is a listing of all the elements of the population from which the sample is to be chosen (Brink *et al.*, 2012:217). The sampling frame was the duty rosters for all the registered nurses selected as the study population.

### **3.6.4 Sample size**

Sample size is the number of subjects in a sample (Polit & Beck, 2010:316). Seventy registered nurses participated in the study. Maree (2008:179) recommend a minimum size of thirty (30) to forty (40) subjects depending on the size of the population. The sample size in this study was seventy.

### **3.6.5 Inclusion and exclusion criteria**

Researchers have specific characteristics that define the subjects they need for their studies which are considered the criteria for inclusion or exclusion (Polit & Beck, 2010:330).

#### **3.6.1.1 The inclusion criteria**

The inclusion criteria in the study included: being a registered nurse working in the proposed setting, trained or experienced, and undergoing critical care training gave the respondents opportunity to be included in the study. Demographic characteristics like age, years of nursing experience, years in critical care nursing, type of unit and patient experience were considered.

#### **3.6.1.2 The exclusion criteria**

Nurses who were not registered or did not have provision of nutritional support included in their scope of practice, like enrolled nurses, nursing auxiliaries, and care givers, were excluded.

## **3.7 MEASUREMENT INSTRUMENT**

A measurement instrument is a measurement device used to examine a specific variable in the study (Burns & Grove, 2007:41). A questionnaire developed by the researcher with the help of the supervisor was used for this study. Polit and Beck (2007:508) define a questionnaire as a method of gathering information from a respondent through self- administration of questions in a paper and pencil format. The questionnaire was divided into two sections, section A and section B. Section A consisted of demographic data. Section B was further divided into six (6) subsections.

Section B1 presented statements requiring a yes or no answer on the importance of nutritional support in critical illness. Section B2 comprised statements requiring true or false answers and enquired information about the timing of initiating nutritional support. A Likert scale on protocols, routes, quantity and quality and choice gave form to section B3 and continued to challenges in the provision of nutritional support in B4. Section B5 consisted of statements warranting a tick for agree and an x for disagree on

monitoring of tolerance of nutritional support. Section B6 comprised statements that required choosing between strongly disagree, disagree and strongly agree concerned with the evaluation of adequacy of nutritional support.

### **3.8 VALIDITY AND RELIABILITY OF THE INSTRUMENT**

In order to have confidence in the results of a study, the researcher must be assured that the questionnaire consistently measures what it is designed to measure when properly administered. This means that the questionnaire must be both valid and reliable (Radhakrishna, 2007:1).

#### **3.8.1 Validity of the research instrument**

The validity of the questionnaire is in its ability to measure the variable that it is intended to measure (Brink *et al.*, 2012:209). For the purpose of this study, three types of validity were discussed, namely content, construct and criterion-related validity. These types of validity will ensure relevance and accuracy, as well as reliability of the instrument in measuring the variables.

##### **3.8.1.1 Content validity**

Radhakrishna (2007:1) states that content validity of the questionnaire will be ensured by checking if it answers the question; does it represent the content? The questionnaires were used in a pre-test to clarify items in terms of whether it measured the essential aspects of the relevant variables. The researcher also consulted critical care specialists to check whether the questions in the questionnaire covered all the aspects that needed to be covered on nutritional support in critically ill patients, to ensure content validity of the instrument.

##### **3.8.1.2 Construct validity**

Construct validity is particularly relevant to quantitative research because research with construct validity is research that accurately measures the behaviour it is designed to measure (McBride, 2010:182). During pretesting, critical care-trained, experienced and inexperienced registered nurses were asked closed-ended questions about the provision of nutritional support for critically ill patients in their units, to facilitate

construct validity. Construct validity of a measurement instrument is about confirming what the respondents know and think about the concept being studied and should relate to the existing literature or conceptual framework. Comments and advice from the supervisor and statistician were sought to check construct validity of the questionnaire.

#### **3.8.1.3 Criterion-related validity**

McBride (2010:184) states that criterion-related validity examines the relationship between the research study scores and other established measures of the behaviour of interest. The scores of the questionnaire were checked against the scores of similar studies, for example scores of a study on monitoring of fluid and electrolytes in critically ill patients, to see if they may be related.

#### **3.8.1.4 Reliability**

Reliability concerns the consistency and dependability of a research instrument in measuring a variable (Brink *et al.*, 2012:216). Using the questionnaires in the pre-test showed its ability to give similar results when used repeatedly, and thus reliability was determined. This was also confirmed by the statistician, as he indicated that the data generated in the pre-test had the potential of analysability, which meant he would be able to analyse data from the main study.

### **3.9 PRETESTING THE MEASUREMENT INSTRUMENT**

Before the questionnaires were used in the main study they were administered by the researcher as a mini study to four (4) registered nurses working in the public hospital adult high care unit and four (4) working in a neonatal high care unit. This helped to determine whether the questions were understandable and gave the researcher experience with the respondents, setting, methodology and methods of measurement (Burns & Grove, 2009:44). Unclear and ambiguous questions were restructured.

### 3.10 DATA COLLECTION

Data, as defined by Polit and Beck (2010:552), are pieces of information obtained in a study. Data collection is the process of selecting subjects and gathering data from these subjects. The actual steps of collecting data are specific to each study and depend on the research design and measurement methods (Burns & Grove, 2009:441).

Data for the study were collected using questionnaires. The researcher distributed and collected the questionnaires personally. The plan was to request a private room where the researcher planned to sit with the respondents to explain the details of the study and its purpose, then to obtain an informed consent. The researcher distributed the questionnaires to the respondents, providing explanations when necessary. It took each respondent about thirty minutes to complete the questionnaire, after which the researcher collected them personally. Because of the circumstances in the critical care units, the researcher had to leave some of the questionnaires with the respondents and collect them later.

### 3.11 DATA ANALYSIS

According to Brink *et al.* (2012:57), data analysis is a process by which the researcher organises the data in an orderly, coherent fashion in order to discern patterns and relationships. Polit and Beck (2010:235) state that correlations can be detected through statistical analyses. As such, the standard Statistical Package for the Social Sciences (SPSS) software was used in this study, with the assistance of a qualified statistician.

Seventy registered nurses participated in the study, age- and sex-matched respondents were randomly selected according to their availability. The demographic characteristics and stand-alone variables were summarised using frequency distribution tables and pie charts, while means and standard errors and box plots were used to summarise the derived variables.

Factor analysis was carried out on section B questionnaire items, to determine the factor structure or items that could constitute a single construct. A variable cluster analysis followed as a confirmatory tool of the factor analysis results. Cluster analysis

was then followed up with reliability analysis based on Cronbach's alpha coefficient to determine whether the items in each cluster could be collapsed into a single variable representing the cluster. Once the constructs were determined and the construct variables derived, the statistical analysis proceeded and this was based on the derived variables and not the individual items, except when the items remained as stand-alone variables.

### **3.12 ETHICAL CONSIDERATIONS**

It is important that research involving human subjects is preceded by a careful assessment of predictable risks as compared to foreseeable benefits to the subjects or others (Rid and Harald, 2010:143. Van der Wal (2011:331) adds that protection of the respondents and the institution from harm, as well as the scientific integrity and competency of the researcher, should be considered during research.

#### **3.12.1 Ethical issues that pertain to the Institution**

The research proposal was submitted to the University of Fort Hare Research ethics committee for evaluation and approval. An ethical clearance certificate was then obtained, which allowed the researcher to proceed with the study. To respect the autonomy of the institution, permission to conduct the study in the public hospital was requested from the Eastern Cape Department of Health. The study was also ethically evaluated and approved by the East London Hospital Complex Research Ethics Committee. Permission was granted by two public hospitals to conduct research in their intensive care units. The Life Healthcare Research Committee was asked for permission to conduct the study in the private hospital.

With regard to anonymity, the five institutions were protected by ensuring that it is not possible to relate particular data to a particular person in an institution. They were not coded as codes could sometimes be connected to the owners; dates of visit to the institution were used to identify the site. The dates were kept in confidence in the researcher's diary, which was kept safe so that no one could connect any information to any site. To show respect, the researcher tried not to interfere with time, resources and the day-to-day activities of the critical care units by securing appointments before visits.

### **3.12.2 The ethical issues pertaining to the respondents**

Respondents have a right to protection from discomfort and harm. The relevant ethical principles in this regard, according to Van der Wal (2010:333), are permission, autonomy, informed consent, confidentiality and anonymity, non-coercion and non-exploitation. The researcher addressed these critical issues as follows:

#### **3.12.2.1 Autonomy**

Autonomy, as the right to self-determination, is respected in health research just as in clinical practice. In this study, registered nurses were made aware of having the right to decide whether or not to participate in the study, without the risk of penalty or unfair treatment. They were also given the right to withdraw from the study at any time, to refuse to give information or to ask for clarity on the purpose of the study.

The respondents were allowed freedom to conduct their lives as autonomous agents, without external control, coercion or exploitation during their participation in the study. They were informed about the purpose and implications of the study to assist them to voluntarily accept or decline the invitation to participate in the study.

#### **3.12.2.2 Confidentiality and anonymity**

The names of respondents were not revealed to protect them from humiliation in case they said negative things about the provision of nutritional support in their units. No information provided by the respondent was divulged in any way, except for research purposes, to facilitate confidentiality. Only members of the research team had access to the data. The researcher tried to avoid linking data to any individual respondent. The anonymity of the institution at which the research was conducted further secured anonymity of respondents.

#### **3.12.2.3 Privacy**

Maintenance of privacy is one of the critical issues that need to be considered when conducting a research study. In order to maintain privacy, the researcher requested a room where she sat with the respondents, helping them when necessary with the completion of the questionnaire, when it was possible for her to do so.

#### **3.12.2.4 Informed consent**

The researcher obtained informed consent from the respondents. The respondents were given full information about the purpose and duration of the study; the nature of information expected from them; the identity of the researcher; and the fact that they would not be remunerated.

#### **3.12.2.5 Non-coercion and non-exploitation**

In no way that respondents were coerced into consent by having certain aspects of the research subtly emphasised or by omitting others. The researcher assured that there were no bribes or favours that were promised respondents for them to give consent.

#### **3.12.3 Scientific Integrity of the researcher**

Van der Wal (2011:340) states that misconduct can figure in a number of ways during research. This can include fabrication and falsification of data through inappropriate techniques of analysis and plagiarism, as well as unoriginal and fraudulently performed research.

The researcher tried by all means to prevent any misconduct. She acknowledged sources of her information and there was no falsification of information in the study. The study was her honest work. Since the study was undertaken for educational purposes, it was assessed in the same way as any other educational project and the required competence was supplemented by the input of research supervisors and experts in critical care nursing.

### **3.13 THE SCOPE**

The selected sampling method gave opportunity for each element of the population to stand a chance of participating in the study. The registered nurses training for additional qualification (critical care students) and those working part time were included in the sample to widen the scope and to reduce methodological limitations. Inclusion of five different hospitals, two public and three private, might have widened the scope of the study.

### 3.14 SUMMARY

The appropriate steps were followed as far as research methodology was concerned. The aspects covered included the research approach, design, population and sampling, data collection and analysis, validity and reliability, as well as ethical considerations. The next chapter presents an in-depth discussion of the data analysis and interpretation.

## CHAPTER 4

### RESEARCH RESULTS

#### 4.1 INTRODUCTION

Chapter 4 presents the results of the statistical data analysis. It is organised according to the principal study concepts of the descriptive correlational study; the descriptive analysis being presented first, then being followed by confirmatory analysis (correlational analysis). Data analysis reveals findings that can be deduced on the basis of the data collected. In quantitative studies, data analysis is performed through statistical procedures in order to examine the gathered data (Burns & Grove, 2007:41).

The measurement instrument of the research was a questionnaire that was developed by the researcher with the assistance of the supervisor and the qualified statistician. The questionnaires were completed by registered nurses and critical care students working in the critical care units in the selected hospitals. The collected raw data were then recorded on an Excel spreadsheet and sent electronically to the qualified statistician who had been consulted in the early stages of the research to assess the measurement instrument for relevance and appropriateness for statistical analysis. The quantitative data were then analysed using the Statistical Package for the Social Sciences (SPSS) software, as described in Chapter 3. Frequency tables were generated, followed by drawing of pie charts to present the results.

#### 4.2 PRESENTATION OF FINDINGS

The research findings are presented under different headings, namely the response rate, sample description, variable derivations, descriptive analysis and confirmatory analysis.

## 4.2.1 RESPONSE RATE

Over a six-week period, questionnaires were distributed to one hundred and fifteen; N = 115 (100%) registered nurses working in the units and seventy, n = 70 (61%) were returned. This number was accepted by the statistician as an adequate sample size. Table 4.1 presents the distribution of the questionnaires.

**Table 4.1: Distribution of questionnaires**

<b>Selected institutions and units</b>	<b>Distributed questionnaires and percentages (N = 115)</b>	<b>Returned questionnaires and percentages (n = 70)</b>
Public Hospital 1 Pub 1 Adult Pub 1 Paediatric CC Students	N = 20 (17.3%) N = 16 (13.9%) N = 14 (12.17%)	n = 17 (24.2%) n = 11 (15.71%) n = 14 (20.0%)
Public Hospital 2 Pub 2 Adult Pub 2 Paediatric	N = 6 (5.2%) N = 4 (3.47%)	n = 2 (3.0%) n = 1 (1.5%)
Private Hospital 1 Pr 1Surgical Pr 1Medical Pr 1Cardiac	N = 15 (13.04%) N = 10 (8.7%) N = 10 (8.7%)	n = 8 (11.43%) n = 5 (7.14%) n = 4 (5.71%)
Private Hospital 2	N = 5 (4.4%)	n = 1 (1.5%)
Private Hospital 3 Pr 3 Adult Pr 3 Paediatric	N = 5 (4.4%) N = 10 (8.7)	n = 3 (4.3%) n = 4(5.71%)
Total	N = 115 (100%)	n = 70 (61%)

## 4.3 SAMPLE DESCRIPTION

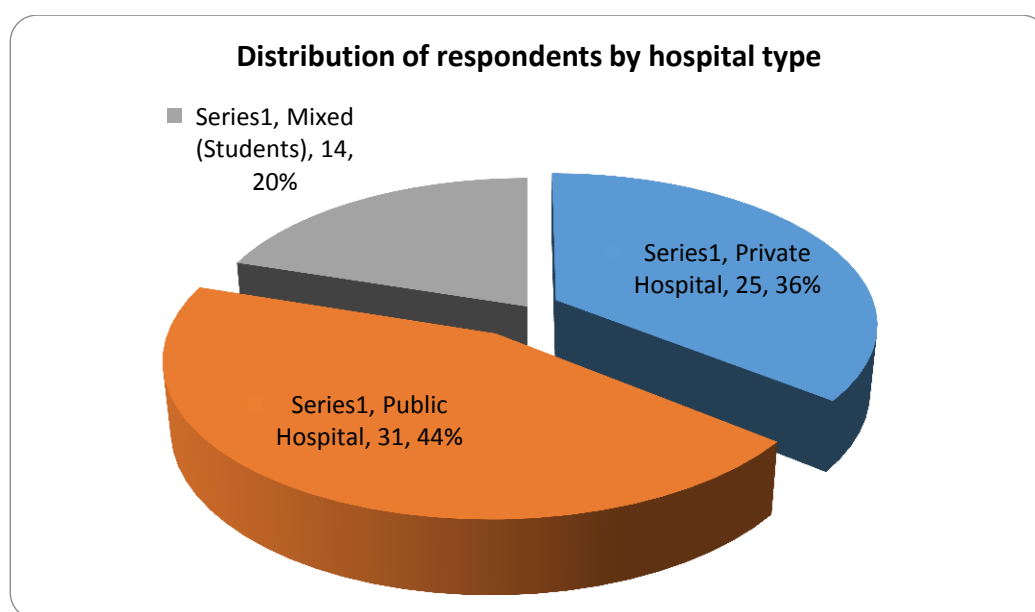
The sample is described according to demographics:

### 4.3.1 Demographics

The demographics are the characteristics of the respondents and it, according to Burns and Grove (2007:127), describes the sample. The demographic data listed below were

obtained from the respondents and concerned the type of hospital the registered nurse is working in, age, gender, years of experience as a registered nurse, years of experience as a critical care nurse, critical care training, type of unit experience and type of patient experience.

Figure 4.1 shows the nurses' distribution by hospital type. Of these nurses, 20% (n = 14) were current public critical care students and 44% (n = 31) were from the public hospitals.

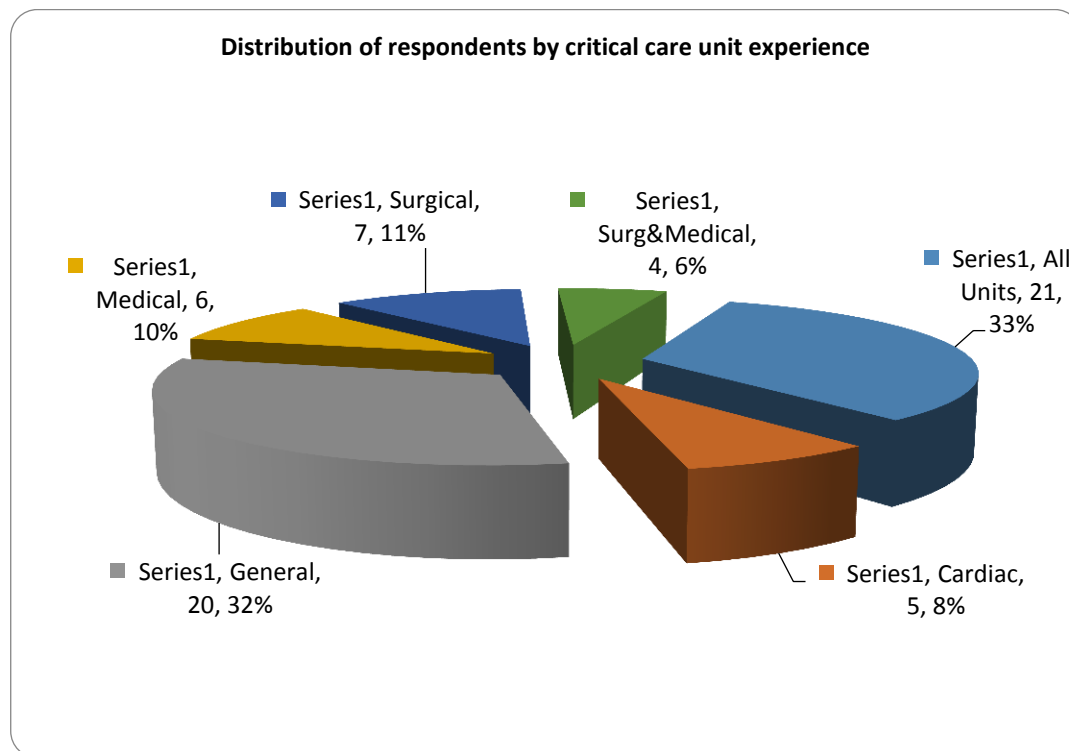


**Fig. 4.1: Pie chart showing distribution of nurses by hospital type**

Close to 94% (n = 66) of the nurses were female. Their ages ranged from 25 years to 65 years with an average of 44.3 years while their nursing experiences ranged from 10 months to 48 years with an average of 17.7 years. The median age was 46 years, which means that half of the nurses were at least 46 years old. Similarly, half of the nurses had at least 17.5 years overall of nursing experience. Critical care experience ranged between 10 months and 28 years, with a median and mean of 8 and 9.4 years, respectively. This suggests that half of the nurses had nursing experience of at least 8 years in critical care.

The respondents came from different critical care units. Fig. 4.2, below, shows that the majority (33%,  $n = 23.1$ ) had experience in all critical care units, followed by general critical care, with 32% ( $n = 22.4$ ). Only 6% ( $n = 4.2$ ) had experience in both medical and surgical units, 8% in the cardiac unit and the rest being almost equally distributed between medical and surgical units. While all the nurses in the sample had critical care experience, only 53% ( $n = 37$ ) had received critical care training.

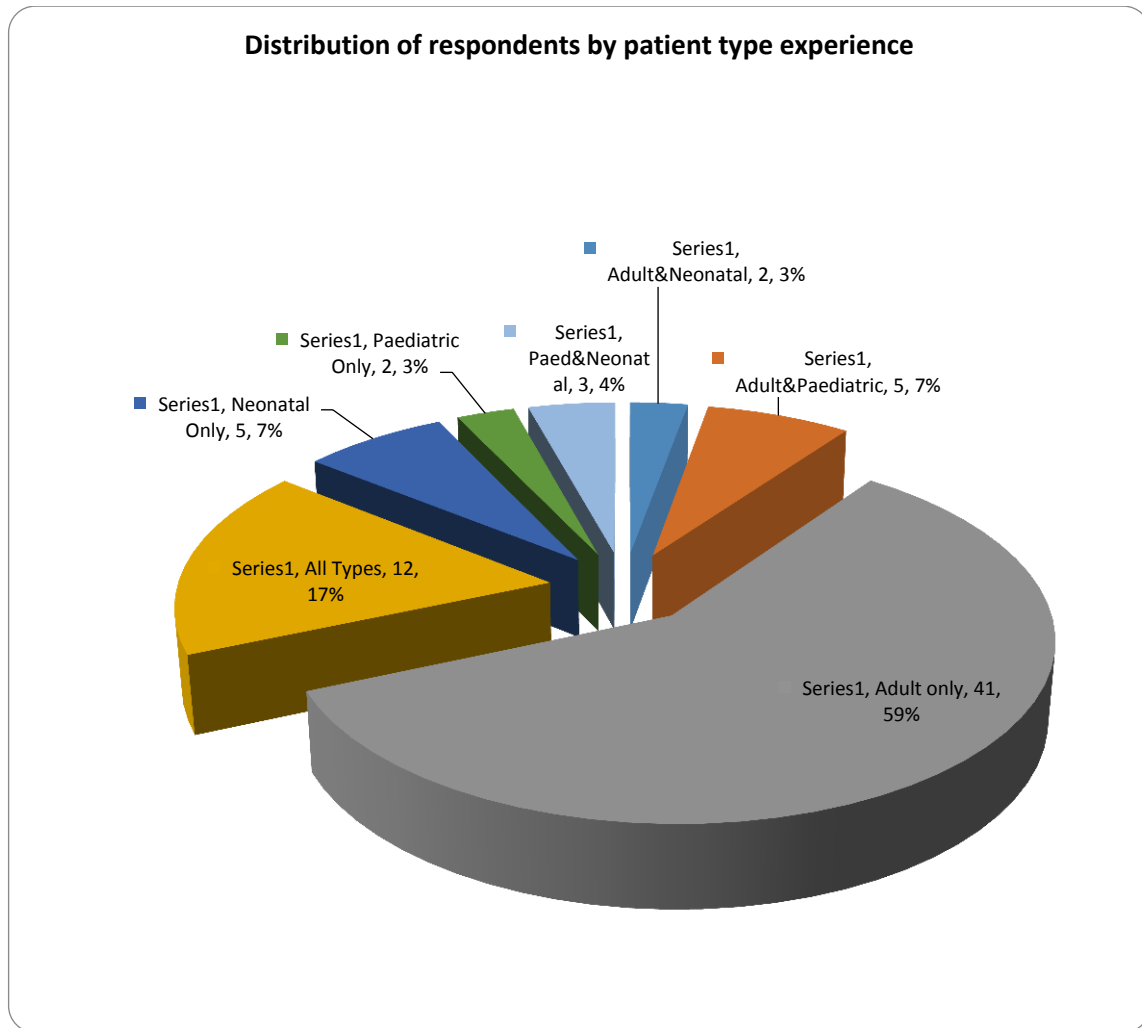
For onward analysis involving this variable, the respondents were classified as having experience in all units, the general unit and the specialised unit. The specialised unit would refer to cardiac, medical and surgical units, as well as any combination of these three specialised units. After this recategorisation, the nurses with all units experience and those with general unit experience remained as they were while those with specialised units experience were constituting 35% ( $n = 35$ ) of the sample.



**Fig. 4.2: Pie chart showing distribution of nurses by unit experience**

Fig. 4.3 shows that the majority of the nurses (59%,  $n = 41$ ) had experience with adult patients only, followed by 17% ( $n = 12$ ) who had experience with all patient types. The

rest were distributed as shown in the pie chart. For onward analysis, the patient type variable was recategorised to adult only, all types, and paediatric. The paediatric category would include neonatal, paediatric and any other combination involving these two. This category would have 24% (n = 17) of the nurses.



**Fig. 4.3: Pie chart showing distribution of nurses by patient type**

## 4.4 VARIABLE DERIVATIONS

### 4.4.1 INTRODUCTION

The variables discussed in this section were derived from the research questions which addressed the research objectives. Knowledge about the importance of

nutritional support in critical illness was measured through five true or false questions. The knowledge on the importance of nutritional support score for each respondent was calculated as the total number of correct responses divided by 5. This was then expressed as a percentage by multiplying the resulting fraction by 100%. Knowledge about timing of initiation of nutritional support was measured through seven true or false questions. The same method was used in deriving the timing of initiating nutrition knowledge score for each respondent. Variable reduction techniques were used for reducing the number of items in the feeding protocols, quantity and quality, routes and choice section, as well as the challenges section. Factor analysis and variable cluster analysis specifically were used. To determine whether the variable grouping identified by these techniques was reliable, the Cronbach's alpha coefficient for reliability was used.

Values of the coefficient of at least 0.7 suggest genuine construct reliability. A new variable combining the grouped items was derived as the arithmetic mean of the concerned items. In the event of the reliability coefficient being small, the items were treated as stand-alone variables. The results are shown in the appendix. These variables are the ones that were subjected to further analysis; they are summarised in the descriptive analysis section below.

## 4.5 DESCRIPTIVE ANALYSIS

The descriptive summaries of the data are presented in this section. Note that tests for statistical significance are not presented in this section, but in the next section.

**Table 4.2: Means for the quantitative variables by hospital**

<b>Variable</b>	<b>PRIVATE</b>	<b>PUBLIC</b>	<b>STUDENTS</b>	<b>OVERALL</b>
<b>Age of respondent</b>	43,1	45,7	42,9	44,3
<b>Overall nursing experience</b>	17,8	20,1	12,1	17,7
<b>Critical care experience</b>	10,0	10,7	5,1	9,3
<b>Nutritional support importance</b>	91,0%	77,2%	71,4%	80,3%
<b>Nutritional support timing</b>	49,6%	40,4%	69,4%	48,0%

The mean score on the knowledge about nutritional support importance was 80.3% while that for knowledge on timing of nutritional support was 48%. This shows that the nurses had better knowledge of the importance of nutritional support than about timing of initiation of nutritional support. Looking at the scores for the two variables across hospitals, it can be seen that students had the most knowledge on timing of initiating nutritional support with a score of score of 69.4%, followed by private hospital nurses with 49.6%. As for importance of nutritional support in critical illness, the highest score was 91% and it was for the private hospital nurses, followed by 77.2% and 71.4% for public hospital nurses and students respectively. These results suggest that knowledge about importance and timing of nutritional support depends on the hospital. However, this was not conclusive until statistical tests for the significance of the hospital effect were carried out. Those were carried out and the results are presented in the confirmatory analysis part of this report.

**Table 4.3: Protocol on routes, quantity, quality and choice of feeding**

<b>Protocol on routes, quality and choice of feeding</b>	<b>SD</b>	<b>D</b>	<b>CumD</b>	<b>A</b>	<b>SA</b>	<b>Neutral</b>
Availability of standard protocol	16,2	30,9	47,1	23,5	13,2	16,2
Facilitating NS and practising scope of doctors and dieticians	10,3	19,1	29,4	32,4	35,3	2,9
Use of universal type of parenteral formula for all patients	27,9	26,5	54,4	20,6	16,2	8,8
Exclusive use of only pre-packed enteral formulas	4,4	20,6	25,0	35,3	38,2	1,5
Availability of pre-packed oral supplementary formulas	4,5	7,5	11,9	47,8	38,8	1,5
Common use of enteral supplementary formulas	24,6	42,0	66,7	20,3	11,6	1,5
Weight and quantity of nutritional requirement	22,1	32,4	66,7	23,5	19,1	2,9
Preadmission nutritional status and type of nutrition	10,3	26,5	36,8	35,3	11,8	16,2

Preadmission nutritional status and amount of feed	16,7	31,8	48,5	25,8	7,6	18,2
Preadmission dietary habits and type of feed	8,7	39,1	47,8	30,4	5,8	15,9
Diagnosis irrelevance in choice of route of nutritional support	37,7	42,0	79,7	11,6	5,8	2,9
Diagnosis as only determinant of feed type	21,9	25,0	46,9	31,3	17,2	4,7
Prescribed feed volumes given as boluses	46,3	35,8	82,1	4,5	4,5	9,0
Use of various immune modulating formulas	7,7	9,2	16,9	46,2	20,0	16,9

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SD= Strongly disagree, D=disagree, Cumulative Disagree, SA=Strongly Agree

Table 4.3 shows the percentages of respondents according to how they responded to questions on routes, quantity, quality and choice of feeding. On the issue of the ready availability of a standard protocol, 47.1% (n = 33) at least disagreed while 16.2% (n = 23) were neutral. This leaves 36.7% (n = 26) of them attesting to the availability of a standard protocol in their ICU.

The protocol is meant to be a standard document with which all members of the ICU should be familiar. It is meant to guide and facilitate their work in the unit. If close to 63% (n = 44) of the nurses working in these units are either not sure about the availability of the protocol or clearly attest to its non-availability it should be an issue of concern. It would be recommended that familiarisation with the ICU should not end with the initial orientation of new nurses but be viewed as an ongoing process to ensure complete familiarity with the operations of the ICU.

About 68% (n = 48) of the respondents feel that facilitation of maintenance of nutritional support is in the practising scope of doctors and dieticians. With 3% (n = 2) being neutral, this leaves about 29% (n = 20) who disagree or strongly disagree that nutritional support maintenance is in the practising scope of doctors and dieticians.

Close to 54% (n = 38) of the nurses, at least, disagree that a universal type of parenteral formula is used for all patients in their units. With 9% (n = 6) being not sure, this leaves the majority in disagreement about the use of a universal parenteral formula for all patients. Only 25% (n = 18) of the respondents disagreed about exclusive use of only pre-packed enteral formulas. With only 1.5% (n = 1) of them being not so sure, over 70% (n = 49) of them agree or strongly agree. Close to 87% (n = 61) of the nurses agree or strongly agree that pre-packed oral supplementary formulas are available in their units. This leaves only 13% (n = 9) at least disagreeing or being not sure. However, the majority of them, at least 66.7% (n = 47), disagreed about common use of enteral supplementary formulas. This suggests that pre-packed enteral formulas are in common use, pre-packed oral supplements are available and enteral supplementary formulas are not commonly used in the units.

Most of the nurses, about 66.7% (n = 47) at least disagreed that there is any link between weight of patient and quantity of nutritional requirements. On the link between preadmission nutritional status and type and amount of nutritional support, at least 15% (n = 11) of them were not sure. However, there were more nurses who at least agreed with the link with type of nutrition, about 47.1% (n = 33), and 48.5% (n = 34) at least disagreed with the link with amount of feed. A similar scenario is presented in the case of the link between preadmission dietary habits and type of feed. About 48% (n = 34) at least disagreed that preadmission dietary habits have an influence on the type of feed a patient would need.

About 80% (n = 56) of the nurses at least agreed that patient diagnosis is relevant in choosing the route of nutritional support. However, they were split equally as to whether diagnosis is the only determinant of type of feed, with 47% (n = 33) disagreeing and 48% (n = 34) agreeing, and the rest being unsure. The vast majority of the nurses at least disagreed that prescribed feed volumes are given as boluses (about 82.1% (n = 57)). About 66% (n = 46) at least agreed that they use various immune modulating formulas.

**Table 4.4: Challenges faced in nutritional support provision**

Challenges in nutritional support	SD	D	CumD	A	SA	N
Surgical interventions are not a reason for delayed nutritional support	22,1	20,6	42,7	29,4	23,5	4,4
Early enteral feed in patients on inotropic support should not be a challenge	12,1	10,6	22,7	50,0	21,2	6,1
Nutritional support should not be delayed because of abdominal trauma	13,4	22,4	35,8	35,8	16,4	11,9
Continuous enteral feeds should not be interrupted by basic nursing interventions	2,9	13,0	15,9	44,9	30,4	8,7
Multidisciplinary team members do not see nutritional support as crucial	11,8	33,8	45,6	29,4	11,8	13,2
Scarcity of feed pumps leads to inadequate delivery of nutritional support	23,2	23,2	46,4	23,2	17,4	13,0
Unavailability of nutritional protocols cannot affect nutritional support	14,5	13,0	27,5	47,8	18,8	5,8
Provision of nutritional support is effective if one uses methods/discretion	3,1	16,9	20,0	50,8	16,9	12,3
Patients' differences in age can impact on the provision of nutritional support	11,9	20,9	32,8	34,3	19,4	13,4
Enteral feeding has more complications than parenteral	18,8	40,6	59,4	15,9	7,3	17,4
Different diagnoses has nothing to do with the provision of nutritional support	20,3	24,6	44,9	29,0	18,8	7,3

The nurses were divided over the effect of surgical interventions on nutritional support with about 53% (n = 37) at least agreeing that surgery leads to delays in nutritional support, with 4.4% (n = 3) being unsure or at least 42.7% (n = 30) disagreeing. The majority, 71.2% (n = 50), believe that early enteral feed in patients on inotropic support should not be a challenge. The respondents were divided as to whether abdominal trauma should cause delays in nutritional support, with about 52% (n = 36) saying it should not and 12% (n = 8) being not so sure.

While 75.3% of the nurses (n = 53) felt that continuous enteral feeds should not be interrupted by basic nursing interventions, about 9% (n = 6) did not know whether nursing interventions should interrupt enteral feeds. About 46% (n = 32) of the respondents felt that multidisciplinary team members do consider nutritional support as crucial and 13.2% (n = 9) were not so sure. The same scenario is depicted in the case of scarcity of feed pumps with close to 46% (n = 32) of nurses feeling that scarcity of feed pumps does not hamper nutritional support delivery. According to 67% (n = 47) of the nurses, unavailability of nutritional protocols cannot affect nutritional support.

The majority of the nurses (67.7%, n = 47) at least agreed that nutritional support provision is effective if one is creative enough to use one's discretion/methods. This suggests that, though standard protocols may say one thing, nurses should be able to adapt protocol guidelines to each situation as best as possible to the benefit of the patient. Almost 33% (n = 23) of the nurses at least disagreed that age differences in patients can impact on nutritional support provision, while 13.4% (n = 9) were not sure about the effect of age on nutritional support provision. Close to 45% (n = 32) of respondents felt that nutritional support provision depends on patient diagnosis, while 7% (n = 5) were not sure and the rest disagreed with that. On the issue of enteral and parenteral feeding, most of the nurses, about 59.4% (n = 42) did not believe that enteral feeding has more complications than parenteral feeding.

**Table 4.5: Nutritional support tolerance monitoring**

<b>Item</b>	<b>Frequency</b>	<b>Percent</b>
<b>Tolerance monitoring protocol availability</b>	41	60,3
<b>Tolerance monitoring protocol clarity</b>	37	54,4
<b>Non-availability of protocol on managing intolerances</b>	30	44,8
<b>Usefulness of X-rays in monitoring nutritional adequacy</b>	27	39,7
<b>Two-hourly gastric aspirations in first six hours of feeding</b>	22	34,4
<b>Volume tolerance checking</b>	19	28,8
<b>Blood glucose as indicator of carbohydrate intolerance</b>	43	67,2

About 60% (n = 42) of the nurses in the sample agreed that there is a standard protocol for monitoring patient tolerance to nutritional support. However, only 54.4% (n

= 38) agreed that the procedures to be followed in monitoring tolerance are clearly stated in the protocol and 55.2% (n = 39) felt that management of intolerances is also stated in the available protocol. Only 39.7% (n = 28) agreed that chest and abdominal X-rays have little or no value in monitoring adequacy of delivery of nutritional support. This means that the majority of them felt that the X-rays are of value in monitoring nutritional adequacy and tolerance. Only 34.4% (n = 24) agreed that two-hourly gastric aspirations in the first six hours of feeding are done to determine intolerance and about 29% (n = 20) agreed that aspirations of gastric contents are useful in checking tolerance to volume administered only when volumes are large.

There was a general agreement that blood glucose levels can be used as an indicator of a patient's carbohydrate intolerance, as shown by 67.2% (n = 47) of the respondents agreeing. About half of the respondents agreed that the normal residual gastric volume is 100 ml and only 10.6% (n = 7) felt that it was 200 ml, with the rest putting it at 500 ml.

**Table 4.6: Nutritional support adequacy assessment**

Item	Frequency	Percent
<b>Effectiveness and adequacy determination through bloods</b>	50	74,6
<b>Inappropriateness of intake and output records as indicators of adequacy</b>	29	43,3
<b>Ineffectiveness of assessing adequacy through physical examination</b>	21	31,8

The majority, about 74.6% (n = 52) of the respondents believe that bloods for urea, creatinine and electrolytes are useful in determining adequacy of nutritional support. Only 31.8% (n = 22) of the nurses believe that physical examination is an ineffective way of assessing nutritional adequacy. This means that the majority, about 68.2% (n = 48) believe in physical examination as a useful tool in assessing nutritional adequacy, especially in critically ill patients. However, they were almost equally divided over the ineffectiveness of intake and output records as tools for assessing nutritional support adequacy. About 43% (n = 30) of them felt that these records are not meant for

assessing nutritional support adequacy but for assessing delivery of fluids and electrolytes. This leaves 57% (n = 40) who believe that such records may be useful in assessing adequacy. Based on the above, it can be said that the respondents generally agreed that bloods for urea, creatinine and electrolytes and physical examination are possible ways in which nutritional support adequacy can be assessed. However, they were not sure about the effectiveness of intake and output records for assessing adequacy of nutritional support.

## 4.6 CONFIRMATORY ANALYSIS

In this section, results of the tests for statistical significance are presented and interpreted. All tests for statistical significance were carried out at a 5% level of significance.

### 4.6.1 Correlation analysis

Correlation analysis was used for testing whether age, nursing experience and critical care experience had linear associations with knowledge about the importance and timing of nutritional support. The results showed that, overall, there was no correlation between the three biographical variables and the knowledge variables. However, when tested within each hospital type, some correlations were found to be significant. Within the private hospitals specifically, knowledge about timing of initiation of nutritional support was found negatively associated with age ( $r = -0.53$ ,  $p = 0.0033$ ); nursing experience ( $r = -0.69$ ,  $p = 0.0023$ ) and critical care experience ( $r = -0.60$ ,  $p = 0.0096$ ), while knowledge about importance was not. This means that the older and more experienced nurses are associated with lower knowledge about timing of initiation of nutritional support. However, knowledge about importance of nutritional support was not correlated with any of the biographical characteristics of the nurses in the case of private hospitals.

Within the public hospitals, the nurses' knowledge about the importance of nutritional support was found to be positively associated with age ( $r = 0.38$ ,  $p = 0.041$ ) and overall experience ( $r = 0.38$ ,  $p = 0.038$ ) of the nurses. This means that the older and more experienced the nurses, the higher their score on knowledge about importance of nutritional support. No significant correlations were detected for the student group.

#### **4.6.2 Testing for hospital effect on knowledge**

One-way analysis of variance (ANOVA) was used for testing whether the mean timing and importance scores differed by hospital. The results of the analysis showed that both knowledge variables depend on hospital type. The F-statistics and the p-values for the importance of nutrition in critical illness and timing of nutrition scores were ( $F = 5.3$ ,  $p = 0.008$ ) and ( $F = 5.12$ ,  $p = 0.01$ ) respectively. To determine the direction of the difference's multiple comparison procedure was used as a follow-up analysis to the ANOVA.

The multiple comparison analysis for importance of nutrition in critical illness showed that private hospital nurses had more knowledge about this than both public hospital nurses and student nurses. The public hospital nurses and student nurses were not significantly different. The importance of nutrition scores for the private, public and student nurses were 91%, 77.2% and 71.4%. Note that the private hospital nurses had a much higher score than the other two groups of nurses.

In terms of knowledge on timing of initiating nutritional support, students scored highest, which was 69.4%, followed by 49.6% for private hospital nurses and 40.4% for public hospital nurses. The results of the multiple comparison showed that the public and private hospital nurses did not display significantly different knowledge of timing of initiating nutrition, while student nurses had significantly higher knowledge scores than the other two groups.

In summary, it was found that private hospital nurses are most knowledgeable about the importance of nutritional support, while students are most knowledgeable about timing of initiating nutritional support.

#### **4.6.3 Testing for critical care training effect on knowledge**

The two independent samples t-test was used to test for the training effect on knowledge variables. It was found that knowledge about importance of nutritional support was the same for nurses trained in critical care and those not trained in critical

care ( $t = -0.89$ ,  $p = 0.3813$ ). However, the knowledge of timing of initiating nutrition was found to be significantly higher for those not trained in critical care ( $t = 2.92$ ,  $p = 0.008$ ). The non-trained nurses scored 59.5% ( $n = 42$ ) in the knowledge of timing of initiating nutritional support while trained ones scored an average of 40.9% ( $n = 28$ ).

## 4.7 SUMMARY OF FINDINGS

This study was able to deliver a number of findings and these are outlined in summarised format below. The main findings of this study concerning knowledge of the registered nurses are:

- i. Regardless of hospital type and critical care training, the older the nurses, the more experienced and experienced in critical care they are.
- ii. Within the private hospitals, the older and/or more experienced the nurses, the less their knowledge on the timing of initiation of nutritional support.
- iii. Within the public hospitals, the older and/or more experienced the nurses, the more their knowledge on importance of nutritional support.
- iv. Private hospital nurses have more knowledge about the importance of nutritional support than their public hospital counterparts and student nurses.
- v. Critical care students have more knowledge about timing of initiation of nutritional support.
- vi. Nurses not trained in critical care have more timing knowledge than their counterparts trained in critical care.
- vii. Nurses not trained in critical care have the same knowledge of importance as their trained counterparts.

## CHAPTER 5

### DISCUSSION, IMPLICATIONS, LIMITATIONS, RECOMMENDATIONS AND SUMMARY

#### 5.1 INTRODUCTION

This chapter presents the discussion of the research results within the perspective of previous research reported in the literature and Myra Levine's Conservation Theory. The focus of the discussion is on descriptive and correlational data analyses. The study's implications for nursing practice and research, its limitations and recommendations for future research are also presented.

#### 5.2 DISCUSSION

The study was aimed at exploring the provision of nutritional support in critically ill hospitalised patients by registered nurses to identify any gaps in the practice through determining potential relationship between certain variables. The objectives which were used as stepping stones towards achievement of the research aim were:

- To explore the provision of nutritional support in critically ill patients by registered nurses in East London public and private hospitals
- To identify possible gaps in the practice (provision of nutritional support)
- To describe the identified gaps
- To describe the identified relationship between the practice (provision of nutritional support) and the demographic characteristics of the population

According to data analysis results, all the objectives of the study were addressed. The conclusions drawn from the results are discussed under each objective as reflected below:

##### **5.2.1 To explore the provision of nutritional support**

The provision of nutritional support was explored through questionnaires that were distributed to the registered nurses. This is discussed under the following sub-headings:

### **5.2.1.1 Importance of nutritional support**

Ros *et al.* (2009:2407) asserts that the goals of nutrition support for intensive care unit patients are to lessen or treat malnutrition that leads to loss of lean body mass, maintain the gut barrier, enhance immune function, decrease the inflammatory state and support wound healing. The authors are seen as supporting Myra Levine's theory, which indicates that "nutritional support changes or influences the human body's ability to adapt and maintain wholeness during illness".

In this study, the private hospital nurses demonstrated more knowledge than public hospital nurses. The reason for private hospital nurses having more knowledge than their counterparts is associated with the fact that private hospital are profit driven and therefore having to sell their services as best as possible. To achieve their goals, an effort is made to empower staff in so many ways, unlike public hospitals where there is less time for that because of staff shortages and limited budgets. The latter statement is supported by De Beer, Brysiewicz and Bhengu (2011:1). Nonetheless, critical care nurses in public hospitals need to make an effort to bridge the identified gap between nursing practices in public and private hospitals, particularly regarding the provision of nutritional support.

Generally, nurses are seen to have better knowledge of the importance of nutritional support in critical illness than about timing of initiating it. The former statement is in support of findings by Prins (2010:11) in which it is concluded that there is consensus across the world that nutritional support is an important practice in the management of critically ill patients and that it determines better outcomes. However, the focus needs to be on providing knowledge regarding timing of initiating nutritional support as this could help to curb hospital-acquired malnutrition; reduce morbidity and mortality; and cut hospital costs. Hospital-acquired malnutrition is associated with increased lengths of stay in ICUs and prolonged dependence on life support.

Allen *et al.* (2011:1) have also identified an increasing recognition of the importance of nutrition in critically ill patients and, as such, have recommended the use of feeding protocols in critical care units. Nonetheless, despite its importance in the management of the critically ill, nutritional support remains inadequate in critical care units, with prevalence as high as 40% (Seron-Arbeloa *et al.*, 2011:346). It is therefore essential

for all unit managers and team leaders in critical care units to be very vigilant in caring for the critically ill patient in order to diminish the high rate of inadequacy of nutritional support for critically ill patients.

#### **5.2.1.2 Timing of initiating nutritional support**

The results of this study reveal a score of 48% (n = 34) on timing of initiating nutritional support against 80.3% (n = 56) on its importance in critical illness. This shows that the nurses have less knowledge of the timing of initiation of nutritional support compared to its importance. At the same time, the scores for the two variables across hospitals showed that students had the highest score on timing of initiating the support of 69.4%, followed by private hospital nurses with 49.6%. These results confirm the researcher's suspicion about the gaps in the knowledge of nurses as far as the timing of nutritional support is concerned. This is despite MacDougall's (2010:157) recommendation that nutritional support should be implemented within three days of ICU admission. This recommendation was supported by one multicentre study performed on 1209 ICU patients that showed that achieving the energy target in the first three days of ICU stay, whatever the route of feeding (enteral or parenteral feeding), was associated with a decrease in morbidity and mortality. Skillman and Mehta (2012:192) have added that early enteral nutrition improves nutrition outcomes.

According to various guidelines from different countries, nutritional support should be initiated within 24 to 72 hours following admission to a critical care unit. Kreymann (1010:29) recommends that enteral feed requires to be initiated within 24 to 48 hours and parenteral nutrition should be initiated in all patients who do not meet the nutritional needs within two days. The question regarding timing of initiating nutritional support was aimed at assessing the registered nurses' knowledge of the right time to initiate the feed, so as to ascertain in which cases it should be started early and in which instances it could be delayed.

Looking at this particular outcome of the study in relation to the timing of the initiation of nutritional support, it seems that it is essential for registered nurses in charge of the patients to emphasise to the lower nursing categories the importance of critically observing the timing of initiation of feeding to critically ill patients. They should

advocate for early feed initiation in the critically ill as required by their scope of practice and recommended by Urden, Stacy and Lough (2010:131) and other authors.

Urden *et al.* (2010:131) further state that critical care nurses should advocate for early nutritional support, and minimise feeding interruptions through careful patient and interruption analysis. Based on the highest score of timing of initiating nutrition of 69.4% observed from the findings on student participants, followed by private hospital nurses with 49.6%, the highest knowledge deficit regarding timing of nutrition is depicted by scores of participants from public hospital nurses. Again, public hospital nurses need to do something to change the situation. In the event of such findings, in order to improve the patient care practice in relation to nutritional support, it is essential that such aspects be discussed, through clinical audit meetings, in-service training as suggested by Tempest (2011:30) as well as educational ward rounds. There is a need for critical care nurses to have a broad understanding of nutritional support, particularly the indications, contra-indications, complications and management thereof (Urden *et al.*, 2010:131).

#### **5.2.1.3 Availability of nutritional protocols**

Nutrition is now viewed as a vital part of ICU management and proper administration of nutritional therapy has been shown to impact on the outcomes of care rendered to critically ill patients (Allen *et al.*, 2011:1). Formulation of nurse-initiated nutritional protocols is therefore of vital importance to achieve nutritional goals. Nutritional education for critical care nurses is relevant to the enhancement of the nursing management of critically ill patients.

On the issue of the ready availability of a standard nutritional protocol, the respondents held different views, for instance, 47.1% (n = 33) disagreed, while 16.2% (n = 11) were neutral. This leaves 36.7% (n = 26) of the nurses attesting to the availability of a standard protocol in their ICUs. The interpretation is that only 26 nurses out of 70 attested to readily available standard nutritional protocols. The low number of participants who have knowledge of such a nutrition-related standard protocol is a matter of concern, because nutrition for the patients who are critically ill is of vital importance in critical care nursing. The protocol is meant to be a standard document with which all members of the ICU should be familiar. It is meant to guide and facilitate

their work in the unit. Feeding guidelines promote consistent approach in practice to ensure adequate prescription and delivery of nutritional therapy (Marshall *et al.*, 2012:186).

Kreymann (2010:1), commenting on clinical practice guidelines, indicated that revised clinical practice guidelines have been published by the major nutritional societies during the last four years: The aim of these guidelines is to provide for the safe and effective care of patients who need nutritional support as part of their overall management. All the guidelines are based on 'best evidence' in order to assist nutrition professionals in making decisions on appropriate and cost-effective nutritional practices. It is further suggested that these guidelines should guide the formulation of nurse-initiated nutritional protocols which should be readily available in each critical care unit (Kreymann, 2010:1).

The non-availability of nutritional protocols to guide the practice may result in inadequacy in the delivery of nutritional support; increased morbidity; prolonged stay in ICU; and an increased mortality rate. This could increase the financial burden on the patients and their families, on institutions and on the state. It is therefore important that nutritional protocols are available in the critical care units and that all the nurses should be familiar with them. Skillman and Mehta (2012:192) furthermore affirm that adherence to nutrition guidelines can overcome barriers to optimal nutrition therapy. Allen *et al.* (2011:1) also recommend the use of feeding protocols, suggesting that they may benefit critically ill patients.

#### **5.2.1.4 Nutritional support as a responsibility of registered nurses**

In the regulatory framework of the nursing practice, Regulation 2598(1984) section 45 (1) (q) of the South African Nursing Council, it is stated that facilitation of the maintenance of nutrition of a patient is one of the important responsibilities of a registered nurse. Critical care nurses are expected to calculate caloric requirements and analyse daily caloric delivery, advocate for early nutritional support, and minimise feeding interruptions through careful patient and interruption analysis (Urden *et al.*, 2010:131).

About 68% (n = 48) of the respondents in this study felt that facilitation of maintenance of nutritional support falls within the practising scope of doctors and dietitians. With 3% (n = 2) of the respondents being neutral, this left about 29% (n = 20) who disagreed or strongly disagreed that nutritional support maintenance is in the practising scope of doctors and dietitians. This means that, out of the seventy respondents, not even a single one associated the facilitation of maintenance of nutritional support with their scope of practice. A conclusion can then be drawn that the registered nurses in selected critical care units and hospitals are not aware of their role as far as nutritional support is concerned. Looking at the interpretation of the results, a dire need for nutritional education prioritisation among nurses has been identified. If left unattended, this knowledge deficit can lead to inadequate provision of nutritional support in hospitalised critically ill patients.

#### **5.2.1.5 Monitoring of tolerance of nutritional support**

Evaluating the effects of nutritional support on clinical outcomes requires a multidisciplinary approach. However, as a member of the team, the nurse who has the most constant contact with the patient is uniquely qualified to evaluate feeding tolerance and adequacy of delivery (Urden *et al.*, 2010:131). It is recommended that critically ill patients who experience feed intolerance (high gastric residuals, emesis) should be managed as follows: 1) a chest X-ray (CXR) is required to check and confirm the position of the nasogastric tube; 2) an abdominal X-ray (AXR) should be taken to check whether the patient is developing ileus; 3) the administration rate of the feeding solution might be reduced; and 4) the use of agents to promote motility, such as prokinetic drugs (metoclopramide and erythromycin) or narcotic antagonists (naloxone and alvimopan), should be initiated where clinically feasible (MacDougall, 2010:158).

In this study, about 60% (n = 42) of nurses in the sample agreed that there is a standard protocol for monitoring patient tolerance to nutritional support in their units, while 54.4% (n = 38) agreed that the protocols clearly state the procedures to be followed in monitoring tolerance. About 55.2% (n = 39) felt that management of intolerances is also stated in the available protocol. The majority felt that the X-rays are of value in monitoring nutritional adequacy and tolerance and 67.2% (n = 47) agreed

that blood glucose levels can be used as an indicator of a patient's carbohydrate intolerance. The interpretation is that the nurses in the study agreed with most of the items recommended for monitoring of tolerance. The only area of disagreement with the current recommendations was in the normal gastric residual volume (GRV), which is of some concern, because feed absorption is determined by the gastric residual volume (Prins, 2010:14).

#### **5.2.1.6 Nutritional support adequacy assessment**

The scores obtained on the questions about nutritional support adequacy assessment, were as follows: 74.6% (n = 52) of the respondents believe that bloods for urea, creatinine and electrolytes are useful in determining adequacy of nutritional support. About 68.2% (n = 48) believe in physical examination as a useful tool in assessing nutritional adequacy, especially in critically ill patients, whilst 31.8% (n = 22) believe that physical examination is an ineffective way of assessing nutritional adequacy. About 57% (n = 40) believe that intake and output records may be useful in assessing adequacy and 43% (n = 30) of them felt that these records are not meant for assessing nutritional support adequacy, but for assessing delivery of fluids and electrolytes.

Based on the above, it can be said that the respondents generally agreed that bloods for urea, creatinine, electrolytes and physical examination are possible ways in which nutritional support adequacy can be assessed. However, they are not sure about the effectiveness of intake and output records for assessing adequacy of nutritional support.

#### **5.2.2 To identify and describe possible gaps in the practice (provision of nutritional support)**

Despite the importance of availability of nutritional protocols, close to 63% (n = 44) of the nurses working in the critical care units were either not sure about the availability of the protocol or clearly attested to its non-availability. This, then, should be an issue of concern because the protocol is meant to be standard document with which all members of the ICU should be familiar. It is meant to guide and facilitate their work in the unit. Some nurses (67.7%, n = 47) felt that nutritional support provision is effective if one is creative enough to use one's discretion/methods. This suggests that, although standard protocols may say one thing, nurses should be able to adapt protocol

guidelines to each situation as best as possible to the benefit of the patient. Education and in-service on nutritional support in the critical care units should not end with the initial orientation of new nurses, but should be viewed as an on-going process to ensure complete understanding of the operations of the critical care unit (Tempest, 2011:30). The author further states that nurses' knowledge of nutritional support enables them to practice independently with regard to nutritional support and not to follow the protocols rigidly.

About 68% (n = 48) of the respondents felt that facilitation of maintenance of nutritional support is in the practising scope of doctors and dieticians. These results are not in favour of the statements and recommendations made by some authors. An example is Urden *et al.* (2010:131) who declare that "Critical care nurses are expected to calculate caloric requirements and analyse daily caloric delivery, advocate for early nutritional support, and minimise feeding interruptions through careful patient and interruption analysis". Urden *et al.* (2010:108) further add that critical care nurses are responsible for providing patients with energy-yielding nutrients like carbohydrates, proteins and fats. These supplements play a key role in the delivery of nutritional support and in critically ill patients.

One other aspect which emerged from the results was that about half of the respondents were of the opinion that the normal residual gastric volume is 100 ml and only 10.6% (n = 7) felt it was 200 ml, with the rest putting it up to 500 ml. Current evidence shows high GRV ranges from 150 to 500 mL of an aspirate, but a single elevated GRV requires no action, only on-going monitoring (Makic *et al.*, 2013:1). On the other hand, Kreymann (2010:1) suggests that inappropriate cessation of EN should be avoided. Holding EN for gastric residual volumes < 500 mL in the absence of other signs of intolerance is not necessary. Reduction of the feed rate or cessation of the feed is believed to deprive patients of nutritional intake, thereby exposing them to the risk of malnutrition. The concern is that, if more than half of the nurses think that a GRV of 200 to 500 millilitres is high, patients are at a risk of being underfed.

Some nurses are not sure about the effectiveness of intake and output records for assessing adequacy of nutritional support. This raises a concern because Prins (2010:14) consider careful interpretation of intake and output charts together with

physical examination as one of the assessment tools that can be used in order to make a nutritional diagnosis. Urden *et al.* (2010:131) add that careful patient assessment and feed interruption analysis are the responsibilities of a critical care nurse and that they 'must' work closely with dietitians and physicians in promoting the best possible outcomes for their patients. They must have a broad understanding of nutrition support, including the indications, prevention and management of associated complications.

### **5.2.3 To describe the identified relationship between the practice (provision of nutritional support) and the demographic characteristics of the population**

Various tests were conducted within each type of hospital in this study, in order to delineate the relationships between the demographic characteristics of the population and provision of nutritional support, and some correlations were found to be significant. Within the private hospitals specifically, knowledge about timing of initiation of nutritional support was found negatively associated with age ( $r = -0.53$ ,  $p = 0.0033$ ); nursing experience ( $r = -0.69$ ,  $p = 0.0023$ ); and critical care experience ( $r = -0.60$ ,  $p = 0.0096$ ), while knowledge about importance was not. This means that the older and more experienced nurses are associated with lower knowledge about timing of initiating nutritional support. However, knowledge of when to start nutrition during critical illness is as important as knowledge of the importance of nutritional support. Critical care nurses should have full understanding of nutritional support in order to achieve goals of nursing management (Urden *et al.*, 2010:131).

Knowledge of timing of initiating nutrition was found to be significantly higher among the nurses not trained in critical care ( $t = 2.92$ ,  $p = 0.008$ ). Again, the assumption is that non-trained nurses do not really have adequate knowledge of the importance of nutritional support like trained critical care nurses. Critical care nurses are required to have adequate knowledge on all aspects of nutritional support in the critically ill as they are expected to calculate caloric requirements and analyse daily caloric delivery, advocate for early nutritional support, and minimise feeding interruptions through careful patient and interruption analysis (Urden *et al.*, 2010:131). MacDougall (2010:157) affirms that the provision of enteral nutrition to critically ill patients early upon admission to the intensive care unit (within 24 to 48 hours of resuscitation) exerts

beneficial physiological effects such as down-regulated systemic immune responses, reduced oxidative stress and improved patient outcomes in terms of mortality and infectious complications.

In a nutshell, private hospital nurses showed more knowledge of the importance of nutritional support than timing of initiating it and non-trained nurses and students revealed more knowledge regarding its timing than regarding importance.

### 5.3 IMPLICATIONS FOR PRACTICE

Previous studies and Myra Levine's conservation theory highlight the importance of nutrition, especially during critical illness. Multi-factorial challenges such as surgical interventions, nursing interventions and certain drugs that interfere with absorption should be considered by nursing professionals when designing nutritional protocols that are specific to each unit. Guided by conservation theory and previous theory, the study makes the following suggestions for practice:

Nutritional protocols should be designed in such a way that they make provision to avoid delays and interruptions of nutritional support. Steps should be taken to address issues like surgical interventions as the reason for delays in nutritional support, as evidenced by the score of 53% ( $n = 37$ ) in agreement with this as a reason for delays. Fifty percent ( $n = 35$ ) of the respondents agreed that early enteral feed in patients on inotropic support should not be a problem meanwhile early enteral feed is contraindicated in hypotensive patients on inotropic support as suggested by various authors in the reviewed literature. In such cases perfusion is directed to vital organs and areas like the gut are bypassed. Administering enteral feed into the poorly perfused bowel can lead to poor absorption, vomiting and aspiration, as well as development of ileus (Urden *et al.*, 2010:123). Another issue that needs to be addressed is the issue of abdominal trauma as another reason for nutritional delay. In this case, nurses have a duty to advocate for other routes of nutritional support as required by their scope of practice. The study suggests that parenteral nutritional support should be initiated in patients whose nutritional needs cannot be met by the enteral route within two day of

admission to a critical care unit. MacDougall (2012:157) suggests that early nutritional support improves the clinical outcomes of the critically ill.

About 75.3% (n = 53) of the nurses felt that continuous enteral feeds should not be interrupted by basic nursing interventions, while about 9% (n = 6) did not know whether nursing interventions should interrupt enteral feeds. Basic nursing interventions include bed baths, pressure parts care, catheter care and assisting physiotherapists and radiographers in positioning patients. Most of these procedures require lowering of the head of the patient's bed, in which cases the continuous enteral feed should be temporarily stopped to prevent aspiration. In as much as the holding of the continuous enteral feeds reduces the risk of aspiration, frequent interruptions may result in patients' nutritional needs not being met. Tempest (2011:30) affirms that inappropriate cessation of enteral feeds may adversely affect outcome through reduced volume of EN infused. It is therefore recommended that nurses are always cautious around this issue.

Some of the respondents, about 67.7% (n = 47) agreed that nutritional support provision can be effective if one is creative enough to use one's own discretion/methods. It is reasoned that a different ideology can make it difficult to monitor and evaluate nutritional goals. Not having a feeding protocol can handicap an ICU in terms of feeding patients adequately, as not every nurse is proactive enough regarding advocating for initiation of nutritional support (Tempest, 2011:30). It is therefore recommended that standard guidelines be set in terms of procedures, choices of routes and quality of feed, as well as monitoring and evaluation of nutritional support.

Again, more than half of the respondents believe that enteral feeding presents more complications than parenteral feeding. Previous studies have shown that parenteral nutrition poses more dangers than enteral. Pathogens gaining entry via intravenous routes are directed straight in the bloodstream, unlike those entering through the gut. Micro-organisms entering the body via the latter route can be less significant as the gut is colonised with protective bugs (normal flora). Intravenous lines for parenteral feeds

therefore need to be inserted and maintained under sterile circumstances to prevent blood borne infections (Urden *et al.*, 2010:120).

The findings of this study are similar to those of other studies undertaken around the world which suggest that knowledge deficits specific to nutritional therapy exist among nurses in critical care units. Based on these results, strategies to increase knowledge in nutritional therapy are imperative and must be included as part of in-service training programmes to emphasise short-, medium- and long-term benefits.

## 5.4 LIMITATIONS OF THE STUDY

Most of the questions in the questionnaire were based on reviewed literature rather than on registered nurses' own views about the subject under study. A qualitative research approach in the form of interviews could provide profound perspectives from registered nurses with regard to their knowledge about and the role they play in the provision of nutritional support in hospitalised critically ill patients. A number of grey areas could have been clarified through qualitative interviews, especially in the areas of monitoring of tolerance and challenges faced in the provision of nutritional support. The time constraints on the side of the researcher and the environment in the critical care units affected the response rate to the study as the researcher, for instance, would sometimes find the nurses resuscitating a patient and being unable to attend to the questionnaire.

## 5.5 RECOMMENDATIONS FOR IMPLEMENTATION

This study makes the following recommendations which might help to bridge the gaps in the provision of nutritional support in critically ill patients:

### 5.5.1 Recommendations for practice

It sometimes happens that patients succumb to hospital-acquired malnutrition in the general wards; their conditions become complicated, leading to transfer to critical care units. The latter constitutes the central motive for this recommendation. Critical care nurses therefore, need to critically analyse the provision of nutritional support and identify challenges to nutritional strategies or reasons for delays or interruptions that are specific to a clinical area. Identification and description of the reasons for

challenges to nutritional strategies could lead to discovery of strategies to counter the challenges.

Collaboration as members of the multidisciplinary team in nutrition-related clinical practice, education, and research is recommended. This could assist in the clarification of roles played by the different members of the multidisciplinary team in the provision of nutritional support. Such collaboration can enable nurses to recognise that early initiated and uninterrupted nutritional support is associated with a decrease in morbidity and mortality and to prioritise it accordingly. This could ensure compliance with three in the six fast-track areas of The National Core Standards for South African Establishments (2011:15), namely, patient safety, waiting times and infection prevention. Patient safety and reduction of waiting times could be ensured by early provision and sustenance of adequate nutritional support to prevent complications during hospitalisations. Benefits of nutritional support, confirmed by previous literature, include maintenance and improvement of the patients' immunological status, thus preventing and controlling infection. The result could be the improvement in health care as well as a considerable relief in the financial burden associated with the hospitalisation of the critically ill in both public and private hospitals.

#### **5.5.2 Recommendations regarding feeding protocols**

Efforts to disseminate nutritional guidelines in the clinical areas can facilitate the formulation and implementation nurse-initiated protocols tailored from the broad guidelines. These guidelines should be aligned with the local context and ways of practicing in the two different health sectors. They should not be contained in the ICUs but made popular to all nurses in an institution. There should protocols for monitoring of tolerance and evaluation of adequacy of nutritional support in each and every critical care unit, which should be readily available and understandable to all nurses.

#### **5.5.2 Recommendations for education**

In general, in-service and education are the key in the management of nutritional support as recommended by Tempest (2011:30).

Recommendations for education in this study are discussed under the following headings:

#### **5.5.2.1 Education for providers**

Inter-hospital workshops in co-operation with the local nursing colleges, both public and private, can make a huge contribution to solving the problem. Nutritional support should be prioritised as a key component of the curriculum in academic programmes that specialise in critical care nursing. Critical illness brings about a catabolic state in the critically ill, which, if not managed by timeous and uninterrupted provision of nutritional support, can result in increased complications.

Integration of nutrition-specific education into student nursing programmes and as an integral part of on-going continuing education should be considered. The positive effects of this could be closure or absence of knowledge gaps with regard to nutritional support as an important part of nursing management.

#### **5.5.2.2 Education for patients**

Co-ordination of patient education programmes on the importance of nutritional support as illness management intervention, as well as illness prevention measure is recommended. Empowerment of patients and their relatives with knowledge about the role played by nutrition during critical illness could promote cooperation and active involvement in the nursing management of the patients. The outcome could be speedy recovery and resultant reduction in the cost of hospitalisation.

#### **5.5.4 Recommendations for further research**

Of interest could be more in-depth research on the effective and safe use of nurse-developed nutritional protocols that are in line with the provincial, national and international nutritional guidelines. An investigation of the reasons for challenges or barriers in the provision of nutritional support by registered nurses also needs to be looked at. The effects of nutritional supplements and immune-modulating formulas during illness should be further investigated, as evidence shows that the area has not been adequately researched.

## 5.6 SUMMARY

In summary, the individual objectives of the study were addressed by the results of data analysis. The provision of nutritional support in critically ill patients by registered nurses in East London public and private hospitals has been explored. The results show that nurses generally are aware of the importance of nutritional support. Nevertheless, differences influenced by demographics have been identified in the knowledge scores and have been described. Private hospital nurses' knowledge of the importance of nutritional support differs from that of public hospital nurses and students, whilst students revealed greater knowledge concerning the timing of initiating the support.

Varying levels of understanding of nutritional support on the part of critical care nurses have been demonstrated. The older and more experienced nurses working in private hospitals were shown to have less knowledge regarding the timing of initiation of nutritional support. The opposite was demonstrated in public hospital nurses. Private hospital nurses have more knowledge of the importance of nutritional support than their public hospital counterparts and students. Critical care students and nurses not trained in critical care have more knowledge about timing of initiation of nutritional support than of its importance.

A need has been identified for registered nurses to engage and empower themselves to be effective agents of change as they strive to optimise the nutrition received by critically ill patients. The identified knowledge deficits highlight the importance of ensuring integration of nutrition-specific education into student nursing programmes and as an integral part of ongoing continuing education, particularly because nurses have considered nutrition to be a low-priority topic. The study has shown that strategies to increase knowledge in nutritional therapy are imperative and must be included as part of in-service training programmes to emphasise short-, medium- and long-term benefits in the clinical areas.

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## ANNEXURE A: QUESTIONNAIRE

### INVESTIGATING THE PROVISION OF NUTRITIONAL SUPPORT IN CRITICALLY ILL HOSPITALISED PATIENTS BY REGISTERED NURSES

The attached questionnaire forms part of a research project on the provision of nutritional support in hospitalised critically ill patients by registered nurses. You are not requested to furnish your name; you are requested to answer all the questions as honestly and as accurately as you can. There is no right or wrong answer. Indicate as required the response that best reflect your views about the research topic in your institution.

#### SECTION A

Demographic data:

Site code: -----

Age : -----years

Gender : male----- female -----

Are you critical care trained? -----

Years of experience in nursing: -----

Years in critical care nursing: -----

Indicate with a tick your type of unit experience:

<input type="checkbox"/> Surgical	<input type="checkbox"/> Medical	<input type="checkbox"/> Neuro	<input type="checkbox"/> Cardiac	<input type="checkbox"/> General
-----------------------------------	----------------------------------	--------------------------------	----------------------------------	----------------------------------

Indicate with a tick your type of patient experience:

<input type="checkbox"/> Adult	<input type="checkbox"/> Paediatric	<input type="checkbox"/> Neonatal
--------------------------------	-------------------------------------	-----------------------------------

#### SECTION B

##### **B1. IMPORTANCE OF NUTRITION IN CRITICAL ILLNESS**

##### INSTRUCTIONS

Indicate your opinions regarding the importance of nutritional support in critically ill patients by ticking in the relevant box.

1. Is nutritional support important in critically ill patients, especially in the first week of admission?

☐ Yes ☐ No

2. Can one bother to take nutritional history from a trauma patient on admission in a critical care unit?

☐ Yes ☐ No

3. Does nutritional status of a patient have anything to do with stress during acute critical illness?

Yes No

4. Can a registered nurse be held responsible if there is no nutritional protocol in the unit?

Yes No

5. Can nutritional support influence the patient's period of stay in a critical care unit?

Yes No

## **B2.TIMING OF INITIATING NUTRITIONAL SUPPORT**

Please choose the correct answer by ticking in the appropriate box

1. Nutritional support should be started the earliest within

12-24 HOURS
24-72 HOURS
72-120 HOURS

following admission to the critical care unit

2. In some instances delayed nutritional support benefits patients

True False

3. The time of commencing nutritional support provision depends on the patient's condition

True False

4. Timing of initiation of nutritional support is not really important in critical care units, the focus is mainly on life support

True False

5. Critically ill patients should not be fed until they are haemodynamically stable

True False

6. Delayed nutritional support can result in electrolyte imbalance and confusion

True False

7. Early enteral nutrition in patients on inotropic support is not usually recommended

True False

### B3.PROTOCOLS, ROUTES, QUANTITY & QUALITY AND CHOICE

For each of the following statements, kindly indicate what your views are by rating your response as per scale provided. Mark with a tick in the box appropriate to your response. 1 = strongly disagree, 2 = disagree, 3 neutral, 4= agree, 5= strongly agree

Section and item	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Rate/point	1	2	3	4	5
1.A standard nutritional protocol is readily available in the unit					
2.Facilitation of maintenance of nutritional support is in the practising scope of doctors and dieticians					
3. We use a universal type of parenteral formula for all patients in ICU					
4. Only pre-packed enteral formulas are used in ICU					
5. Pre-packed oral supplementary formulas are also available					
6. Enteral nutritional formulas are mostly prepared in the hospital					
7. Patient's weight is the only determinant of the quantity of nutritional requirement					
8. Preadmission nutritional status determines the type of patient's nutrition					
9. Preadmission nutritional status determines the amount of feed					
10. Preadmission dietary habits determine the type of feed					
11. Patient's diagnosis has nothing to do with the route of nutritional support therapy					
12. Patient's diagnosis is the only determinant of the type of feed in all ages.					
13. The prescribed volume					

of feed is given as boluses					
14. We use a variety of immune modulating formulas					
<b>B4.CHALLENGES IN NUTRITIONAL SUPPORT</b>					
1.Surgical interventions are a reason for delayed and interrupted nutritional support					
2. Early enteral feed in patients on inotropic support should is seen as a challenge					
3. Abdominal trauma should not be a reason for delayed nutritional support					
4.Continuous enteral feeds are frequently interrupted by basic nursing interventions					
5.Some of the multidisciplinary team members do not see nutritional support as crucial					
6.Scarcity of feed pumps is the reason for inadequate delivery of nutrition					
7.Inavailability of nutritional protocols is not a problem in providing nutritional support					
8. Provision of nutritional support can be more effective if one uses own methods/discretion					
9.Patients' differences in age can impact on the provision of nutritional support					
10.Enteral feeding has more complications than parenteral nutrition					
11. That patients' different diagnoses guide the provision of nutritional support					

## **B5. MONITORING OF NUTRITION TOLERANCE**

Read the following list of statements regarding the monitoring nutrition tolerance, and give your views about each. Indicate your views by putting an x or a tick in the boxes. x = Disagree, tick = Agree.

1. There is a standard protocol to monitor the tolerance to nutritional support ☐
2. The procedure to be followed regarding monitoring nutrition tolerance is stated clearly in the protocol ☐
3. There is no standing protocol for management of nutritional intolerances in the unit ☐
4. Chest and abdominal x-rays have little or no value in the monitoring of adequacy delivery of nutritional support ☐
5. The normal residual gastric volume is 200-500 milliliters ☐
6. Gastric aspirations are done 2 hourly in the first six hours of feeding to determine intolerance to the formula used ☐
7. Tolerance to the volume administered is checked by aspiration of gastric contents only when large volumes are administered ☐
8. Blood glucose levels may be an indicator for patients' carbohydrate intolerance ☐

## **B6. EVALUATION OF ADEQUACY OF NUTRITIONAL SUPPORT**

Please indicate your views by choosing the relevant response from those listed below

1. Bloods for urea, creatinine and electrolytes do assist in determining adequacy of nutritional support
  - a. Strongly disagree
  - b. Disagree
  - c. Agree
  - d. Strongly agree
2. Intake and output records are not meant to indicate adequacy in the provision of nutritional support but assess delivery of fluids and electrolytes
  - a. Strongly disagree
  - b. Disagree
  - c. Agree
  - d. Strongly agree

3. Physical examination cannot assist in assessing adequacy of nutritional support especially in critically ill patients
    - a. Strongly disagree
    - b. Disagree
    - c. Agree
    - d. Strongly agree
- 

Thank you for your participation in this study.

## ANNEXURE B: INFORMED CONSENT



University of Fort Hare  
*Together in Excellence*

### Ethics Research Confidentiality and Informed Consent Form

**Please note:**

**This form is to be completed by the researcher(s) as well as by the participant before the commencement of the research. Copies of the signed form must be filed and kept on record**

Our university is asking you to answer some questions, which we hope will benefit your institution and possibly other institutions in the future.

The researcher is conducting research regarding the provision of nutritional support by registered nurses in hospitalised critically ill patients. We are interested in finding out more about gaps that may be there. We are carrying out this research to help identify these gaps which might help improve clinical practice.

Please understand that you are not being forced to take part in this study and the choice whether to participate or not is yours alone. However, we would really appreciate it if you do share your thoughts with us. If you choose not take part in answering these questions, you will not be affected in any way. If you agree to participate, you may stop at any time and tell me that you don't want to go on completing the questionnaire. If you do this there will also be no penalties and you will NOT be prejudiced in ANY way. Confidentiality will be observed professionally.

I will not be recording your name anywhere on the questionnaire and no one will be able to link you to the answers you give. Only the researchers will have access to the unlinked information. The information will remain confidential and there will be no "come-backs" from the answers you give.

The questionnaire will take about fifteen (15) to thirty (30) minutes to complete (*this measurement instrument has been pretested*). I ask that you are as open and honest as possible in answering the questions. Some questions may be of a personal and/or sensitive nature. I will be asking some questions that you may not have thought about before, and which also involve thinking about the past or the future. We know that you cannot be absolutely certain about the answers to these questions but we ask that you try to think about these questions. When it comes to answering questions there are no right and wrong answers. When a question asks about the future we are not interested in what you think or

the best thing would be to do, but what you think would actually happen. If possible, the university would like to come back to this institution once we have completed our study to inform you and your institution of what the results are and discuss our findings and proposals around the research and what this means for people in this institution.

### **INFORMED CONSENT**

I hereby agree to participate in research regarding the provision of nutritional support in hospitalised critically ill patients. I understand that I am participating freely and without being forced in any way to do so. I also understand that I can stop completing this questionnaire at any point should I not want to continue and that this decision will not in any way affect me negatively.

I understand that this is a research project whose purpose is not necessarily to benefit me personally.

I have received the telephone number of a person to contact should I need to speak about any issues which may arise in this questionnaire.

I understand that this consent form will not be linked to the questionnaire, and that my answers will remain confidential.

I understand that if at all possible, feedback will be given to my institution on the results of the completed research.

.....

**Signature of participant**

.....

**Date**

I hereby agree to participate in the study.

.....

**Signature of participant**

.....

**Date**

## ANNEXURE C: ETHICAL CLEARANCE CERTIFICATE



University of Fort Hare  
*Together in Excellence*

### ETHICAL CLEARANCE CERTIFICATE

Certificate Reference Number: MBA01 1SMOI01

Project title: **Investigation the provision of nutritional support in hospitalised critically ill patients by registered in East London hospitals in the Eastern Cape.**

Nature of Project: Masters

Principal Researcher: Nomaxabiso Mildred Mooi

Supervisor: Mrs Adelia N Mbatha

Co-supervisor:

On behalf of the University of Fort Hare's Research Ethics Committee (UREC) I hereby give ethical approval in respect of the undertakings contained in the above-mentioned project and research instrument(s). Should any other instruments be used, these require separate authorization. The Researcher may therefore commence with the research as from the date of this certificate, using the reference number indicated above.

Please note that the UREC must be informed immediately of

- Any material change in the conditions or undertakings mentioned in the document
- Any material breaches of ethical undertakings or events that impact upon the ethical conduct of the research

The Principal Researcher must report to the UREC in the prescribed format, where The UREC retains the right to

- Withdraw or amend this Ethical Clearance Certificate if
  - Any unethical principal or practices are revealed or suspected
  - Relevant information has been withheld or misrepresented
  - Regulatory changes of whatsoever nature so require
  - The conditions contained in the Certificate have not been adhered to
- Request access to any information or data at any time during the course or after completion of the project.

The Ethics Committee wished you well in your research.  
Yours sincerely

A handwritten signature in dark ink, appearing to read 'Gideon de Wet'. The signature is fluid and cursive, with a large initial 'G' and 'd'.

**Professor Gideon de Wet**  
**Dean of Research**  
22 July 2013

## ANNEXURE D: PERMISSION FROM THE EASTERN CAPE DEPARTMENT OF HEALTH



### Eastern Cape Department of Health

Enquiries: Zonwabele Merile

Tel No: 040 608 0830

Date: 23<sup>rd</sup> August 2013

Fax No: 043 642 1409

e-mail address: zonwabele.merile@impilo.ecprov.gov.za

Dear Ms N Mooi

**Re: Investigation of the provision of nutritional support in hospitalized critically ill patients by registered in East London hospitals in the Eastern Cape**

The Department of Health would like to inform you that your application for conducting a research on the abovementioned topic has been approved based on the following conditions:

1. During your study, you will follow the submitted protocol with ethical approval and can only deviate from it after having a written approval from the Department of Health in writing.
2. You are advised to ensure, observe and respect the rights and culture of your research participants and maintain confidentiality of their identities and shall remove or not collect any information which can be used to link the participants.
3. The Department of Health expects you to provide a progress on your study every 3 months (from date you received this letter) in writing.
4. At the end of your study, you will be expected to send a full written report with your findings and implementable recommendations to the Epidemiological Research & Surveillance Management. You may be invited to the department to come and present your research findings with your implementable recommendations.
5. Your results on the Eastern Cape will not be presented anywhere unless you have shared them with the Department of Health as indicated above.

Your compliance in this regard will be highly appreciated.

**DEPUTY DIRECTOR: EPIDEMIOLOGICAL RESEARCH & SURVEILLANCE MANAGEMENT**



*Isimiso Mthembu*

## ANNEXURE E: CONFIRMATION LETTER FROM THE UNIVERSITY OF FORT HARE

**SCHOOL OF HEALTH SCIENCES  
UNIVERSITY OF FORT HARE**

P.O. Box 1054  
East London 5200  
Tel: +27 (043) 7047593 | Fax: 0866282007



September 17, 2013

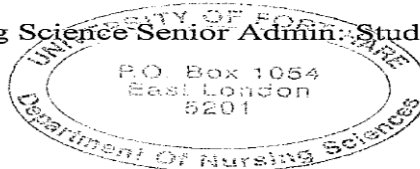
TO WHOM IT MAY CONCERN

This letter serves to confirm that Ms Mooi, student number 201204819 is a registered student of the university of Fort Hare, pursuing a degree in Masters of Curationis: Medical –surgical Nursing.

She has been granted an ethical clearance permission by the university to conduct research entitled: An investigation of the predicted gaps in the provision of nutritional support to critically ill patients at public and private institutions in the Eastern Cape, South Africa.

I hope this explanation will be sufficient. Please do not hesitate to contact me if there are any more questions.

  
MRS. A OKEYO (Nursing Science Senior Admin: Student Affairs)



## ANNEXURE F: LETTER OF APPROVAL FROM THE EAST LONDON HOSPITAL COMPLEX RESEARCH ETHICS COMMITTEE

### ***Ethics Committee: E. L HOSPITAL COMPLEX***

**Postal Address :**

C/o East London Health Resource Centre  
PO Box 12882  
Amalinda  
5252

**Telephone :** 043 –709 2032

**Physical Address :**

Cheltenham Road  
East London  
5201 South Africa

**Fax no.:** 043 – 7092386

27<sup>th</sup> September 2013

Nomaxabiso Mildred Mooi  
East London Hospital Complex  
Amalinda  
East London  
5200

Dear

**RE:Investigation the provision of nutritional support in hospitalized critically  
patients by registered in East London Hospital in the Eastern Cape**

We acknowledge receipt of the above mentioned proposal.

Having gone through your proposal, the committee has no ethical problems noted.

Please be advised that the committee has granted you the consent to do the research.

Yours sincerely



**Dr P Alexander – Chairman Region C Ethics Committee  
Ophthalmologist EL Hospital Complex**

## ANNEXURE G: PERMISSION FROM FRERE HOSPITAL



**EAST LONDON HOSPITAL COMPLEX**  
Frere Hospital, Amalinda, Private Bag/Ingxowa Eyodwa X 9047, East London, 5200  
South Africa • Tel: (043) 709 2135 • Fax: (043) 709 2443 • Website: [www.ecdoh.gov.za](http://www.ecdoh.gov.za)

### INTERNAL MEMORANDUM

To:	Ms. N. Mooi; Nursing Student, UFH
From:	Dr. J. Thomas; Acting Director Clinical Governance, ELHC
CC:	Mrs. J. Scholl; Acting Hospital Manager, Frere Hospital Mrs. T. Mguli; Deputy Director Nursing services, Frere
Subject:	Nutritional Support in Hospitalized Critically ill Patients at Public Institutions
Date:	1 October 2013

Your correspondence of 17 September 2013 refers. Your request to access Frere Hospital has been approved.

It is requested that a copy of the completed analysis be submitted to this office for record purposes.

You can liaise with the following persons to coordinate the research:

1. Mrs. T. Mguli, Tel: (043) 709 2781

Regards,

Dr. J. Thomas  
Acting Clinical Governance Director: ELHC  
Nmp/cjr

United in achieving quality health care for all

24 hour call centre: 0800 0323 64  
Website: [www.ecdoh.gov.za](http://www.ecdoh.gov.za)



*Ikamva eliqagambileyo!*

## ANNEXURE H: PERMISSION FROM CECILIA MAKIWANE HOSPITAL



Province of the  
**EASTERN CAPE**  
HEALTH

Cecilia Makiwane Hospital • East London Hospital Complex • East London  
Private Bag X 9047 • East London • 5200 • South Africa  
Tel: 043 708 2135 • Fax: 043 760 2252 • e-Mail: [siphokazi.peter@impilo.ecprov.gov.za](mailto:siphokazi.peter@impilo.ecprov.gov.za)

**TO: MS MOOI**

**FROM: DR GALO: MANAGER – MEDICAL SERVICES**

**SUBJECT: RE: REQUEST TO CONDUCT RESEARCH ON INVESTIGATION  
THE PROVISION OF NUTRITIONAL SUPPORT IN HOSPITALISED  
CRITICALLY ILL PATIENTS BY REGISTERED IN EAST LONDON  
HOSPITALS IN THE EASTERN CAPE.**


**DATE: 18 NOVEMBER 2013**

Dear Ms Mooi

Permission to conduct research is granted for findings to be concluded.

Please ensure that adequate information is attached to study participants as well as ensuring confidentiality. You are requested to liaise with the Nursing Services Manager after submitting the Indemnity form.

Regards

  
**DR L. GALO**  
DATE 18/11/13  
**MANAGER: MEDICAL SERVICES**  
**CECILIA MAKIWANE HOSPITAL**  
**EAST LONDON HOSPITAL COMPLEX**

**MEDICAL SUPERINTENDENT**  
**CECILIA MAKIWANE HOSPITAL**  
PRIVATE BAG X 9047 EAST LONDON 5200  
**DR LUNTU GALO**

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Website: [www.ecdoh.gov.za](http://www.ecdoh.gov.za)



*Ikamva elizaqambileyo!*

# ANNEXURE I: APPROVAL FROM LIFE HEALTHCARE RESEARCH COMMITTEE



Life Healthcare Head Office  
Oxford Manor, 21 Chaplin Road, Illovo 2196  
Private Bag X13, Northlands 2116, South Africa  
Telephone: +27 11 219 9000  
Telefax: +27 11 219 9001  
[www.lifehealthcare.co.za](http://www.lifehealthcare.co.za)

Life Healthcare group (Pty) LTD is registered as a  
Private Higher Education College with the DHET  
Registration number: 2008/HEO7/003

02 October 2013

ATTENTION: NM Mooi

## APPROVAL FOR RESEARCH STUDY

**TITLE:** Investigation into the provision of nutritional support in hospitalised critically ill patients by registered nurses in East London hospitals in the Eastern Cape.

Our previous correspondence refers.

The Research Committee of Life Healthcare has granted permission for your study.

We look forward to seeing the results of your research once it is completed.

Yours sincerely

A handwritten signature in black ink, appearing to read "Anne Roodt".

**Anne Roodt**  
Nursing Education Specialist



## ANNEXURE J: EDITING CERTIFICATE

LANGUAGE PRACTITIONER

91 BRANDWACHT STREET, STELLENBOSCH 7600

TELEPHONE / FAX 021 886 4541

E-mail: hestermh@netactive.co.za

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To whom it may concern:

I hereby confirm that I have edited the Dissertation by

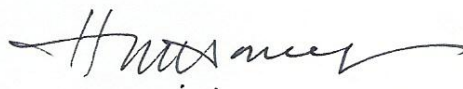
**N.M. MOOI**

**(STUDENT NUMBER: 201204819)**

titled

**INVESTIGATING THE PROVISION OF NUTRITIONAL SUPPORT TO CRITICALLY ILL HOSPITALISED  
PATIENTS BY REGISTERED NURSES IN EAST LONDON PUBLIC AND PRIVATE HOSPITALS IN THE  
EASTERN CAPE**

(submitted in partial fulfilment of the requirements for the Master's degree in Nursing (Medical-Surgical) in the Department of Nursing Sciences at the University of Fort Hare) and have made suggestions regarding language use and technical care to be implemented by the candidate.



H M Honey

(28/01/2014)



