

**KNOWLEDGE ATTITUDES AND PRACTICES REGARDING  
PHYSIOTHERAPY MANAGEMENT OF PATIENTS  
ADMITTED TO INTENSIVE CARE UNITS IN KHARTOUM  
STATE**

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## **KEYWORDS**

Intensive Care Unit (ICU)

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Attitude

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Health Care Professionals (HCPs)

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## **ABSTRACT**

*Background:* The Physiotherapist is an important member of the multidisciplinary team managing critically ill patients in the ICU. Physiotherapy practice in the ICU has shown itself to be effective, whereas the lack of physiotherapy management in the care of critically ill patients may prolong recovery. Therefore, the knowledge and attitudes about physiotherapy management by the other Health Care Professionals of the team is essential in order to facilitate efficient and effective medical services. This study aimed to determine other Health Care Professionals' knowledge, attitudes regarding physiotherapy management in the ICU. As well as, it determined the current physiotherapy practices applied by physiotherapists in ICUs in Khartoum State – Republic of Sudan. The study was conducted due to limited studies in this field.

*Method:* The study employed a quantitative, descriptive cross-sectional design, using a survey conducted in the ICUs of 17 hospitals in Khartoum state- Sudan. The population consisted of 541 health care professionals working in ICUs. A convenient sample of all (541) was recruited from the selected hospitals to participate in the study. These participants included 24 Consultants, 150 Doctors, 233 Nurses, 56 Dieticians, 19 Medical Technicians, 40 Physiotherapists and 19 Other Allied Health Professionals. The research instruments used to collect the data included a self- developed questionnaire and checklist. The validity and reliability of the research instruments were tested. The data was analysed using SPSS Version 24. Descriptive statistical analysis was done to identify the socio-demographic characteristics, the knowledge and attitudes of participants. In addition, it identified the physiotherapy practices and equipment used in the ICU, as well as the duration and frequency of sessions. Inferential statistical analysis was done to determine associations between variables such as socio-demographic features and the knowledge and attitudes of HCPs by means of either the Kruskal Wallis or Chi – square test, depending on the nature of the categorical variable. Participation in this

study was voluntary, and all participants provided a written-informed consent form. Anonymity and confidentiality was ensured throughout the study. The participants had a right to withdraw from the study at any time without facing any negative consequences and no names appeared in the questionnaire and checklist. All survey instruments, consent forms and information sheets were available in English and Arabic in order to accommodate all participants. The survey instruments were kept in a locked cabinet and only the researcher had access to it.

*Results:* A total of 501 questionnaires and 200 checklists were analysed. The results show that 74.7% (374/501) of Health Care Professionals (HCPs) had adequate knowledge about physiotherapy management in ICU, and that 97% (486 /501) of them demonstrated a positive attitude toward physiotherapists working in the ICU. In addition, statistical tests showed a significant positive relationship between knowledge and attitudes, suggesting that those HCPs with better knowledge were more likely to have a more positive attitude.

With regard to the physiotherapy practices utilised in ICUs the study showed that manual airway clearance techniques (MACTs) which includes Percussion, Vibration, Suctioning and Postural drainage were the most frequently used techniques. Also Limb exercises, Mobilisations and Positioning were frequently used for ICU patients as part of physiotherapy rehabilitation. However, the Manual Hyperinflation practice (MH) was not applied by physiotherapists in the ICU. Some equipment was used by physiotherapists in the ICU such as Suction equipment, Spirometer and Nebulizer; while Hyperinflation Bags, Chest Support and Neuromuscular Electrical Stimulation (NES), were not used. Furthermore, the results highlighted that 1-2 treatment session per day is an ideal frequency of physiotherapy treatment sessions in the ICU, while it indicated that 24 minutes as an average duration of session.

*Conclusion:* The participants in this study had adequate knowledge and positive attitudes regarding physiotherapy management in the ICU. Chest physiotherapy and

rehabilitation were most frequent approaches used in the physiotherapy management of patients in the ICU. The study recommends further in depth clinical researches in term of the effectiveness of physiotherapy interventions on patients in the ICU. As well as investigate factors that may affect the physiotherapy service provision in the ICU in Sudan.

## **DECLARATION**

I hereby declare that “*Knowledge Attitudes and Practices Regarding Physiotherapy Management of Patients Admitted to Intensive Care Units in Khartoum State*” is my own work, it has not been submitted, or part of it, for any degree or examination in any other university, and that all resources I have used or quoted have been indicated and acknowledged by complete references.

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January, 2017

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**Professor Anthea Rhoda**

## **DEDICATION**

To my role model, the greatest influence on my life my mother, Fawzia, for her ongoing love and unfailing support.

To the loving memories of my late father, Abdalrahman, a great man who will always be a part of my life and heart.

To my sisters, Reem, Rasha and Taja, for their sincere love.

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### ***Participants***

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## **ABBREVIATIONS USED IN THE THESIS**

**ACTs:** Airway Clearances Techniques

**APTA:** American Physical Therapy Association

**CCU:** Coronary Care Unit

**CPAP:** Continuous Positive Airway Pressure

**DS:** Dressing Stations

**EBP:** Evidence Based Practice

**EM:** Early Mobilisation

**FMOH:** Federal Ministry of Health

**HCPS:** Health Care Professionals

**HDU:** High Dependency Unit

**ICC:** Intra Class Correlation

**ICU:** Intensive Care Unit

**LOS:** length of Stay

**MH:** Manual Hyperinflation

**MICU:** Medical ICU

**MOH:** Ministry of Health

**MACTs:** Manual Airway Clearances Techniques

**NCMHP:** National Council for Medical and Health Professions

**NICU:** Neonatal ICU

**NIV:** Non-invasive Ventilation

**PD:** Postural Drainage

**PEEP:** Positive End-Expiratory Pressure

**PHCU:** Primary Health Care Units

**PICU:** Paediatric ICU

**PT:** Physiotherapist

**PTA:** Physiotherapist Assistant.



**RCT:** Randomised Controlled Trial

**RTs:** Respiratory Physiotherapists

**SD:** Standard Deviation

**SICU:** Surgical ICU

**SMC:** Sudan Medical Council

**SPO:** Structure, Process, Outcome

**SPSS:** Statistical Package for Social Sciences

**VAP:** Ventilator-Associated Pneumonia

**WCPT:** World Confederation for Physical Therapy

**WHO:** World Health Organization



# **1 CHAPTER ONE: INTRODUCTION**

## **1.1 Introduction**

This chapter will focus on the background of the study. The rationale and problem statement are described, as are the research questions, aims and objectives. The definitions of terms used in study are defined, and the chapter concludes with the outline of the thesis chapters

## **1.2 Background**

Critically ill patients are defined as those with life threatening health problems who need to receive critical medical interventions and complex care (Bennett et al., 2016; Bersten & Soni, 2013). These patients are known to have serious health problems that require a high-level of support, which could be in the form of respiratory support or the support of two or more organ systems, including cardiovascular, respiratory, renal, metabolic, or cerebral function (Hough, 2001). As a result these patients are managed in specialised units called Intensive Care Units (ICUs) where they are provided with a critical level of care that includes advanced respiratory support, intensive monitoring or constant evaluation (Valentin, et al., 2011; Takroui, 2004). An Intensive Care Unit (ICU) is an isolated confined ward in the hospital where the most critically ill patients are located together and managed using specialised personnel and equipment (Leligdowicz et al., 2016). The treatment of critically ill patients in the ICU is often costly, needing expensive equipment such as advanced monitors, mechanical ventilators, defibrillators and pacemakers (Cubro et al., 2016; Abubakar et al., 2008).

The ICU is considered to be a transitional environment where patients are managed by special teams of medical personnel, including doctors, nurses, respiratory

therapists, pharmacists, physiotherapists, dieticians, occupational therapists, clinical ethicists and social workers (Valentin et al., 2011; Takrouri, 2004). The composition of the ICU team is often driven by the availability of resources as well as the pathologies of the patients in the ICU (Turner et al., 2016). The presence of this team of experts from various disciplines has been shown to improve efficiency, functional outcomes and lower the cost of care for patients hospitalised in the ICU (Brilli et al, 2001). The management of critically ill patients in the ICU is achieved through the use of a multidisciplinary approach that includes ICU supportive care, the treatment of primary critical illnesses such as infection or haemorrhage, and ICU preventive care (Rodriguez & Hern, 2001).

This approach ensures a high-quality of critical care that requires candid multidisciplinary teamwork with clear individual roles, knowledge sharing and consultation between team members (Stiller, 2000). Knowledge sharing and information dissemination among members of the medical team allows for proactive measures to be taken in decision making. It also enables shared clinical governance as well as individual and team accountability, which are considered to be significant factors influencing the quality of care provided to patients in the ICU (Marino, 2007). A fundamental aspect of the ability of a multidisciplinary team to effectively achieve specified objectives is team dynamics, which may differ according to the amount of time allocated to accomplish the objective (Brilli et al, 2001).

Although the ICU is known for the inclusion of team of medical experts, each discipline has unique and individual roles and responsibilities that facilitate efficiency and effective medical service provision (Stiller 2013). The physiotherapist is one of the team members who have a potentially important role to play in patients' recovery from critical illness (Baidya, Acharya & Coppieters, 2016; Clini & Ambrosino, 2005).

Physiotherapists constitute an important part of the multidisciplinary team within ICU and they interact closely with medical, nursing and other health care

professionals regarding the patient's condition, progression and treatment plans (Denehy and Berney, 2006). In many developed countries, including Australia and United States, physiotherapists are primary contact health care practitioners, meaning they are able to independently assess, diagnose and execute treatment plan for patients (Berney, Haines & Denehy, 2012). This is in contrast to some developing countries such as Sudan, Saudi Arabia (Al Mohammedali, O'Dwyer, & Broderick, 2016); Nepal (Baidya, Acharya & Coppieters, 2016); India (Shimpi, Writer, Shyam & Dabadghav, 2014); and the Special Administrative Region of Hong Kong - China (Jones, 2001), where physiotherapists are not first line practitioners and need a medical referral from doctors in order to assess patients and formulate treatment plans.

In the ICU the physiotherapist as a rehabilitation expert is involved in assessing, treating and managing critically ill patients who have a variety of neurological, respiratory, cardiac, medical, and surgical conditions. The aim of physiotherapy in the ICU is to enhance function, reduce the length of stay (LOS) and improve the quality of life of critically ill patients, including those receiving mechanical ventilation (Hanekom, Van Aswegen, Plani, & Patman, 2015). The primary physiotherapy interventions provided to critically ill patients are focused on physical deconditioning and associated problems. These typically include muscle weakness, joint stiffness, impaired functional exercise capacity, physical inactivity and respiratory conditions such as retained airway secretions, atelectasis and respiratory muscle weakness (Kayambu, Boots & Paratz, 2013; Gosselink, et al., 2011).

Many studies have reported on physiotherapy practices in the ICU and in most cases this is focused primarily on chest physiotherapy and rehabilitation (Kayambu, Boots & Paratz, 2013). For instance, in the United States, Hodgin et al. (2009) reported that the type of physiotherapy practice and frequency varies based on the clinical scenario of the patient and the type of hospital. In similar studies in Europe,

researchers found that common physiotherapy interventions in the ICU were respiratory therapy, mobilisation, and positioning. In addition, physiotherapists were mostly involved in mechanical ventilation by contributing to adjustment of equipment, weaning of the patient from the ventilator, extubation, and the implementation of non-invasive mechanical ventilation (Norrenberg & Vincent, 2002). In the case of developing countries such as South Africa, Lottering & Van Aswegen (2016) stated that physiotherapy practice in ICUs is evidence-based and focused on mobilisation, exercise therapy and multimodality respiratory therapy. In India, ICU physiotherapists are routinely involved in chest physiotherapy and mobilisation (Kumar, Maiya & Pereira, 2008). In Nepal physiotherapy services in the ICU are limited to weekdays, dependent on physician referrals and limited to chest physiotherapy (Baidya, Acharya & Coppieters, 2016).

Stiller (2013) conducted a review of the evidence for physiotherapy practices in the ICU, and suggested that physiotherapists engage in routine treatment of patients in the ICU by using a combination of respiratory techniques that included positioning, mobilisation, manual hyperinflation (MH), percussion, vibration, suction, coughing, and various breathing exercises. In other words, these studies highlighted the fact that those physiotherapists were applying this combination of techniques regardless of the patients' underlying pathophysiological condition, with the intention of preventing pulmonary and physical complications (Gosselink et al., 2008; Denehy & Berney, 2006). However, the use of these techniques differs considerably between units and is dependent on several factors, including the country, type of unit, availability of expertise and equipment (Kayambu, Boots & Paratz, 2013; Stiller, 2013).

Highlighting the knowledge and attitudes of health care professionals towards physiotherapy in critical settings is important due to fact that it may influence inter-professional relationships and their effect on teamwork, as well as affect patient

management in critical care setting (Gupte & Swaminathan, 2016; Kydona Ch, Malamis, Giasnetsova, Tsiora & Gritsi-Gerogianni, 2010).

The knowledge, perceptions and attitudes of every team member towards other team members may affect the delivery of patient care (Gupte & Swaminathan, 2016).

There have been few reviews carried out to investigate the knowledge and attitudes of HCPs towards physiotherapy management in ICU, whereas every professional has different perceptions of their colleagues in other fields of health care (MacDonald et al., 2010; Jones, 2001).

The aim of this study is to determine the knowledge and attitudes of health care professionals related to physiotherapy management in the ICU in Khartoum State. In addition it determines the current physiotherapy practices utilised in the ICU.

This will be considered in the context of discussing the importance of multidisciplinary teamwork in the ICU as it relates to the provision of effective rehabilitation services. In addition, the awareness of team members regarding the roles of other team members is explored.

### **1.3 Rationale**

The ICU is a very demanding multidisciplinary environment where the physiotherapist is vital member of the team (Miranda, 2012). Physiotherapists play precise and important roles that contribute to the management of long-term physical impairments that many ICU survivors experience (Yeole, Chand, Nandi, Gawali, & Adkitte, 2015). As a result, physiotherapy care is considered to be a cornerstone in the comprehensive management of critically ill patients. The early application of physiotherapeutic procedures can improve the patient's quality of life thereby preventing some of the ICU-associated complications (Kayambu, Boots & Paratz, 2013; Gosselink et al, 2008).

In Sudan, the emergence of the physiotherapy profession in recent years has seen the physiotherapists' role grow significantly. Physiotherapy is still however an underrepresented discipline, especially in the ICUs in Sudan (Rhodes, 1989; Haugland, Sørtdahl, Salih, & Salih, 2014). There is therefore an urgent need to identify the current physiotherapy practices employed by physiotherapists in the ICU, In addition to identify the knowledge and attitudes of HCPs regarding physiotherapy management of patients in the ICU. A lack of awareness or negative attitudes among HCPs regarding the role of physiotherapy will influence the referral system and negatively impact effective multidisciplinary team work (Jones, 2001; Kutty, Gebremichael & Vargehese, 2013). In this study, understanding the levels of knowledge, attitudes and practice of HCPs regarding physiotherapy management in ICU will enable a more efficient process of awareness creation among all HCPs in ICU.

#### **1.4 Problem Statement**

Sudan is a developing country with a high demand for physiotherapist, partly because of the fact that physiotherapy education is a relatively recent development (Haugland, Sørtdahl, Salih, & Salih, 2014). There is also a lack of available data or reported evidence in Sudan that can help to determine whether physiotherapy management in the ICU has value to other HCPs as well as to the patients' management in the ICU.

There are several studies have highlighted the attitudes and perceptions of medical personnel that may underlie inter-professional relationships and their effect on teamwork and associated effectiveness of management in critical care (Dalley & Sim, 2001). But although the importance of understanding each other's role is recognised, others have observed differences in role perception and role expectation.

There may also be a difference in ideology between professions which may lead to negative attitudes among HCP sub-groups, creating barriers to achieving optimal patient care (Atwal, Tattersall, Caldwell & Craik, 2006). As a result it is important to investigate the level of the knowledge and attitude among HCPs toward physiotherapy as an essential component of care in the ICU, as well as toward physiotherapists as part of the ICU team.

Due to the fact, that the level of knowledge and attitudes of HCPs will affect collaboration and communication between ICU team members, it will subsequently have an effect on the process of patient care. Furthermore, it is important to review current practices by Sudanese physiotherapists in the ICU in order to determine where they are aligned with what is recommended in the literature.

Therefore it is important to conduct a comprehensive survey on the knowledge, attitudes and practices about physiotherapy management in the ICU in Khartoum, Sudan.

### **1.5 Research Questions**

This study therefore aimed to answer the following two research questions:

- What are the knowledge and attitudes of other health care professionals regarding the physiotherapy management in the ICUs in Khartoum State?
- What are the current physiotherapy practices applied by physiotherapists in ICUs in Khartoum State?

## 1.6 Study Aims

The aims of this study were:

- To determine other HCPs knowledge and attitudes regarding physiotherapy management of critically ill patients in the ICU in Khartoum State.
- To determine the current physiotherapy practices applied by physiotherapists in ICUs in Khartoum State.

## 1.7 Specific Objectives

The objectives of this study were:

- To determine other health care professionals' knowledge with regards to physiotherapy management in the ICU.
- To determine the health care professionals' attitudes towards physiotherapists working in the ICU.
- To determine associations between variables such as socio-demographic features (gender, age, years of clinical experience, years of ICU experience), and knowledge, and attitudes of HCPs.
- To determine the current physiotherapy practices employed by physiotherapists in ICUs at Khartoum state.

## 1.8 Definition of Terms

**Intensive care unit (ICU)** - Is a specially staffed and equipped unit in the hospital dedicated to provide intensive care management and monitoring of patients with unstable and life-threatening conditions. It functions under the full medical

responsibility of the ICU team. The term ICU and critical care unit are often used interchangeably (Valentin, et al., 2011).

**Critically ill patient** - Is a patient with life – threatening health problems that need constant, close monitoring and support by using specialist equipment and medication. In addition, these patients need regular observation, intervention and evaluation aimed at maintaining normal bodily functions (Tinker & Rapin, 2013). In this study, the critically ill patients referred to are those patients who have been admitted to the ICU.

**Physiotherapy** - Is a health care profession concerned with identifying and maximising the quality of life and movement potential within the spheres of health promotion, intervention, habilitation, and rehabilitation to promote physical, psychological, emotional, and social wellbeing of an individual or population (World Confederation of Physical Therapy, 2007).

**Physiotherapists** - Rehabilitation allied health care professionals who aim to rehabilitate people with movement disorders by using evidence-based methods such as exercise, adapted equipment, education, motivation and advocacy (World Confederation of Physical Therapy, 2007).

**Physiotherapy Practice** – It includes examinations, interventions, and practice patterns (American Physical Therapy Association, 2001). In this study, practice refers to the ways in which physiotherapists working in ICUs demonstrate their knowledge and attitudes regarding their role in the management of patients in the ICU.

**Health care professionals (HCPs)** - Also known as health care providers, they are individuals who play a central role in improving access and quality of health care for the population. They provide essential services that promote health, prevent disease and deliver health care services to individuals, families and communities, based on an extensive body of theoretical and factual knowledge in the diagnosis and treatment of disease and other health problems (World Health Organization, 2010). In this study health care professional refers to individuals who provide preventive, curative, promotional and rehabilitative care services for critically ill patients in the ICU.

**Knowledge** - Is defined as the capacity to acquire, retain and use information through experience, comprehension, discernment and skill (Mari, 2010). For this study, knowledge refers to the understanding and awareness of HCPs regarding physiotherapy management in the ICU.

**Attitude** - An abstraction or theoretical construct that is used to indicate and summarise psychological tendencies, particularly where these indicate a favourable or unfavourable evaluation of an entity (Smith & Mackie, 2000). According to Lopper 2006 *attitude* is defined as a mental position relative to a way of thinking or being, and it can imply positive or negative feeling. For this study, attitude refers to the positive and negative feelings of HCPs in Khartoum state toward physiotherapists working in the ICU as well as toward physiotherapy services in general in the ICU. Therefore, the attitude scores were categorised as positive if the total score of attitude questions was within the range of 26 – 36 points ( $\geq 70$ ) and negative if the total score was between 12 – 25 points ( $< 70$ ) from total score = 36.

## 1.9 Outline of the Thesis

**Chapter one:** Chapter one presents the background of the study. The rationale and the problem statement are presented. In addition, the research questions are stated. The aims and objectives of the study are described in detail. The chapter concludes with the definition of the terms used in the study.

**Chapter two:** This chapter presents the literature for a better understanding of the role of the physiotherapist in the ICU. It highlights the physiotherapy practice that is usually applied in critical care settings. In addition, it describes the available research on knowledge and attitudes of HCPs toward physiotherapy care in the ICU. Furthermore, it explains the importance of teamwork and the potential need for physiotherapists as part of an effective ICU team. The chapter concludes by discussing the physiotherapy management of patients in the ICU within the Structure, Process and Outcome (SPO) framework.

**Chapter three:** In this chapter, the methods used in the study are described. It introduces the reader to the research setting and explains the research design, sample, and population as well as the data collection methods. Furthermore, it discusses the procedures used to assess the research instruments, and then the process of data analysis is explained. Finally, the ethics considerations are described in detail.

**Chapter four:** This chapter presents the results of the study with respect to the research objectives. The results are presented as descriptive and inferential statistics. The descriptive part of the chapter illustrates the demographic characteristics of the participants, and their knowledge and attitudes regarding physiotherapy management in the ICU. It also includes the most common

conditions managed by physiotherapists in the ICU, physiotherapy practices that are implemented in ICU settings, and the equipment used by physiotherapists during routine treatment sessions in the ICU.

**Chapter five:** This chapter discusses the results with reference to the literature by providing possible explanations for the findings, it discussing the findings regarding knowledge, and attitude of other Health Care Professionals (HCPs) about physiotherapy management in the ICU. In addition, to physiotherapy practices applied in the ICU. Furthermore, the main strengths and limitations were addressed.

**Chapter six:** Summarises the findings of the study about knowledge, attitudes and practices regarding physiotherapy management in the ICU in Khartoum State, Sudan. It provides a conclusion and recommendations based on the findings of the study. Furthermore, the clinical implications and the relevance of the study are presented.

## **2 CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

This chapter presents a review of previous studies that report on the management of critically ill patients in the ICU. It highlights the importance of a multidisciplinary team approach to the management of patients in the ICU, as well as presenting knowledge and attitudes of health care professionals towards physiotherapy management. Furthermore, the physiotherapy management of patients in the ICU will be discussed within the Structure, Process and Outcome (SPO) framework. The chapter is concluded with a summary of the literature.

### **2.2 Intensive Care Units (ICU)**

An intensive care unit (ICU) is a specially staffed and equipped hospital ward aimed at providing intensive care facilities for critically ill patients (Leligdowicz et al., 2016). These units often have limited resources, along with extremely expensive equipment and medical expertise (Brilli, et al., 2001). The ICU provides critical care to patients with life threatening illnesses, injuries or complications, including those patients who are medically unstable and who need intensive monitoring and emergency treatment (Kumar, Maiya & Pereira, 2008). Intensive Care Units have developed around a highly specialised field with significant variations occurring between regions, countries, states, and even hospitals. This variation occurs in term of physical structure, the services provided medical personnel and levels of expertise, and organisational characteristics, capabilities and equipment (Isamade, 2007).

Generally, intensive care units require significant resources and specialised equipment such as advanced monitors and organ support equipment, including

mechanical ventilators, endotracheal and tracheostomy tubes, pacemakers and defibrillators (Abubakar et al., 2008). The characteristics of an ICU depend on the population served, the services provided by the hospital and the subspecialties of physicians on the hospital staff (Haupt et al., 2003). In addition, a hospital may choose to separate patients into physical space in the ICU based on diagnosis, acuity of illness, prognosis, or age (Brilli et al., 2001; Haupt et al., 2003).

There are different types of ICUs that are characterised by specialty or subspecialty practices (Miranda, 2012). In large hospitals there are usually relatively high percentages of hospital beds that are dedicated to critical care and multiple specialty ICUs. For example, Medical ICU (MICU) for adult and geriatric critically ill medical patients, Surgical ICU (SICU) for critically ill patients who require surgery or are recovering from surgery, Coronary care units (CCU) for patients with heart attacks, unstable angina, cardiac dysrhythmia and other cardiac conditions, Neurological ICU for patients with neurological disorders and complications, Trauma ICU dedicated to critically ill patients who have experienced traumatic incidents, Neonatal ICU (NICU) specialising in the care of critically ill and premature new-born infants, Paediatric ICU (PICU) specialising in the care of critically ill infants and children and High dependency units (HDU), which are sections of an intensive care complex that provides a level of care that is intermediate between intensive care and the general ward (Webb, 2016; Hawkins & Jones, 2015; Moran et al., 2012). In contrast, many smaller hospitals have fewer beds allocated to critical care and may have only one intensive care unit designed to care for a large number of diverse, critically ill patients, including adult and paediatric populations (Haupt, et al., 2003; Arabi et al., 2016).

In recent years there has been a growing emphasis in developed countries toward the establishment of more specialised intensive care units such as cardiac, neurological, renal, paediatric and neonatal units, in order to achieve better patient care and improve outcomes (Poluyi et al., 2016). The evidence shows that sub – specialised ICUs can reduce diagnostic variability, improved patient outcomes, and are also associated with decreased mortality (Lott et al., 2009). In contrast, in developing countries in Africa such as Egypt and Nigeria, the establishment of these specialized ICUs has not been achieved due a lack of infrastructure and medical expertise (El-Nawawy, 2003; Oke, 2001).

Providing services in the ICU is a demanding job with continuous hard work and the skilled use of advanced equipment, providing care to patients who have a variety of pathologies that are usually considered to be severe or life-threatening (Miranda, 2012; Valentin, et al., 2011). Admission to an ICU may be due to different diagnoses, including severe trauma, multiple organ dysfunction or acute respiratory failure (i.e. an inability to breathe normally) (Sitwala, 2015).The intensive care provided in a specialised unit may improve survival from septic shock, adult respiratory distress syndrome (ARDS), and multiple organ system failures. The result may also be that critically ill patients face a variety of new complications subsequent to both illness and treatment (Razvi & Bone, 2003). Critically ill patients admitted to the ICU require constant support from specialised medical equipment in order to maintain normal physiological functions (Lilly & Katz, 2016; Tinker & Rapin, 2013). In some cases medical equipment – for example, a ventilator - may take the place of some of bodily functions while the patient recovers (Sitwala, 2015; Fan, 2012).

Patients who are admitted to the ICU with critical illness may experience frequent complications as a result of their stay in the ICU. These include physical

impairments (for example, acquired muscle weakness), respiratory complication (for example, pneumonia), neurological complications (for example, polyneuropathy or myopathy), bed sores, contractures and infections (Bennett, Robertson & Al-Haddad, 2016). These complications are associated with prolonged mechanical ventilation, longer ICU stay and increased mortality (Hermans et al., 2008). Furthermore, critically ill patients in the ICU commonly develop deep vein thrombosis DVT as complications associated with immobility (Booth, et al., 2016). The physiotherapy play important role in prevention of such complication by using DVT protocol as prophylactic which is safe and effective in reduce patient deconditioning (Attia, et al., 2001).

The nature and complexity of critical illness demands specialised and highly trained staff to deliver intensive care, including includes doctors (physicians, surgeons, intensivists), nursing staff, respiratory therapists, physiotherapists, critical care clinical pharmacists, clinical dieticians, social workers and technicians (Taylor, Sherry & Sing, 2016; Kim et al., 2010). Their role and function in the ICU environment varies greatly as every member has specific role and responsibilities (Hasin, et al., 2005). For instance the common role of doctors is the responsibility of all decisions regarding the care of the patient, including admissions, monitoring and discharge, and ensuring that all procedures are carried out safely and competently (Amin et al., 2016; Chelluri, 2015). The nurses' responsibility is to prepare of the bed area, conduct an initial assessment and continually monitor the critically ill patient. They are also responsible for safe staffing levels within the unit, as well as effective communication with patients and their families or other carers (Creed & Hargreaves, 2016).

The physiotherapist is a specialist in the evaluation and treatment of musculoskeletal, neurological, and cardiopulmonary impairments of critically ill

patients that have a direct impact on the patients' strength, motor control, sensation, functional mobility, gait, and balance (Malone et al., 2015). Respiratory therapists (RTs) are specialists involved in monitoring and managing complex ventilators, the patient's airway, and providing oxygen therapy as part of the rehabilitation process for patients in the recovery phase (Singer, 2016; Barnes et al., 2011). Pharmacists are specialists in the clinical use of medications in order to improve medication safety, improve patient outcomes, and reduce drug costs (Horn & Jacobi, 2006). Dieticians are focused on the nutritional assessment and calculating the nutritional needs of the critically ill patient, aim to optimise nutritional support while monitoring the nutritional balance to improve health and recovery from critically illness (Taylor, Renfro & Mehringer, 2005). And Social Workers are specialist counsellors who assist critically ill patients and their families with all aspects of the illness from financial, to long-term planning following ICU and hospital discharge; they provide emotional support and guidance to ease the impact of critical illnesses (Sandhu, Colon, Barlow & Ferris, 2016).

Furthermore, ICU physical design require that intensive care is delivered to patients by highly trained staff and should include both clinically oriented and design based multi- professional team members (Taylor, Sherry & Sing, 2016; Hasin, et al., 2005).

### **2.3 Knowledge and attitudes of health care professionals about physiotherapy management in the ICU**

In the intensive care unit the patients are constantly monitored by a highly specialised team including consultants, physiotherapists, dieticians and nurses (Takrouri, 2004). Each member of this team must be more than competent clinician scientists, problem solvers or reflective practitioners, and must also demonstrate accountability and responsibility (Jones & Sheppard, 2008; Trede, 2006).

Physiotherapists in the ICU interact closely with medical, nursing and other allied health professionals regarding the patient's condition, progression and treatment plans, as well as aid in service integration through collaboration with multiple providers, playing an essential role in the continuum of care when transitioning patients from the ICU (Kumar, Maiya & Pereira, 2008). Furthermore, the collaboration between team members promotes and optimises the active participation of all health care professionals in clinical decision making, focusing on patient needs while ensuring respect for each team members contributions (Rose, 2011).

The optimal management of patients in the ICU is achieved through a multidisciplinary approach, which requires teamwork with clear individual roles, sharing of knowledge, skills and best practices (Stiller, 2000). The effectiveness of teamwork is considered to be a significant factor that influences the quality of care provided in the ICU (Marino, 2007). Many studies have emphasised the interaction between professionals among ICU team members as being an integral competent of professional practice (Stiller, 2013). Certainly, professionals are judged not only on the basis of their professional skills but also on their ability to interact with a range of different clients and colleagues, and to make decisions in different settings, within the context of a changing political or institutional environment (Denehy & Berney, 2006).

The presence of active teamwork between health care professionals within the ICU team from various disciplines may improve efficiency, functional outcomes and the cost of care for patients (Brilli et al, 2001). The multidisciplinary relationship plays a major role in effective patient care so the provision of effective and efficient health services needs communication and coordination between practitioners (Appleton, MacKinnon, Booth, Wells, & Quasim, 2011). The awareness of every member's role

in the multidisciplinary environment of ICUs important and any lack of knowledge among HCPs may influence the referral process and the delivery of patient care (Berney, Haines & Denehy, 2012). The awareness of the importance of the role of the physiotherapist in the ICU may therefore influence the patient care process (Jone, 2001).

In most clinical settings the physiotherapist receives patients as part of a referral process from medical doctors. It is therefore important that these doctors are knowledgeable with respect to the role of the physiotherapist and have a positive attitude towards the discipline. Good awareness of the role of physiotherapy in health care delivery may influence its use (Donato et al., 2004). Odebiyi et al (2010) noted that a lack of knowledge about the role of the profession may not only lead to misconception but may also lead to inter-professional conflict. Inappropriate physiotherapy referral has sometimes been attributed to incorrect attitudes and poor knowledge of the profession by medical practitioners. Because of this, the practice of physiotherapy as a prescription such as physiotherapy treatment instructed by doctors rather than as a referral for consultation basis which mean physiotherapy treatment decided by physiotherapists themselves is now discouraged in developed countries (Odebiyi et al., 2010).

The current study adds information about the level of knowledge and attitudes among HCPs regarding physiotherapy management in the ICU in Sudan, particularly Khartoum State, information that is currently not available in the literature.

#### **2.4 Physiotherapy management of patients in the ICU**

The physiotherapy management of patients in the ICU is discussed here using the framework of structure, process, and outcome (SPO) (Hoenig et al., 1999; Hoenig et al., 2002). In this section the structure of physiotherapy services in the ICU is

presented, followed by the process of care by physiotherapists. *Structure* includes information about the facilities and resources available for providing intensive care management of patients, including professional staff and equipment. The *process* of care includes the assessment of patients in the ICU and the physiotherapy practices used to manage these patients. It also includes the frequency and duration of the physiotherapy treatment sessions received by patients in the ICU. The *outcome* includes factors that could have change as results of care such as quality of life. This thesis only determines the structure and process of care therefore these two concepts were only explored in the literature review.

#### **2.4.1 Structure of physiotherapy service provision in the ICU in the ICU**

This section includes information about physiotherapy staffing levels and the equipment used by physiotherapists to manage patients in the ICU. The World Confederation for Physical Therapy (WCPT) (2011: page 19) describes ‘physiotherapy as a service that intends to maintain and enhance the quality of life of individuals and populations throughout the lifespan’. The WCPT also emphasises the importance of physiotherapy practice by describing the various roles and responsibilities of a professional physiotherapist. These responsibilities are categorised under health promotion, prevention of illnesses, and the treatment and rehabilitation of individuals and their communities. Physiotherapists are qualified medical personnel tasked with the evaluation, diagnosis, establishment and execution of detailed treatment plans for patients in their care. After the completion of the treatment plan, physiotherapists engage in re-evaluation of the patient and their response to the treatment in order to determine its success.

It is recommended that physiotherapists should be regarded as cornerstones in the management of patients in the ICU through prompt intervention at early stages of the process in order to minimise serious complications (Pattanshetty & Gaude, 2011).

An important aspect of physiotherapy practice in critical environments is that it is aimed at the use of advanced, cost-effective therapeutic modalities that reduce the patient's dependency on the ventilator, improve residual function, prevent the need for recurrent hospital admission, and enhances the patient's quality of life (Castro et al., 2013; Clini & Ambrosino, 2005).

The training of physiotherapists varies globally. In some countries, the entry level for professional practice is a Doctorate in Physiotherapy, while in others it is possible to exit with a diploma in physiotherapy (Sigerá et al., 2016; Kumar & Shergill, 2013). Although the WCPT clearly describes the role of physiotherapists it may be that some medical staff complete short courses in physiotherapeutic techniques and are subsequently employed as physiotherapists. This type of practices could occur, as a result of shortages in professional therapists (Rhodes et al., 1989). This is evident by the limited number of published work on physiotherapy in Sudan (Rhodes et al., 1989).

Furthermore, the evidence of increasing physiotherapist competence in the management of patients in the ICU in both professional (entry-level) education programs and in clinical settings (Pawlik & Kress, 2013; Davenport et al., 2005). Physiotherapy education in Africa is currently facing several important challenges, including a lack of undergraduate training opportunities, a lack of research as a major component of undergraduate physiotherapy education, and recognition of physiotherapy as an essential service (Frantz, 2007).

The literature showed that continuing medical education and training has been effective in improving professional practice and health care outcomes which can be measured at the level of competence, performance, and patient health status (Forsetlund et al., 2009). The burden of critical care remains especially high in low-income countries due to the fact that critical care is in its infancy, and the

management of patients in the ICU requires significant resources including the medical staff, financial support, and the availability of resources that have direct consequences on the patients who are admitted (Adhikari et al., 2010). The availability of resources is one of the important factors that influence physiotherapy practice in the ICU in terms of equipment availability, training of the physiotherapist, awareness of techniques, physiotherapist to patient ratio, and open versus closed ICUs (Bhat et al., 2014; Haupt et al., 2003).

In most developing countries where there are financial constraints due to poor funding of the health care system generally - and in the ICU specifically - there is often a limit to the availability and specialisation of the physiotherapy services, which can affect the quality of care delivered to patients (Abubakar et al., 2008; Towey & Ojara, 2007).

The outcome of physiotherapy treatment in the ICU may vary with the degree to which physiotherapy services are available and the specific tasks that are performed (Yeole et al., 2015). For instance, in Sri Lanka, in the ICU, the availability of physiotherapy services and staffing density has remained very low, which meant that there was a limitation in critical care training and physiotherapy practices in the ICU due to limited resources (Sigera et al., 2016).

The number of physiotherapists employed at the hospital in comparison to the number of patients requiring physiotherapy may affect the provision of physiotherapy service in the ICU (Pawlik & Kress, 2013). And this could be due to the lack of availability of physiotherapists that cover ward, outpatient departments and ICU (Sigera et al., 2016).

The complexity of the job of the physiotherapist is explicit in terms of the need for effectiveness in carrying out procedures and for controlling patient risk. Therefore,

appropriate certification of these professionals, perhaps through physiotherapy residencies is imperative, only physiotherapists who have had adequate training and experience can be fully integrated into multidisciplinary teams working in the ICU (Yamaguti et al., 2005).

Several strategies are suggested to optimise the physiotherapists' role in the ICU, including the promotion of inter-professional relationships, clear descriptions of the physiotherapists' role, multidisciplinary team member education, additional support staff, and innovative models of care to address funding and staff shortages (Lau et al., 2016).

The physiotherapy profession has been undergoing a period of change and is moving towards demonstrating effectiveness of clinical interventions through the implementation of evidence-based practice (Akinbo et al., 2009; Sackett, 2000). Evidence-based practice (EBP) is the conscientious, explicit and judicious use of current best evidence in making decisions about the care of the individual patient. It is concerned with the integration of the best available clinical research evidence with clinical experience and patient value (Herbert, 2005).

#### **2.4.2 Processes of physiotherapy management in the ICU**

The components of the process and outcome of the SPO framework are discussed together in this section when presenting physiotherapy management in the ICU. It will firstly include physiotherapy assessment of patients in the ICU and secondly, physiotherapy practices in the ICU. Finally, it includes the frequency and duration of physiotherapy sessions as well as the referral process.

#### ***2.4.2.1 Physiotherapy assessment of patients in the ICU***

The initial physiotherapy assessment is aimed at identifying patient's current and potential health problems and by extension, determines the necessary precautions to be taken, including any contraindications to each treatment technique (Berney et al. 2002). As result, the physiotherapist is able to set aims and plan treatment for each patient (Gosselink et al. 2008). It is important to emphasise that the physiotherapist must carry out routine and continuous re-assessment and monitoring of the patient's vital organ functions. This is to ensure that the treatment administered to each patient is safe and effective (Gosselink et al. 2008; Berney et al. 2002).

Patients in the ICU often have multiple pathologies and their rehabilitation must be tailored to their individual needs and capabilities (Lewis, 2003). As a result, critically ill patients in the ICU need regular physiotherapy assessment to ensure that they receive the most appropriate treatment for their condition (Hanekom et al. 2011). The physiotherapists in the ICU assess the patient's respiratory, cardiovascular, muscular and neurological systems (Hough, 2013). The respiratory assessment by physiotherapists includes; evaluation of retained airway secretions, atelectasis and respiratory muscle weakness, in order to identify the appropriate physiotherapy treatment. Specifically, physiotherapists assess the respiratory system by monitoring the respiratory rate, airway pressure, radiological tests, perform auscultation of the lungs, conduct thoracic expansion tests and lung compliance, review arterial blood gas analysis,, ascertain the quantity and quality of sputum, and determine the patient's readiness for weaning from the mechanical ventilator (Pryor & Prasad 2008; Wehrman, 2012). Physiotherapy assessment includes issues related to mobility and physical deconditioning, including muscle weakness, joint stiffness, impaired functional exercise capacity and physical inactivity (Gosselink et al., 2011).

Furthermore, it is essential to assess the patient's functional abilities, for example rolling, and sitting over the edge of the bed, using tools such as the Functional Independence Measure (FIM) (Nordon-Craft et al. 2012). In addition, another assessment approach employed by physiotherapists in the ICU includes skin assessment as a precautionary measure in order to prevent further skin damage, as well as muscle tone and sensation. Finally, there is a need to assess the renal system in order to determine the patient's fluid balance as it affects the consistency of the patient's secretions (Wehrman, 2012).

The benefit of multi-system assessment is that it helps the physiotherapist in identifying the patient's current and potential problems, as well as the precautions and contraindications for each treatment technique applied. With this information the physiotherapist can set appropriate treatment objectives and plan effective interventions (Gosselink et al. 2008; Berney et al. 2002).

#### ***2.4.2.2 Physiotherapy practice in the ICU***

The physiotherapist, as a rehabilitation expert is considered to be an integral member of a multidisciplinary team that is responsible for the management of critically ill patients in the ICU (Stiller 2000). Although the professional role of physiotherapists in the ICU differs from country to country, there is general consensus on specific physiotherapy practices in the ICU, including mobilisation, respiratory therapy, positioning, airway suction, implementation and supervision of non-invasive ventilation, extubation, supervision of weaning from mechanical ventilation, and adjustment of mechanical ventilation and intubation (Lewis, 2003). Also, there is evidence to show the effectiveness of physiotherapy techniques such as positioning, manual hyperinflation, suction, use of non-invasive ventilation and intermittent positive pressure breathing on critically ill patients (Chang et al., 2016;

Brooks et al., 2001). In effect, the roles of the physiotherapist often include providing interventions such as chest physiotherapy (CPT) and rehabilitation (Norrenberg & Vincent 2000; Stiller 2000; Van Aswegen & Potterton, 2005). There are various physiotherapy practices or techniques used for patients in ICU which can be divided into two broad categories; chest physiotherapy, which includes manual airway clearance techniques (MACTs), manual hyperinflation (MH) and implementation and supervision of non-invasive ventilation (continuous positive airway pressure, or CPAP). Rehabilitation which includes mobilisation, positioning and limb exercises. These practices will be discussed briefly below.

#### ***2.4.2.2.1 Chest physiotherapy***

Chest physiotherapy or respiratory physiotherapy techniques are used interchangeably in the literature. It is routinely practiced in the ICU by both physiotherapists and respiratory therapists and is considered to be the important component of physiotherapy practice in critical care settings (Chaboyer et al., 2004).

Chest physiotherapy is a general term for a number of techniques, including percussion and vibration, gravity-assisted drainage, positioning, manual hyperinflation and airway suctioning (Choi & Jones, 2005). Chest physiotherapy interventions are versatile and focus on achieving various goals, including the promotion of alveolar ventilation, secretolysis, improved oxygen saturation, and the improvement of thoracic mobility (Hellweg, 2012). In a randomised controlled trial (RCT) of individuals with acquired brain injury, chest therapy showed a positive effect on ventilator-associated pneumonia, leading to a reduction in the duration of mechanical respiration, a shorter length of stay in the ICU, and prevention of ventilator-associated pneumonia (Patman, Jenkins, Stiller, 2009).

Physiotherapists in the ICU use several manual techniques, including percussion, vibration, suctioning, postural drainage (PD), manual hyperinflation (MH) and breathing exercises, all of which are used to aid in the removal of secretions from the tracheobronchial tree (Pryor & Prasad, 2008). Furthermore, nebulisation can be combined with postural drainage positions in order to assist with the drainage of secretions and should be initiated 10-15 minutes prior to the application of chest clearance techniques (Pryor & Prasad, 2008). Airway clearances techniques (ACTs) have the potential effect of improving mucociliary clearance by reducing mucus plugging, enhancing the removal of secretions and treating cardiopulmonary complications (Ambrosino & Makhbah, 2014).

These techniques may result in improved ventilation, a reduction of airway obstruction and atelectasis, improved ventilation and perfusion mismatch, and a decrease in proteolytic activity in the airways (Pisi & Chetta, 2009). The use of multimodality physiotherapy (ACTs) treatment was demonstrated to be more effective than either single modality treatment or breathing exercises alone (Dennis, Duncan, Pinder, Budgeon & Jacob, 2016; Ntoumenopoulos et al., 2002; Stiller, 2000).

Physiotherapists commonly use manual hyperinflation (MH) as an aid in the removal of secretions to improve static lung compliance and oxygenation (Denehy & Berney, 2013; Hodgson et al., 2000). This technique refers to the delivery of a volume of gas greater than tidal volume to the patient's lungs via an endotracheal tube, tracheostomy or face mask (Hodgson et al., 2000). It is one of the physiotherapy practices in the ICU that is commonly adopted by physiotherapists when working with patients who are mechanically ventilated, in order to improve lung volume, promote ventilation and mobilise secretions (Bennett, Thomas & Ntoumenopoulos, 2015).

According to El-Deen & Ahmed (2013) the use of MH with a combination of chest physiotherapy (CPT) has a beneficial effect on clearing chest secretions and also helps to improve respiratory parameters in postoperative intubated patients. In addition, when combining MH with suction produces beneficial changes in respiratory mechanics in mechanically ventilated patients with ventilator-associated pneumonia (Choi & Jones, 2005). The use of MH on patients with acute atelectasis from ventilation support significantly improves alveolar recruitment (Maa et al., 2005).

Physiotherapists in the ICU play an active role in procedures such as the adjustment of mechanical ventilation parameters, supervision of weaning from mechanical ventilation, implementation of non-invasive mechanical ventilation (NIV), extubation and implementation of continuous positive airway pressure (CPAP) (Norrenberg & Vincent, 2000). The involvement of the physiotherapist in such procedures has beneficial effect in term of improved efficiency of ventilation, functional capacity, and patient outcomes (Lewis, 2003; Piper & Moran, 2006).

Although the role of the physiotherapist in the decision-making process and the application of NIV vary worldwide, physiotherapists are ideally suited to this role due to their combined skills in physiology, knowledge of equipment and clinical management (Denehy & Berney, 2013). The NIV/CPAP procedure sees a shared responsibility between physiotherapists, physicians and nurses in the ICU in order to save time consumed by other health professionals (Simonelli, Paneroni, Vitacca, 2013).

Findings from a randomised controlled trial (RCT) verify that the use of CPAP in preventing intubation in hypoxaemic patients leads to a lower incidence of pneumonia and a shorter stay in the ICU (Squadrone et al., 2005). Another trial confirmed that the use of non-invasive CPAP as a method of avoiding mechanical ventilation also reduces the incidence of endotracheal intubation and other severe

complications (Hilbert et al., 2000; Squadrone et al., 2005). As a result, non-invasive ventilation is an essential option in the management of patients with respiratory failure in the acute care setting (Keenan et al., 2011).

#### ***2.4.2.2.2 Rehabilitation***

Rehabilitation is the cornerstone of management of critical, illness-related morbidity in the ICU (Connolly, 2015). The mobilisation of critically ill patients in the ICU refers to movements of body parts, physical, or functional tasks that are sufficient to elicit acute physiological effects on ventilation, perfusion, and muscle metabolism (Denehy & Berney, 2013). Physical rehabilitation interventions are delivered during ICU admission in order to address the physical and functional deficits that are associated with ICU acquired weakness.

Delivery of these interventions is advocated across the continuum of the patient pathway commencing in the ICU, has been shown to be beneficial (Connolly et al., 2015). Rehabilitation exercises in the ICU include functional positioning, stretching, range of motion exercises (passive, supported-active, and active exercises), splinting, functional mobilisation, resistive exercises, cycling, sitting up in the bed, standing, transferring from bed to chair, and walking are all recommended activities for managing physical deconditioning and related complications in the patient (Thomas et al., 2015; Ambrosino & Makhbah, 2014).

The evidence base for physical exercise for critically ill patients shows that there is significant benefit in improving quality of life, physical function, peripheral and respiratory muscle strength, increasing ventilator-free days, and decreasing hospital and ICU stay (Kayambu, Boots & Paratz, 2013).

The decision to start rehabilitation activities for critically ill patients need to be guided by a comprehensive screening process that is combined with individual

multi-system assessment and analysis (Thomas, 2009). Rehabilitation exercises in the ICU aims to mobilise patients early, facilitate weaning, optimise oxygenation, and improve function by increasing strength and endurance (Cirio et al., 2003). The role of physiotherapists in the application of exercise varies widely in response to scant evidence (Denehy & Berney, 2013; Cirio, et al., 2003).

Mobilisation refers to any physical activity that is sufficient to elicit acute physiological effects that enhance ventilation, central and peripheral perfusion, circulation, muscle metabolism and alertness, and that are also countermeasures for venous stasis and deep vein thrombosis (Gosselink et al., 2008). Early mobilisation implies that mobilisation activities start immediately after physiological stabilisation of the patient in the ICU (Truong, Fan, Brower & Needham, 2009).

The growing evidence shows that early mobilisation of patients is a safe and cost-effective strategy to improve patient outcomes (Harris & Shahid, 2014). Early mobilisation improves the general outcomes of mechanically ventilated patients, leading to increased functional activities, including active-assisted bed exercises, sitting on the edge of the bed, standing, marching-on-the-spot and walking (Bakhru et al., 2016; Connolly et al., 2015). Furthermore, EM is effective in improving peripheral and respiratory muscle strength, reducing shortness of breath, shorter durations of delirium, more ventilator free days, reduced stay in the ICU and reduced overall time to discharge (Schweickert et al., 2009).

Many studies conclude that early mobilisation of critically ill patients can be done with low risk to the patient (Ambrosino & Makhabah, 2014; Li. et al., 2012). Stiller and Phillips (2003) defined mobilisation as a hierarchy of patient activities ranging from moving around the bed to standing and walking. Mobilisation has been recognised as an umbrella term for functional movement that is defined according to its context of use, with a hierarchy from low to high-level tasks (Li. et al., 2012). A

retrospective cohort study conducted in a trauma and burns ICU showed that the early mobilisation protocol for patients was safe and effective (Clark et al., 2013).

There is evidence supporting the mobilisation of patients in the ICU. Active mobilisation has a positive effect on physical functioning and hospital outcomes in mechanically ventilated patients (Li. et al., 2012). A randomised controlled trial (RCT) conducted on the effect of graded early mobilisation versus routine physiotherapy on the length of stay in the ICU for mechanically ventilated patients shown its better outcome in reducing length of ICU stay (Bezbaruah et al., 2012).

There are several factors based upon staffing structure that are significantly associated with the practice of EM, such as multidisciplinary rounds, the setting of daily goals for patients, the presence of physiotherapists, country, and nurse to patient staffing ratio (Green et al., 2016; Connolly et al., 2015).

The positioning of patients in ICU is used to facilitate the drainage of respiratory secretions, enhance arterial blood oxygenation, prevent gastroesophageal reflux, nosocomial pneumonia, and to promote patient comfort (Thomas & Paratz, 2007). Positioning is also used to reduce the adverse effects of bed immobility, including pressure sores and pulmonary complications (Dean & Perme, 2002). The positioning of the patient in the ICU is the responsibility of nurses and physiotherapists. Hewitt, Bucknall and Faraone (2016) concluded that critically ill patients require regular body position changes to minimise the adverse effects of bed rest, inactivity and immobilisation.

Another study conducted by Alsaghir and Martin (2008) concluded that the prone position improves oxygenation in patients with adult respiratory distress syndrome, as well as reducing mortality in patients with more severe conditions.

Denehy and Berney (2013) found that positioning of patients with predominantly unilateral lung disease resulted in improved oxygenation for these patients, while the

semi-recumbent position for intubated and mechanically ventilated patients was shown to minimise the aspiration of gastric contents to the lower airway.

#### ***2.4.2.3 The frequency and duration of physiotherapy sessions in the ICU***

With regard to the frequency and duration of physiotherapy treatment sessions in the ICU, it is suggested that one to two sessions per patient per day – on average - in the ICU is appropriate, regardless of the patient's condition. The duration of each session is recommended in the range of 15-20 minutes (Sigera et al., 2016; Jones, Hutchinson & Oh, 1992).

#### ***2.4.2.4 Referral Process***

The WCPT states that physiotherapists are independent practitioners who are able to work as first contact health care professionals, who patients can engage with directly, without the need for referral from any other disciplines. It also ensures the autonomous status of physiotherapists who are equipped with sufficient skills to be a first contact professional. In many developed countries, physiotherapists are primary contact practitioners who use a comprehensive multisystem assessment that includes the respiratory, cardiovascular, neurological, and musculoskeletal systems to formulate individualized treatment plans (Berney, Haines & Denehy, 2012).

By applying this model of direct access to the physiotherapy service without referral from other doctors the autonomy of physiotherapists will be ensured as first line practitioners. The WCPT encourage all nations to adopt this model in their health care services and claims that physiotherapist actions and decisions should not be controlled or compromised by employers, other health care professionals or

individuals (WCPT, 2011). Although the WCPT advocates that physiotherapists are first line practitioners in some developing countries such as Sudan, physiotherapists can only treat patients that are referred by doctors (Federal Ministry of Health, 2009).

## **2.5 Summary**

The literature reviewed in this chapter has described physiotherapy in the ICU in the context of ICU infrastructure, the type of critically ill patients admitted to the ICU, and the multidisciplinary team who provide intensive care management for patients in the ICU. Also, it discussed the knowledge and attitudes of health care professionals related to physiotherapy management in the ICU. It found diversity in knowledge, attitudes and practices with regards to physiotherapy management in the ICU among health care professionals in developed and developing countries. This is mainly dependent on the availability of resources in terms of infrastructure of the ICU, highly trained medical staff and availability of equipment. Finally, the physiotherapy management of patients in the ICU was presented using the Structure, Process and Outcome (SPO) framework.

### **3 CHAPTER THREE: METHODOLOGY**

#### **3.1 Introduction**

This chapter describes the quantitative approach that was implemented in this study. It includes the research setting, study design, and study population. Furthermore, it describes the sampling procedure and the study instruments that were used. In addition, the data collection and analysis procedure is described. The chapter concludes by stating the ethics considerations for the study and summary of the chapter.

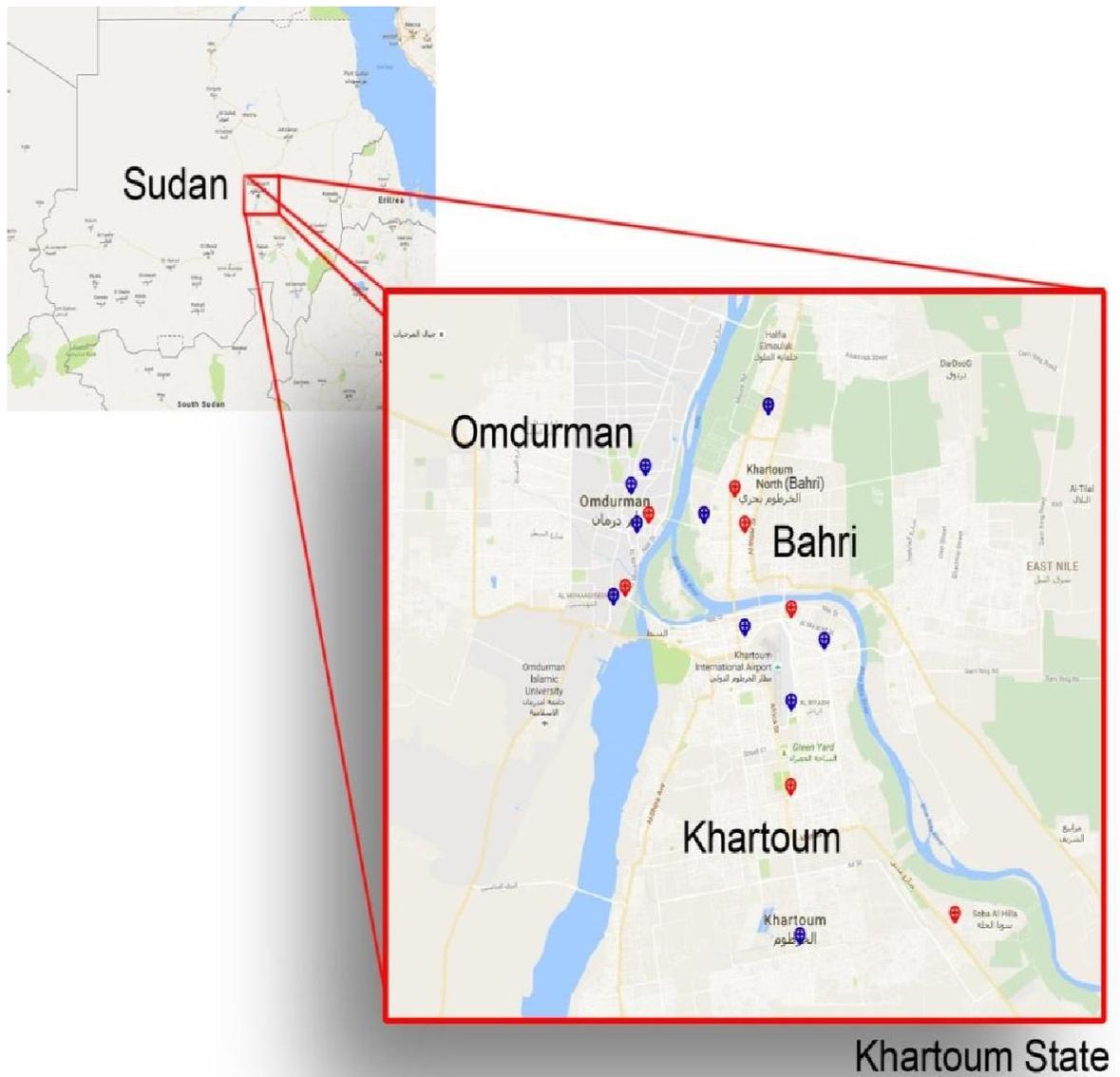
#### **3.2 Research setting**

The study was conducted in Khartoum State, the capital of the Republic of Sudan, which is a tripartite metropolis in Central Sudan that is divided geographically by the Blue Nile and White Nile into three provinces; Omdurman, Khartoum, and Bahari (Khartoum – North) that are linked by bridges to form the capital city. The 2008 census of the Republic of Sudan indicates that the nation's population was 43.6 million and the population density was approximately 17 persons per square kilometres.

In Sudan the structure of the health care system includes primary health care units (PHCU), dressing stations (DS), dispensaries, health centres and rural hospitals (Ministry of Health annual report, 2015). There are two main sectors that provide health care; public and private. In the public sector, services are provided by the Ministries of Health (MoH), Medical Departments of Armed Forces, Police and Security Forces, Health Insurance Organizations, and the Ministry of Higher Education through its university hospitals where members of the population without adequate financial resources can be treated. The private sector includes both non-

profit and market based institutions, and has expanded rapidly over the last two decades. The private system provides care for citizens with adequate financial resources. Health care professionals in both private and public sectors practice allopathic and traditional medicine, which includes preventive, promotive, curative, and rehabilitative services (Federal Ministry of Health, 2009). The Ministry of Health annual report (2015) stated that the number of private medical institutions and diagnostic centres in Khartoum state was 138, while the number of public and government hospitals was 34.

This study was conducted in the Intensive Care Units in tertiary hospitals - including teaching and specialised hospitals - operated by the MoH, located in Khartoum state. These hospitals provide different levels of care, including emergency services, ICU services, and in- and out-patient services in all disciplines. These hospitals are considered as training hospitals for both undergraduate and postgraduate students (A-Rahman & Jacquet, 2014). A total of 17 hospitals were included in the study; one army, one police, five governmental and ten private hospitals. The rationale for selecting these hospitals was because it has available physiotherapy services and would provide samples large enough to conduct a survey (See Fig 3.1 for the geographic distribution of hospitals, and Table 3.1 for more detailed information on each institution).



- 📍 Governmental hospital
- 📍 Private hospital

**Figure 3.1: Geographic distribution of hospitals at provinces within Khartoum State**

**Table 3.1: Hospitals at Khartoum state included in the study**

	<b>NAME OF HOSPITAL</b>	<b>NO. OF ICU BEDS</b>	<b>PROVINCE</b>
<b>GOVERNMENTAL HOSPITAL</b>	Omdurman Teaching Hospital	Surgical ICU 3 Neurological ICU 3 Medical ICU 6	Omdurman
	Military Hospital	General ICU 7 Surgical ICU 3 Medical ICU 8 HDU 3	Omdurman
	Bahari Teaching Hospital	Medical ICU 6 ICU 9 HDU 11	Bahari
	Ahmed Gasim Paediatric Hospital	Surgical ICU 8 Surgical HDU 8 Paediatric ICU 10 Paediatric HDU 3	Bahari
	Police Hospital	ICU 10 CCU 10	Khartoum
	Sudan Cardiac Center (SHC)	ICU 7 CCU 8	Khartoum
	Soba Teaching Hospital (SUH)	Pediatric ICU 4 Adult ICU 8 HDU 5	Khartoum
	<b>PRIVATE HOSPITALS</b>	Alia Specialist Hospital	ICU 6 CCU 7
Asia Hospital		ICU 6 CCU 6	Omdurman
Abugaa Hospital		ICU 3 CCU 3	Omdurman
Tuga Hospital		ICU 4	Omdurman
Albraha Hospital		ICU 10	Bahari
International Hospital		General ICU 5	Bahari
Imperial Hospital		ICU 6	Khartoum
Royal Care International Hospital		ICU 14 CCU 8 HDU10	Khartoum
Alingaz Sudanese German Specialized Hospital		ICU 3	Khartoum
Dar Al-elaj Specialized Hospital		ICU 6	Khartoum

### **3.3 Research design**

The study employed a quantitative, descriptive, cross-sectional study design. A quantitative approach was chosen because it enabled the researcher to collect numerical data and perform quantitative analysis using statistical procedures to describe the phenomena of interest, as well as to determine the associations between variables (Hopkins, 2008). This quantitative approach is appropriate for describing the relationship of phenomena at a single point in time and is relatively easy to manage within a limited timeframe (Polit, Beck & Hungler, 2001; Domholdt, 2000). This design was considered to be the most suitable for the current study in order to systematically determine and report the level of the knowledge and attitude cross section of HCPs within Khartoum State regarding physiotherapy management in the ICU at one point in time. It also expresses the physiotherapy practices applied in the ICU in terms of frequency and percentage.

### **3.4 Study population and sampling**

The total population included all HCPs working in ICU settings at the selected hospitals in Khartoum State. The size of population was 541 (Personal communication with medical directors of hospitals, June 2015). The targeted study sample was defined as all HCPs working in ICUs from selected hospitals; see Table 3.2 for more detailed information on each HCPs discipline.

**Table 3.2: Population of Health Care Professionals per Disciplines**

HCPs	SPECIALITY	PARTICIPANT (N)
Consultants	specialist physicians, surgeons, anaesthetists, cardiologists and emergency medicine specialists	24
Doctors	registrars, medical officers, house officers and physicians	150
Nurses	professional nurses, specialist nurses, nurse practitioners, clinical nurses and operating theatre nurses	233
Medical technicians	medical radiation therapists, magnetic resonance imaging technologists, diagnostic medical radiographers and mammographers	19
Dieticians	consultant dieticians and clinical dieticians	56
Physiotherapists	specialist physiotherapists and assistant physiotherapists	40
Other	biomedical Engineer	19
Total		541

The sample was selected conveniently from hospitals within Khartoum State at the time of the study regardless of their age and gender. The selection of these hospitals was done purposively based on:

- Noteworthy ICUs with different classifications, namely; Coronary Care Unit (CCU), High Dependency Unit (HDU), Medical ICU, Surgical ICU, Neurological ICU, and Paediatric ICU.
- Availability of physiotherapy services in the hospital and ICU.

- The hospitals needed to be located in the three main provinces within Khartoum state (Omdurman, Bahari, and Khartoum).
- From these 17 hospitals, a convenient sample of HCPs working in ICU was selected in order to represent a variety of settings (governmental, private, police and army hospitals) during the period from 1<sup>st</sup> of January to 30<sup>th</sup> of April, 2016.

A convenient sampling technique is defined as a non-probability sampling technique where samples are selected because of their convenient accessibility (Polit, Beck & Hungler, 2001). Convenient sampling is used when a researcher has reason to believe that the population that is being sampled is either homogeneous or else has characteristics being measured that are so randomly distributed that the outcome would not be materially affected by more sophisticated methods of sampling (Dorofeev & Grant, 2006). So this sampling technique was appropriate for the researcher since the participants in this study were all HCPs working in the ICUs, therefore the researcher had reason to believe that they were more or less homogenous according to the context. In this method, the sample is chosen purely on the basis of availability. It consists of taking all cases at hand until the sample reaches the desired size (Struwing & Stead, 2004). The size of population was 541 (Personal communication with medical directors of hospitals, June 2015). Subsequently, all HCPs working in the ICUs who voluntarily agreed to participate in the study were included.

Grove, Burns, and Gray (2014) noted that in spite of the fact that convenient samples may be simple, easy and efficient, it is possible that multiple, indirect and unrecognisable biases may exist in the actual sampling procedure. Therefore, to decrease biases in this study the researcher carefully considered the characteristics of the people who were eligible for the sample, and took steps to improve the

representativeness of the sample by carefully describing the decisions in terms of who in the sample was selected. Subsequently, a detailed description of the sampling process is explained below.

***The criteria that the researcher adopted for possible inclusion in the sample consisted of the following:-***

- Those who were eligible for inclusion had to be HCPs working in different ICU sub- categories such as: CCU, HDU, Medical ICU, Surgical ICU, Neurological ICU, and Paediatric ICU at the time of the study.
- The participants had to be registered HCPs at their regulatory bodies, which were either the National Council for Medical and Health Profession (NCMHP) or the Sudan Medical Council (SMC).
- HCPs that were eligible for inclusion must have been employed for at least six months in the intensive care units prior to the time of their selection.

***The criteria that the researcher adopted for possible exclusion from the sample consisted of the following: -***

- All medical students and health care professionals who were employed in managerial positions (non-clinical staff).
- Those who have physiotherapy course certificates had alternative primary qualifications. For example, anatomists and those who had completed respiratory therapy courses may have been practising in the ICU as physiotherapists were excluded from the study.

## **3.5 Data collection methods**

### **3.5.1 Data collection instruments (questionnaire and checklist)**

This study used a questionnaire and checklist as data collection instruments that were developed from related literature, and modified based on the research objectives of this study.

#### ***3.5.1.1 Questionnaire***

The questionnaire was developed using information from a study conducted by Jones (2001) that aimed to gather international perceptions of medical staff regarding intensive care physiotherapy in the United Kingdom, Australia, Canada, South Africa and Hong Kong.

This questionnaire was demonstrated to have internal and external validity (see section 3.4.3.2 Validity testing below). To address the aim of the study the researcher only collected data from HCPs with regard to their knowledge and attitudes about physiotherapy management in the ICU, therefore, the perception questions were excluded. This process led to the development of a structured self-administered questionnaire that was designed according to the objectives of this study (Appendix A).

A three-page questionnaire containing closed-ended questions was created and divided into three sections (A, B, C) which were scored separately. The sections are described below.

*Section A* included questions relating to the socio-demographic characteristics of the study participants. This section gathered information on the participant's age, gender, profession, type of hospital employed at, ICU setting where the participant worked, employment type (contract of employment such as full time, part time, and

on-call), years of experience in the profession, and years of experience in the ICU. This section was intended to provide a better understanding of the participants' background and allow the researcher to interpret their responses more reliably (Neumann, 2005).

*Section B* contained 14 True / False /I don't know questions to determine the knowledge of the participants that related to the physiotherapy management of patients in the ICU (Iyor 2005). In scoring the participants' knowledge, each correct response was given a '1' and each incorrect response or no response was given a '0' to obtain each participant's total knowledge score. A score of 0 was applied for the "I don't know" or no response, on the assumption that these participants were unaware of the correct response at the time of data collection (Park et al., 2011). A total score of knowledge questions was = 14. A previous study suggested that a score of seventy percent or higher could be interpreted as an acceptable level of knowledge (Kaddourah, Abu-Shaheen & Al-Tannir, 2016). In this study the value of 70% was also used to determine the acceptable level of knowledge. Therefore, the knowledge scores were classified as adequate knowledge when the total score was within the range of 10 – 14 points ( $\geq 70$ ) and inadequate knowledge if the total score was within the range of 0 – 9 points ( $< 70$ ) (Kaddourah, Abu-Shaheen & Al-Tannir, 2016).

*Section C* This section determined the participants' attitudes toward physiotherapists working in the ICU. It included a set of 12 questions that each used three Likert-scale statements; Agree, Neutral and Disagree. The scoring of participants' attitude ranged from 1 = "Disagree", 2 = "Neutral" and 3 = "Agree". From a total score of attitude =36 an average of greater than 70% (Kaddourah, Abu-Shaheen & Al-Tannir, 2016) was determined to be acceptable. Therefore, the attitude scores were categorised as positive if the total score was within the range of 26 – 36 points ( $\geq 70$ ) and negative if the total score was between 12 – 25 points ( $< 70$ ).

### 3.5.1.2 *Checklist*

The checklist was used to capture the existing physiotherapy practices for patients admitted to ICUs in Khartoum state. This checklist was developed based on a study done in India by Kumar, Maiya & Pereira (2008) that aimed to address the role of physiotherapists in ICUs, and also on systematic reviews conducted by Stiller (2013) and Kayambu, Boots & Paratz (2013), looking at physiotherapy in intensive care. The checklist was modified and adjustments were made according to inputs by a panel of experienced physiotherapists with experience in the ICU.

Appendix C contains the checklist completed by physiotherapists to document their practices, including the types of equipment they used when treating patients in the ICU. It consists of the following five sections:

*Section A* gathered data about the hospital, such as the type of hospital and number of ICU beds.

*Section B* gathered personal information about the participant. This section asked about the participant's age, gender, highest qualification as physiotherapist, rank at the National Council for Medical and Health Professions, the ICU categories where they currently work, their type of employment in the ICU, number of years of clinical experience, and number of years' experience in the ICU.

*Section C* aimed to gather general information regarding the patients managed in the ICU by the participant. It elicited information about patient diagnosis, reasons for the ICU admission, and the duration and frequency of the physiotherapy treatment sessions. To assist with the diagnosis section eight different patient conditions that required physiotherapy intervention were listed (Hodgin, et al., 2009; Gosselink, et al., 2011). The classification was based on the main reasons for ICU admission, patient clinical scenarios, and the specialty under which the patients were admitted and treated. For example, the cause of admission to ICU was neurological condition

and the patient was treated at neurological ICU. As a result, the categories formed were Neurological, Respiratory, Medical, Surgical, Traumatic, Cardiac and Multiple Organ Dysfunction.

*Section D* gathered information related to physiotherapy practices in the ICU. This section focused on the types of physiotherapy techniques that are used to manage patients in the ICU, such as manual airway clearance techniques (percussion, vibration, suctioning, postural drainage), positioning, limb exercises, mobilisation, breathing exercises, assisted coughing and huffing, nebulisation, implementation and supervision of non-invasive CPAP, manual hyperinflation and deep vein thrombosis (DVT) protocol.

*Section E* was used to gather information about the equipment that was used regularly by physiotherapists in the ICU, including suctioning equipment, spirometers, chest support, cervical collars, neuromuscular electrical stimulation (NES), positive end-expiratory positive pressure PEEP bottle, hyperinflation bags, nebulisers and deep vein thrombosis (DVT) socks.

### **3.5.2 Translation of the research instruments**

The questionnaire and checklist were initially developed in English (see Appendices A and C). It was then translated to Arabic - the official language in Sudan (see Appendices B and D) and then translated back into English. The back translation into English was conducted by different expert translators who were working in the English Language Teaching Unit at Ahfad University for Women, Khartoum – Sudan. This was done to ascertain that the meaning of the statements had not changed or been lost during the translation process.

The survey instruments were available to participants in both languages in order to ensure that all participants were not disadvantaged. Therefore, the questionnaire and checklist were available in English and Arabic and the participants had an opportunity to choose whichever one they were most comfortable with.

### **3.5.3 Instrument evaluation**

#### ***3.5.3.1 Pre-pilot evaluation***

The research instruments (questionnaire and checklist) were developed following a comprehensive literature review and subsequent discussion with the supervisor. Then a draft of each was forwarded to experts in the field, gathered from South Africa and Sudan in order to improve both face and content validity of the survey instruments.

#### ***3.5.3.2 Validity testing***

Validity and reliability are the two most important criteria by which a quantitative instrument's adequacy is evaluated (Polit et al., 2001). The evaluation of the research instruments for this study (questionnaire and checklist) included measures of comprehensiveness, clarity, face and content validity. In South Africa, the instruments were given to two physiotherapists employed by the University of the Western Cape knowledgeable in the field of the ICU (chosen according to availability). They were asked to assess the structure, interpretation, and terminology used in each survey question prior to pilot testing. They agreed that the instruments covered all aspects of the research objectives adequately and only made suggestions for changes in the structure. In Sudan, 12 experts in the field were asked to make comments on each instrument item and to give suggestions to improve the instruments. Final modifications based on this feedback were then made to the instrument layout and phrasing. These modifications were included the ICU sub-categories in the checklist and questionnaire they suggested it should be indicated the common ICU sub- categories that can be available in any hospital rather than use more specific ICU –sub- categories and add other ICU as an option, concerning the physiotherapy practice in the ICU the researcher should indicate the practices that

have consensus on the literature, In addition, with regard questionnaire, rephrase the questions in way that extract knowledge and attitude of HCP participants. There was good agreement among the experts that the survey instruments covered important concepts, was clearly worded, and was likely to elicit information regarding the knowledge, attitudes and practices pertaining to the physiotherapy management of patients in the ICU. The final survey instruments are presented in Appendices A and C.

#### ***3.5.3.3 Reliability testing***

The test-retest method was used to determine the reliability of the survey instruments. In Sudan, Twelve health care professionals in the ICU team in Khartoum State were recruited to participate and complete the research instruments twice, with a two week period between the first and second iterations. Reliability was assessed using Cronbach's alpha to compare the consistency, stability, and reliability of the questions overtime.

The Intra Class Correlation (ICC) is an inferential statistic used to evaluation of inter-rater reliability on quantitative data (Kim, 2013). The ICC coefficient in this study was determined to be 0.75. Kline (2013) recommends a minimum requirement for internal consistency to be 0.7, therefore the result of the ICC was considered to be satisfactory.

#### ***3.5.3.4 Pilot testing***

A pilot study was conducted to determine the user-friendliness and the clarity of the research instruments (De Vos, 2002). It was conducted during December, 2015. The participants were 12 health care professionals who were working in ICU settings from two hospitals in Khartoum state at the time (Alroda Hospital and Awedad Hospital). These hospitals were excluded from the main study. The participants in the pilot study consisted of two participants from each HCP sub-category, including

consultants, doctors, nurses, medical technicians, dieticians, and physiotherapists. They were asked to assess the administrative ease of the questionnaire and checklist, as well as being asked to determine the clarity of the questions in terms of addressing the study objectives, the completeness of the response sets, the time required to complete the instruments, and the success of the data collection technique. These pilot study participants made several comments regarding the flow, arrangement and length of the instruments, which were modified according to their feedback.

### **3.6 Data collection procedure**

The ethics clearance for the study was provided by the University of the Western Cape Senate Research Committee. In addition, approval was obtained from the Sudanese Ministry of Health, the Federal Ministry of Health, the National Council for Medical and Health Professions, and the Medical Directors of hospitals. The lists of governmental and private hospitals were obtained from the Federal Ministry of Health and the selection of hospitals was then completed.

After receiving ethics clearance and permission to access the hospitals from the Ministry of Health, a brief meeting was held. Participants of the meeting included the heads of departments and authorised personnel (senior staff) from selected ICUs. The purpose of the meeting was to explain purpose and procedures of the study. Following this a brief introduction to prospective participants was done at individual levels, and consent forms - available in both languages (see Appendices E and F) - were provided to the eligible participants. The researcher allowed the participants enough time to read the consent form and to ask any questions about the study. Written informed consent was obtained from the participants (physiotherapists and other HCPs in the ICU). Then a copy of the questionnaire and checklist was delivered by hand to each participant depending on their speciality. Each participant

was given two weeks to complete the questionnaire and checklist and asked to return them when they were finished. Physiotherapist participants were able to complete more than one checklist, depending on the number of patients they treated in the ICU during the study period from 1<sup>st</sup> of January to 30<sup>th</sup> of April, 2016.

### **3.7 Data analysis**

Completed data were captured and entered into the Statistical Package for the Social Sciences (SPSS) Version 24 for analysis. The data from the questionnaire and checklist were initially entered into Microsoft Excel 2010 and numerically coded before being entered into the Statistical Package for the Social Sciences (SPSS) Version 24 for analysis. A descriptive statistical analysis was done to express the socio-demographic characteristics of the participants, and the knowledge and attitudes of the participants. Descriptive analysis was also used to identify the common patients' conditions managed by physiotherapists in ICU, the physiotherapy practices implemented, and the equipment used by physiotherapists during treatment sessions. This data is presented in the next chapter using frequencies, tables, and pie charts.

Inferential statistical analysis was done to determine associations between variables such as demographic features, knowledge and attitudes of HCPs. Kruskal Wallis or Chi – square tests were conducted, depending on the nature of the categorical variable. Pairwise comparison was conducted in cases where significant differences were observed following Kruskal Wallis tests. This was done in order to determine differences in the pairs of sub- categories of the HCPs with regards to the primary outcomes of this study (knowledge and attitude).

### **3.8 Ethics considerations**

Permission to conduct this study was obtained from the University of the Western Cape Faculty of Community and Health Sciences Higher Degrees Committee, The University of the Western Cape Senate Research Committee (see Appendix G). The Ministry of Health (MoH), the Federal Ministry of Health (FmoH), and the National Council for Medical and Health Professions in Sudan were contacted and asked for study approval. Thereafter, the superintendents of the selected hospitals within Khartoum state were asked for permission to conduct the study in their institutions.

Before the research began, the aim and purpose of the study were explained to all participants who were asked to sign an informed consent form before participating in the study (see Appendices E and F). All participant forms were available in both Arabic and English. The informed consent forms stated that participation in the study was voluntary, and that all information gathered would remain anonymous and confidential. All participants had the right to withdraw from the study at any time without any negative consequences. In order to maintain anonymity and confidentiality, no names appeared on the questionnaires and checklists, and all consent forms, questionnaires and checklists, were collected in separate boxes and stored in different locked cabinets. Only the researcher has access to those cabinets. A final copy of the results of the study will be submitted to the University of the Western Cape, the Ministry of Health, the Federal Ministry of Health, and the National Council for Medical and Health Professions in Sudan.

### **3.9 Summary**

Chapter three provided an overview of the research methodology. It described the quantitative, descriptive cross-sectional design used to conduct the study in the hospitals located in Khartoum state in Sudan. The population and sample of the HCPs participants were described. It also explained the process of the research instruments development and evaluation. Further it described the procedure of data collection as well as data analysis in term of descriptive and inferential statistical analysis. It concludes by detailed description of the ethics considerations.

## **4 CHAPTER FOUR: RESULTS**

### **4.1 Introduction**

This study investigated the knowledge, attitudes and practices regarding the physiotherapy management of patients admitted to ICUs in Khartoum State of the Republic of Sudan.

A total of 501 questionnaires were completed and returned by health care professionals who were not physiotherapists. A total of 200 checklists were completed during the study time and returned by 40 physiotherapists working in the ICUs. Data from both the questionnaire and the checklists were retrieved and analysed, before being presented in the subsequent sections of this chapter.

This chapter contains the results of the study. It is organised into four sections where the results that answer each objective is categorised into *First section* (the socio-demographic characteristics of HCPs), *Second section* (health care professionals' knowledge and attitudes with regards to physiotherapy management of patients admitted to the ICU), *Third section* (associations between demographic features, knowledge, and attitudes of HCPs), and *Fourth section* (features of physiotherapists working in the ICU, patients conditions managed by physiotherapists in the ICU, current physiotherapy practices applied in the ICU, equipment used by physiotherapists in the ICU, and the duration and frequency of physiotherapy sessions). The chapter concludes with a summary of the main findings.

### **4.2 First section: Socio-demographic characteristics of the HCPs**

This section presents the socio-demographic characteristics of the participants in this study, which included both physiotherapists and other HCPs. Table 4.1 below indicates that all professional categories included more females than males,

particularly among physiotherapists (52.5%), nurses (76.0%), dieticians (87.5%) and others (57.9%). However, males were predominant among doctors (54.7%), consultants (54.2%) and medical technicians (52.6%).

The majority of the HCPs (physiotherapists, doctors, and medical Technicians) were found to be within the age range of 28-33 years (37.5 - 52.6%). With respect to the type of hospital sector where HCPs work, there was only a minimal difference, with the public sector having 50.7% representation compared to 49.3% in the private sector.

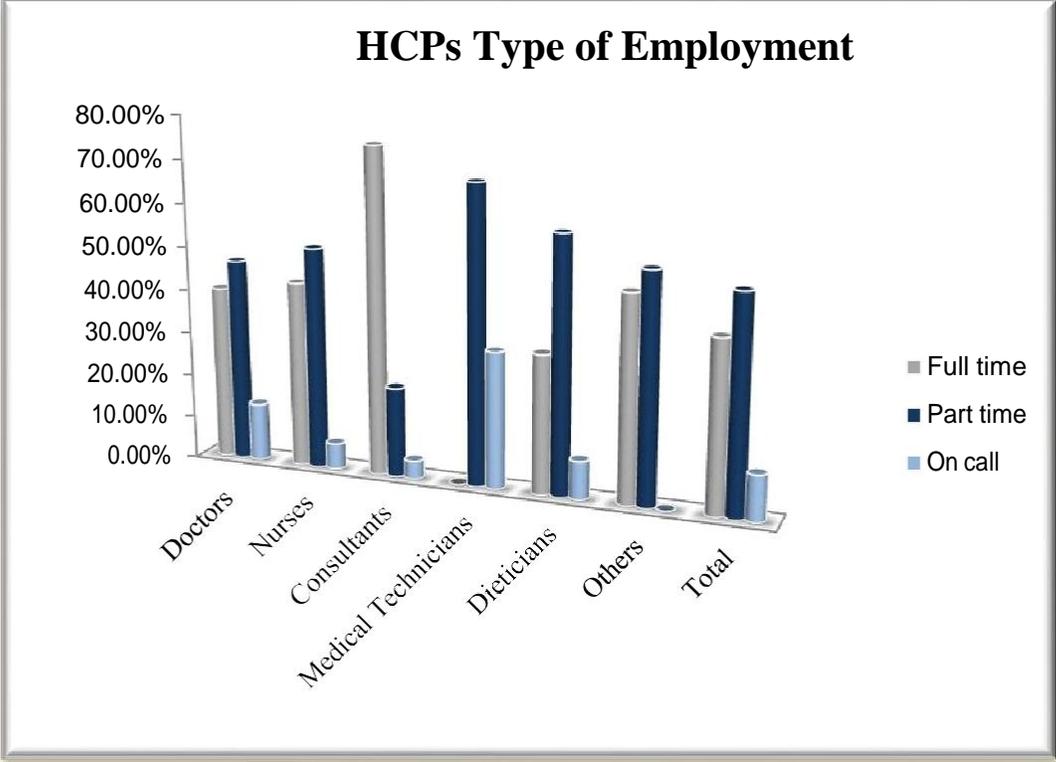
However, more physiotherapists work in the public sector (65.0%), compared to doctors and nurses, where there was a slight majority working in the private sector (55.3% and 50.2% respectively). With regards to work experience, the results suggested that the participants were significantly different in both overall years of clinical experience ( $F_{6,534}= 29.6, p<0.0001$ ) and years of ICU experience ( $F_{6,534}=28.5, p<0.0001$ ). Post hoc tests indicated that the consultants and physiotherapists were the most experienced in both overall years of clinical experience and years of ICU experience ( $p=0.0001$ ).

**Table 4.1: Socio-demographic characteristics of participants**

<b>Variables</b>	<b>Physiotherapists</b>	<b>Doctors</b>	<b>Consultants</b>	<b>Nurses</b>	<b>Medical Technicians</b>	<b>Dieticians</b>	<b>Other</b>
<b>Gender n (%)</b>							
Male	19 (47.5)	82(54.7)	13(54.2)	56(24.0)	10(52.6)	7(12.5)	8(42.1)
Female	21 (52.5)	68(45.3)	11(45.8)	177(76.0)	9(47.4)	49(87.5)	11(57.9)
Total	40(100.0)	150(100.0)	24(100.0)	233(100.)	19(100.0)	56(100.0)	19(100.0)
<b>Age n (%)</b>							
22-27	7 (17.5)	56 (37.3)	0(0.0)	157(67.4)	6(31.6)	31(55.4)	12(63.2)
28-33	15 (37.5)	69 (46.0)	1(4.2)	48(20.6)	10(52.6)	21(37.5)	4(21.1)
34-39	3 (7.5)	10(6.7)	5(20.8)	18(7.7)	0(0.0)	3(5.4)	1(5.3)
40-45	9 (22.5)	13(8.7)	10(41.7)	6 (2.6)	2 (10.5)	1 (1.8)	2(10.5)
46-51	5 (12.50)	2 (1.3)	5 (20.8)	3 (1.3)	1 (5.3)	0 (0.0)	0 (0.0)
= or >52	1 (2.5)	0 (0.0)	3 (12.5)	1(0.4)	0 (0.0)	0 (0.0)	0 (0.0)
Total	40(100.0)	150 (100.0)	24(100.0)	233(100.0)	19(100.0)	56(100.0)	19(100.0)
<b>Type of Hospital Sector n (%)</b>							
Governmental	26(65.0)	67 (44.7)	11 (45.8)	116(49.8)	6(31.6)	39(69.6)	12(63.2)
Private	14(35.0)	83 (55.3)	13(54.2)	117(50.2)	13 (68.4)	17 (30.4)	7(36.8)
Total	40(100.0)	150(100.0)	24(100.0)	233(100.0)	19(100.0)	56(100.0)	19(100.0)
<b>Experience M±SD</b>							
Years of clinical experience ( $F_{6,534}= 29.6$ , $p=0.0001$ )	10.7±7.2	3.9±2.7	11.8±7.8	3.9±4.1	4.6±2.4	3.3±2.7	3.3±3.3
Years of ICU experience ( $F_{6,534}=28.5$ , $p=0.0001$ )	7.4±5.8	2.4±1.6	7.2±4.4	2.6±2.3	3.1±1.9	2.3±2.7	2.4±3.2

**4.2.1 Type of employment of HCPs in the ICU**

The study outcome regarding the type of employment for other HCPs (aside from physiotherapists) indicates that a majority 49.75% (250/501), of HCPs work as part-time staff in the ICU in the evening and night shifts. There are more full-time staff consultants than any other profession 75% (18/24) (See Figure 4.1).

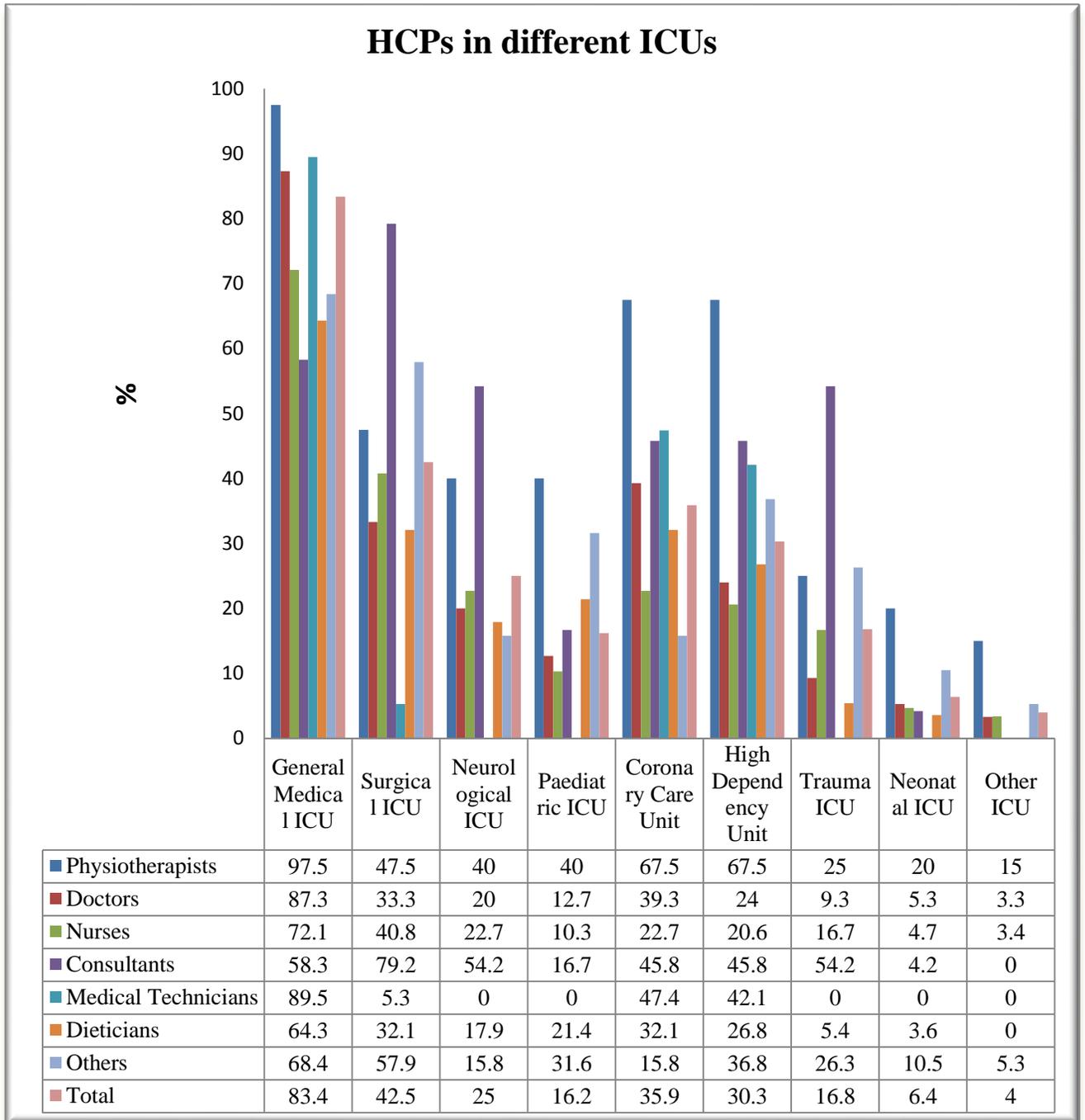


**Key: HCPs = Health Care Professionals**

**Figure 4.1: Type of employment of HCPs in the ICU**

#### **4.2.2 Distribution of HCPs working in different types of ICU**

Figure 4.2 shows the distribution of HCPs according to the ICU categories in which they work. Figure 4.2 shows that most of the HCPs - including physiotherapists - work mainly in General medical ICUs 83.4% (418/501), followed by the Surgical ICU 42.5% (213/501) The least of the listed ICU categories identified by HCPs was Other ICU (4%), which included Renal ICU, Burn ICU and Transplant ICU.



Key: HCPs = Health Care Professionals

**Figure 4.2: Distribution of HCPs in different types of ICU**

### **4.3 Second section: Knowledge and attitudes of HCPs about Physiotherapy management in the ICU**

This section presents results regarding the knowledge and attitudes of other HCPs in relation to physiotherapy management for patients admitted to the ICU.

#### **4.3.1 Knowledge of HCPs regarding Physiotherapy management in the ICU**

Analysis of captured data indicates that a majority 74.7% (374/501) of the HCPs had adequate knowledge regarding physiotherapy management in the ICU (indicated by a knowledge score  $\geq 70\%$  from a total score of 14 items) (see Table 4.2 presents the HCPs participants knowledge percentage). In addition, participants were significantly different across HCP categories with respect to their knowledge of the role of physiotherapy management in the ICU ( $\chi^2 = 28.89, p=0.0001$ ).

Pairwise comparison suggested that, with regards to knowledge, participants from four HCP categories (doctors, nurses, consultants and others) demonstrated adequate knowledge, with a significant difference to dieticians ( $p<0.05$ ). Participants from three HCP categories (doctors, nurses, and consultants) demonstrated adequate knowledge with a significant difference between them and medical technicians. Participants from two HCP categories (doctors and medical technicians) demonstrated adequate knowledge with a significant difference between those professionals who classified themselves as others ( $p<0.05$ ). Table 4.2 below provides additional detail.

**Table 4.2: Knowledge of HCPs regarding physiotherapy management in the ICU**

Knowledge score	N	Adequate n (%)	Inadequate n (%)	Mean	SD	Sig.
Doctors	150	114 (76%)	36 (24%)	10.66	1.993	0.0001
Nurses	233	183 (78.5%)	50 (21.5%)	10.91	1.951	
Consultants	24	20 (83.3%)	4 (16.7%)	11.21	2.105	
Medical technicians	19	12 (63.2%)	7 (36.8%)	9.58	1.575	
Dieticians	56	29 (51.8%)	27 (48.2%)	9.43	2.463	
Others	19	16 (84.2%)	3 (15.8%)	11.42	2.545	
Total	501	374(74.7%)	127(25.3%)	10.65	2.103	

#### 4.3.2 Attitudes of HCPs towards physiotherapists working in the ICU

Data from Table 4.3 shows that 97% (486/501) of the HCPs in this study demonstrated a positive attitude towards physiotherapists working in the ICU (attitude score of  $\geq 70\%$  from a total score of 36). The HCPs reported significant differences in attitudes towards physiotherapists working in the ICU ( $\chi^2 = 13.41$ ,  $p=0.020$ ).

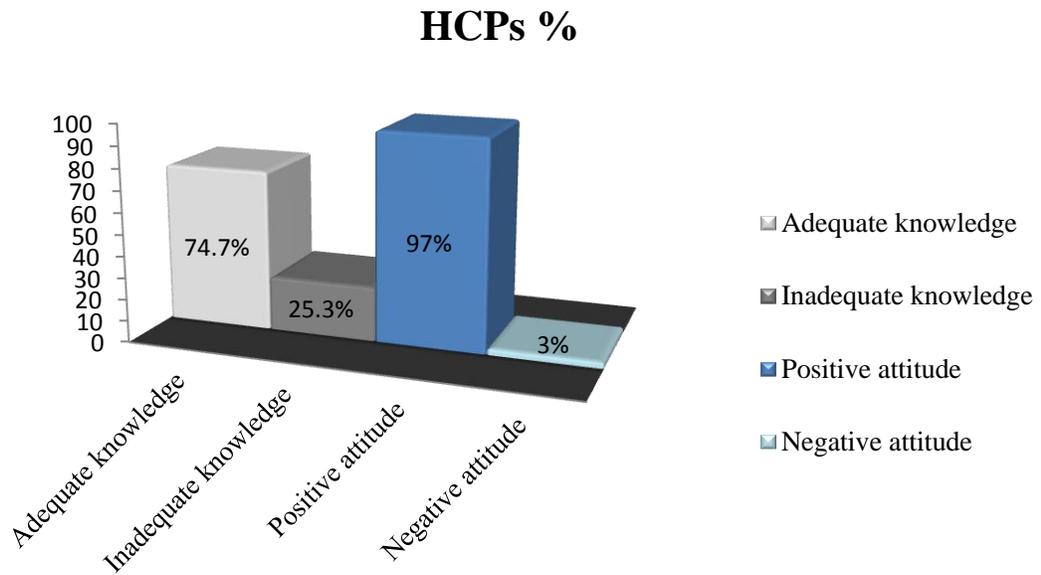
The pairwise comparison revealed that, with regards to attitude, participants from three HCP categories (doctors, nurses, and medical technicians) demonstrated significantly more positive attitudes compared to dieticians. Participants from two HCP categories (nurses and medical technicians) reported having significantly more positive attitudes than those professionals who identified themselves as other in this study ( $p<0.05$ ).

**Table 4.3: Attitudes of HCPs towards physiotherapists working in the ICU**

Attitude score	N	Positive n (%)	Negative n (%)	Mean	SD	Sig.
Doctors	150	145 (96.7%)	5 (3.3%)	33.08	3.536	0.020
Nurses	233	227 (97.4%)	6 (2.6%)	33.42	3.045	
Consultants	24	23 (95.8%)	1(4.2%)	33.17	4.007	
Medical technicians	19	18 (94.7%)	1(5.3%)	33.95	2.738	
Dieticians	56	54 (96.4%)	2 (3.6%)	32.43	3.008	
Others	19	19 (100%)	0	32.68	2.286	
Total	501	486 (97.0%)	15 (3.0%)	33.19	3.217	

**4.3.3 Overview of the knowledge and attitudes of HCPs**

Figure 4.3 presents an overview of the knowledge and attitudes possessed by HCPs working in ICUs within hospitals in Khartoum state.



Key: HCPs = Health Care Professionals

**Figure 4.3: Overview of knowledge and attitudes of HCPs**

#### **4.4 Third section: Association between socio-demographic features, knowledge and attitudes of the HCPs about physiotherapy management in the ICU**

This section presents the association between HCPs socio-demographic features, and their knowledge and attitudes towards physiotherapy management in the ICU. Pearson's Chi-square test was performed to determine the relationship between these variables.

The results of this study indicated that the overall years of clinical experience, as well as the years of experience in the ICU were two factors found to significantly and positively relate with knowledge ( $r=0.13$ ,  $p<0.003$  and  $r=0.17$ ,  $p=0.0001$  respectively).

This suggests that more experience leads to improved knowledge of the HCPs of the role of physiotherapy management of patients in the ICU. The data also indicated a significant positive relationship between knowledge and attitude ( $r=0.25$ ,  $p<0.0001$ ), implying that those with better knowledge are more likely to demonstrate a positive attitude.

#### **4.5 Fourth section: Physiotherapy practices applied in ICUs within Khartoum State**

This section presents the demographic features of the physiotherapist participants, the common patients' conditions they experience in the ICU, the techniques used to manage their patients, and the equipment they use as part of that management. The duration and frequency of physiotherapy sessions is also described.

##### **4.5.1 Socio-demographic features of the physiotherapists**

Table 4.4 describes the features of the physiotherapists who participated in this study. The data included the educational qualifications of participants, their rank within the National Council for Medical and Health Professions (NCMHP) and the nature of their employment in the ICU.

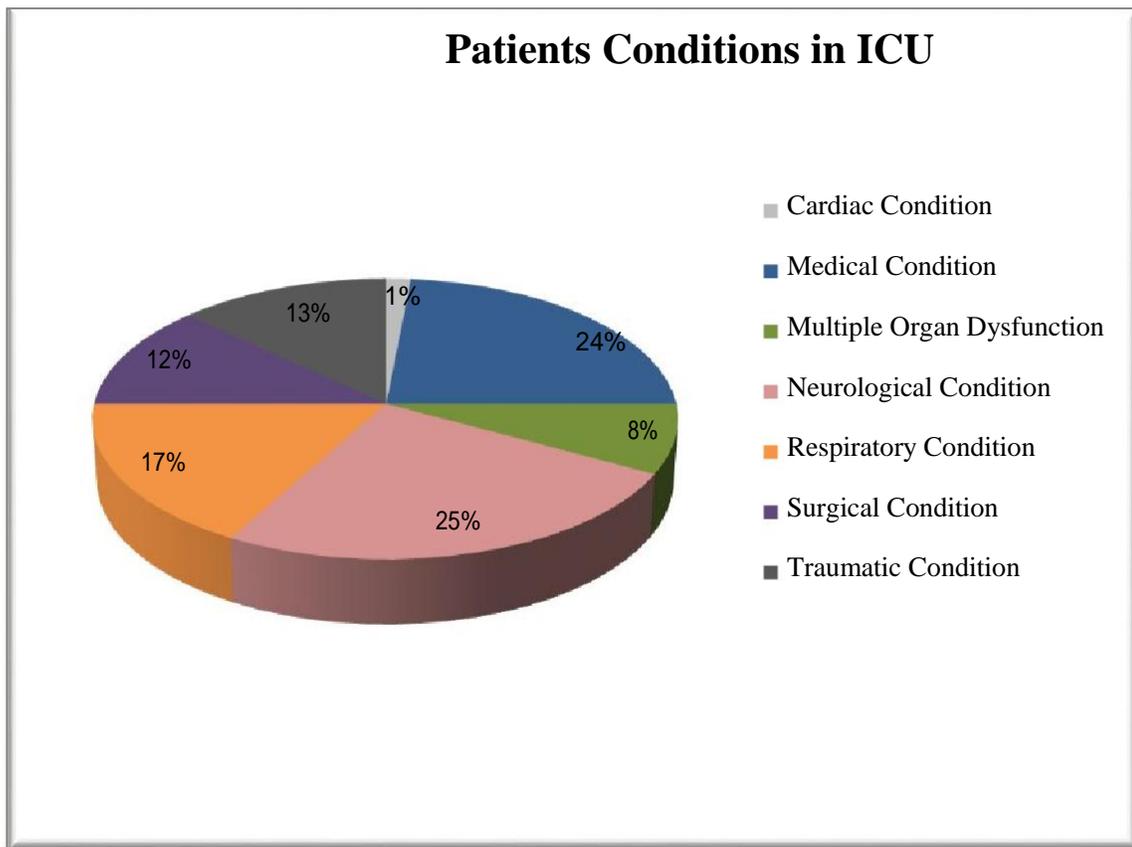
A total of 40 physiotherapists participated in the study and completed the checklists with regards to their educational qualifications and their rank within the National Council for Medical and Health Professions (NCMHP), the data shows that 47.5% of the physiotherapist had a Diploma in Physiotherapy (cadre of Assistant Physiotherapists), followed by 32.5% of physiotherapists had a Master's Degree (First Physiotherapy Specialists). In addition, according to their type of employment in the ICU, most physiotherapists (62.5%) work as rotational staff within the same hospital, with only 15% working permanently in the ICU.

**Table 4.4: Socio-demographic features of the physiotherapists**

<b>FEATURES OF PHYSIOTHERAPISTS</b>	<b>N (%)</b>
<b>Qualification</b>	
Diploma in Physiotherapy	19 (47.5%)
Bachelor degree in Physiotherapy	8 (20%)
Masters degree in Physiotherapy	13 (32.5%)
Total	40 (100%)
<b>Rank in National Council for Medical and Health Professions</b>	
Physiotherapy Assistant	19 (47.5%)
Second physiotherapy specialist	8 (20%)
First physiotherapy specialist	13 (32.5%)
Total	40 (100%)
<b>Type of employment in the ICU</b>	
On rotation from general wards	25 (62.5%)
On call in ICU	9 (22.5%)
Permanent in ICU	6 (15%)
Total	40 (100%)

#### 4.5.2 Patients conditions managed by physiotherapists in the ICU

The types of conditions that patients present with in the ICUs within Khartoum state during the period of study were reviewed. The most common patients' conditions seen were neurological conditions (25%), followed by medical conditions (24%) and respiratory conditions (17%). The category of conditions that was reported to be the least common with respect to physiotherapy management was cardiac conditions, accounting for only 1.5% of all cases seen (see Figure 4.4 below).



**Figure 4.4: Percentage of patients' conditions managed by physiotherapists in the ICU**

### 4.5.3 Physiotherapy practices used in the ICUs

According to the data presented in Table 4.5 below, the most common practices used by physiotherapists in the ICU were limb exercises (71%), percussion (68%) and mobilisation (63.5%). A specific practice like manual hyperinflation was reported to never have been used by these participants in the ICU setting.

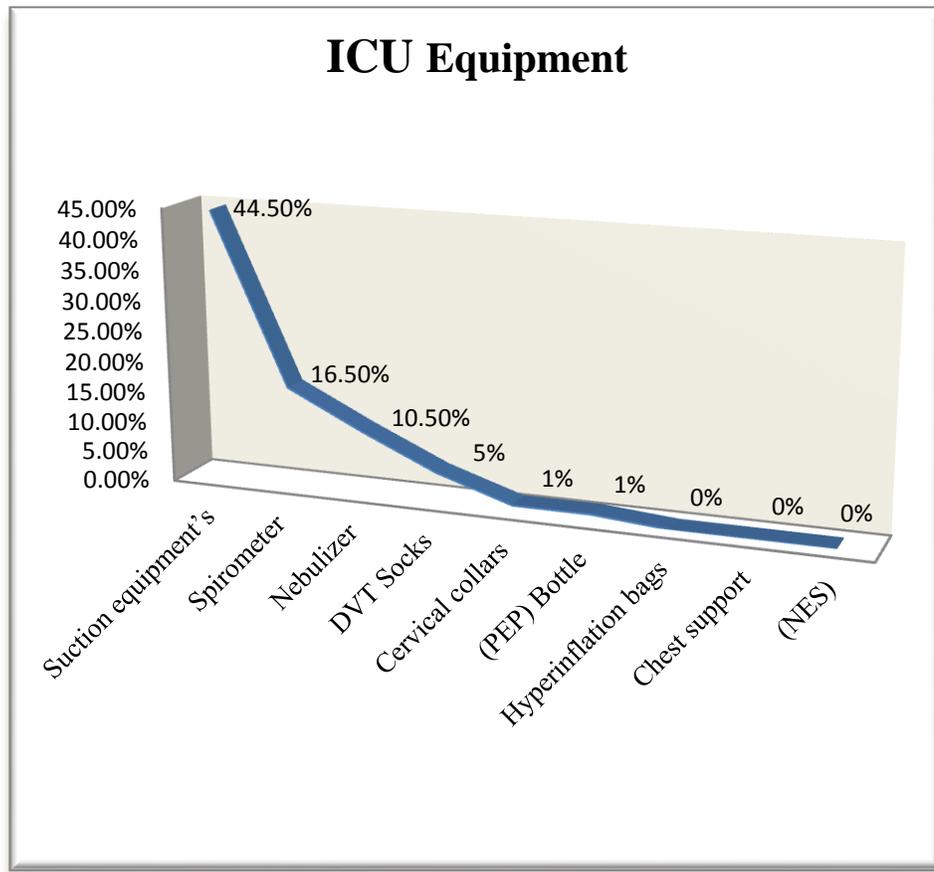
**Table 4.5: Physiotherapy practices used in different ICUs**

<b>PHYSIOTHERAPY PRACTICES</b>	<b>N (%)</b>
Manual airway clearance techniques (MACTs)	
Percussion	136 (68%)
Vibration	112 (56%)
Suctioning	81 (40.5%)
Chest manipulation and suctioning	42 (21%)
Postural drainage	53 (26.5%)
Positioning (Supine, side-lying, prone, sitting, etc.)	81 (40.5%)
Limb exercises	142 (71%)
Mobilisation	127 (63.5%)
Assisted coughing/huffing	21 (10.5%)
Breathing exercises	50 (25%)
Nebulisation	21 (10.5%)
Counselling	31 (15.5%)
DVT protocol	2 (1%)
Implementation & supervision of non-invasive (CPAP)	1 (0.5%)
Manual hyperinflation (MH)	Never used

MACTs = Manual airway clearance techniques, CPAP = Continuous positive airway pressure, DVT = Deep vein thrombosis & MH = Manual hyperinflation

#### 4.5.4 Equipment used by Physiotherapists working in the ICU

As shown in (Figure 4.5) below, the most frequently used items of equipment reported by these participants was for suctioning (44.5%), followed by spirometers (16.5%), and nebulisers (10.5%). It is noted that hyperinflation bags, chest support and neuromuscular electrical stimulation (NES) were never used at all.



Key: PEEP= Positive end-expiratory pressure, NES= Neuromuscular electrical stimulation, DVT= Deep vein thrombosis

**Figure 4.5: Physiotherapy equipment used in the ICU**

#### 4.5.5 Duration and frequency of physiotherapy sessions in the ICU

Table 4.6 below presents the number of sessions for each patient per day. Most physiotherapists (94%) reported seeing their patients for 1–2 treatment sessions per day. The difference in time spent per sessions is a significant among the three categories (1-2 treatment sessions, 3-4 and 5-6) ( $F_{2,197}=15.84$ ,  $P=0.0001$ ). Post hoc tests suggest that in mean time spent per treatment session, 5 - 6 sessions per day is significant over 1 - 2 sessions ( $P<0.05$ ). This is can be interpreted as the overall time spent in 5 – 6 session per day is more than time spent in 1 – 2 session per day.

**Table 4.6: Duration and frequency of physiotherapy sessions in the ICU**

Variables	N (%)	Mean Minute	SD	df	F	Sig.
1-2 session per day/minute	188 (94%)	24.15	9.52	2	15.84	0.0001
3-4 session per day/minute	2 (1%)	30.00	0.00	197		
5-6 session per day/minute	10 (5%)	42.00	15.49			
Total	200 (100%)	25.11	10.56			

#### 4.6 Summary

This study investigates the knowledge, attitudes and practices regarding the physiotherapy management of patients admitted to Intensive Care Units within Khartoum State in the Republic of Sudan.

The findings showed that a majority of HCPs were knowledgeable about physiotherapy management in the ICU. Furthermore, most of the HCPs who participated in this study demonstrated positive attitudes toward physiotherapists working in the ICU settings.

The statistical tests showed significant positive relationships between the level of knowledge and the attitudes towards physiotherapy.

The most common physiotherapy practices used in ICUs within Khartoum State were limb exercises, percussion, mobilisation, vibration, suctioning and positioning. Manual hyperinflation was reported to have never been used by these participants. Analysis further revealed that suctioning equipment, spirometers and nebulisers were used by physiotherapists working in the ICU. Hyperinflation bags, chest support and neuromuscular electrical stimulation (NES) were almost never used.

## **5 CHAPTER FIVE: DISCUSSION**

### **5.1 Introduction**

The chapter discusses the study findings. It presents the relevant literature that is used to interpret and explain the study findings. These findings are then discussed in relation to the aim and objectives of the study. In addition, the strengths and limitations of the research findings are presented at the end of this chapter.

### **5.2 Socio-demographic characteristic of participants**

The study revealed the numerical predominance of female HCP participants, which is consistent with the general trend in the profession. This may be a reflection of the gender disparity within the profession, which saw increased participation of women in the medical and health care professions. This trend has been called the “feminization of medicine”, where a dramatic increase in women enrollment in the medical field is leading to major shifts in the gender composition of the workforce (Ramakrishnan, Sambuco & Jagsi, 2014). Or it could be attributed to the fact that the female population in Sudan is higher than males (Population Census Council, 2008). According to a review study of health care interpersonal interactions related to gender biases and discrimination, there is a suggestion that gender- based differences have an influence on the interactions between patients and health care professionals in terms of communication and quality of care services provided (Govender & Penn-Kekana, 2008). These gender differences have been explained in terms of disparities in treatment seeking behaviour. For example, HCPs men and women perceive and report some symptoms differently, they use the health care system differently (women use it more), women are more likely to access primary health care, and men are more likely to receive more specialist referrals (Hausmann-Muela et al., 2003).

Findings of this study also indicated that most HCPs were in the third decade of their lives (28-33 years). This finding is similar to a study conducted in Sudan in which a majority of the respondents were within the same age range. This would imply that more young medical personnel are in the workplace in different specialities and ranks (Kheir, Dafaalla, Bashir, Abuelgasim & Abdalrahman, 2016).

The younger age of HCPs in the Sudanese ICUs typifies the current status of the entire field of ICU in Sudan, which is still in a state of infancy (Mohamed & Elsaid, 2010; Ahmed, 2011) and as a result, is dominated by young HCPs. In addition, the majority of the HCPs were working in General Medical ICUs possibly due to the fact most of the hospitals included in this study had the General Medical ICU as its major ICU. There is also evidence that most hospitals have a General Medical ICU as the primary ICU, which is also designed to care for a variety of critically ill patients, including adult and paediatric populations (Webb, 2016; Haupt, *et al.*, 2003).

### **5.3 Knowledge of HCPs regarding physiotherapy management in the ICU**

The results indicated that 74.7% of the HCPs who participated in this study demonstrated adequate knowledge about physiotherapy management in the ICU. This knowledge was presented in terms of the importance of physiotherapy services in the ICU in general, knowledge of commonly applied physiotherapy practices in the ICU, and the effectiveness of physiotherapy treatment on the critically ill patient, including the prevention of complications, length of stay in the hospital or ICU, functional status, and quality of life.

This finding corresponds with a survey study done by Acharya et al (2011) about physiotherapy awareness among clinical doctors in Nepal. The study found that participants had a good awareness of physiotherapy. Another study by Shimpi et al

(2014) conducted a cross sectional survey that also reported significant awareness among referring doctors about the role of physiotherapy.

On the other hand, the finding of this study contrast with those of Karthikeyan & Jones (2015) and Kutty, Gebremichael and Vargehese (2013), who reported that HCPs in Papua New Guinea and Northern Ethiopia had inadequate knowledge regarding physiotherapy services. It is surprising to note that the findings of the current study are both aligned and in contrast to studies conducted in other developing countries. Although these studies used a survey to collect data, the settings could have influenced the result. Another explanation of these differences in knowledge could be due to differences among countries, regions, populations, and even the tool used to collect data.

The finding of participants in this study having adequate knowledge about physiotherapy in the ICU may be connected to the recent surge in the development of the physiotherapy profession in Sudan, particularly Khartoum State. This development is largely attributable to the ongoing collaboration between a Sudanese institution and Norwegian collaborators, which has seen the growth of the profession in recent years both clinically, with new clinical roles and an increased focus on physiotherapy services in the ICU, and academically (Haugland, Sørtdahl, Salih, & Salih, 2014). These new roles and improved services might explain this acknowledgement of physiotherapy by other HCPs highlighted in the present findings.

The findings regarding the knowledge of HCPs about physiotherapy management in the ICU in Khartoum State suggests that they are better equipped in knowledge than HCPs in other African countries. For example, a study in Northern Ethiopia identified that nearly 50% of medical doctors had inadequate knowledge and negative attitudes towards physiotherapy (Kutty, Gebremichael & Vargehese, 2013). Although the physiotherapy profession is still in its infancy in Sudan and considered to be an emerging discipline in both Ethiopia and Sudan, there appears to be a sharp

difference between how the HCPs in these two countries perceive physiotherapy. The reason for this variance could be to the differences in the research setting. However, it should also be noted that Ethiopia has only had a single physiotherapy school in the whole country in the last decade (Brook, 2013). In contrast, there are several institutions with reputable standards of education offering physiotherapy in Sudan (Haugland, Sørsvahl, Salih, & Salih, 2014).

Health care professionals in this study demonstrated heterogeneity in their knowledge about physiotherapy management in the ICU. Nurses, doctors, and consultants had adequate knowledge compared to other HCPs in the ICU team, which may be due to the fact that these professionals work more closely with physiotherapists in the hospitals. They are also more exposed to and have more experience with patients having conditions that are amenable to physiotherapy. As a result, they may be more aware of the types of interventions that physiotherapists would tend to use in the ICU. A study in China reported that respiratory care services in the ICU are shared responsibilities between nurses, doctors, and physiotherapists (Li et al., 2012), which may partly explain why these HCPs have increased knowledge about physiotherapy relative to other ICU team members.

This study also showed that the knowledge of HCPs had a significant positive association with overall years of clinical experience, as well as the number of years of ICU experience. HCPs with more years of experience demonstrate better knowledge in their practice, acquired through their additional working experience (Quinones, 2004). This contrasts with a study done by Gomes (2010), who found a weak correlation between the number of years working in the ICU and knowledge. However, the study also reported that this correlation may be clinically insignificant.

#### **5.4 Attitudes of HCPs towards physiotherapists working in the ICU**

In the present study, it is interesting to note that 97% of HCPs working in the ICUs were found to have a positive attitude toward the physiotherapists' role in the ICU, regardless of their professions. They accepted physiotherapists as part of the ICU team, contributing to the effective management of patients through medical staff rounds, case discussions regarding the patient's condition, decisions regarding weaning from mechanical ventilation and discharge planning from both the ICU and hospital.

This positive attitude of HCPs can be interpreted in two ways. Firstly, the high percentage of adequate knowledge of the HCPs may have resulted in a high percentage of positive attitudes among them. Secondly, the Sudanese physiotherapists they worked with may have demonstrated effectively their roles in practice in the ICU, prompting positive attitudes from other team members. There is a study corroborating this finding. For example, Gupte and Swaminathan (2016) showed that nurses who worked as part of the critical care team had positive perceptions towards the role of physiotherapists in ICU. This study supports the current study regarding the positive attitudes of other HCPs towards physiotherapists in the ICU. This is important to note because the predominant attitude among medical staff will affect the process of team work as well as the referral process having a subsequent effect on patient care (Brilli et al., 2001).

Furthermore, the results of this study indicated a significant positive relationship between knowledge and attitudes, which could be interpreted as meaning that the more knowledge one acquires about other HCPs, the more positive one's attitude towards those HCPs will be. Similarly, a study regarding the knowledge, attitudes and practices around health promotion amongst physiotherapists, also found a positive relationship between knowledge and attitudes (Taukobong, Myezwa,

Pengpid & Van Geertruyden, 2015). The knowledge and attitudes of team members are considered to be significant factors that affect teamwork interaction and influence the quality of care provided in the ICU (Marino, 2007). Also, Kilner and Sheppard (2010) found positive attitudes of medical staff related to the importance of teamwork and communication in the emergency department (ED).

### **5.5 Physiotherapy Practices Applied in ICUs**

The World Confederation for Physical Therapy (WCPT) (2011) describes physiotherapy as examination, intervention, and practice patterns. In the ICU the physiotherapy practices have historically included positioning, mobilisation, manual hyperinflation, chest manipulation, suctioning, breathing and limb exercises, and postural drainage (Jones, Hutchinson & Oh, 2009). Moreover, when physiotherapy treatment is started early it helps to prevent delays in weaning patients from ventilation, improves limited mobility, and prevents total dependence on the ventilator (Kumar, Maiya & Pereira, 2008). There have been challenges in stating a clear international consensus on the standardisation of the roles and responsibilities of physiotherapists in the ICU despite the role of physiotherapy in that setting being well- established (Gosselink et al., 2008; Stiller, 2000). Studies from different countries have however described the scope of practice for physiotherapists in the ICU, including the United States (Hodgin et al., 2009), South Africa (Lottering & Van Aswegen, 2016), Nepal (Baidya, Acharya & Coppieters, 2016) and India (Kumar, Maiya & Pereira, 2008).

This was the first study looking at physiotherapy practices in the ICUs in Sudan, which did not however explore roles and responsibilities or scope of practice as was done in studies in other countries.

In the current survey within Khartoum State, several important trends were identified concerning physiotherapy practice in the ICU. This study showed differences in the qualifications of physiotherapists within the ICU setting. Although physiotherapist education can provide the basis for their practice in the ICU, it is still the responsibility of the practitioners and authorised staff in the hospital to ensure patient safety by allowing only competent clinicians to provide physiotherapy care in the ICUs (Pawlik & Kress, 2013). In Sudanese law, according to the National Council for Medical and Health Professions (NCMHP), any physiotherapists (PTs) should have licensure to ensure that practising physiotherapists have met the basic level of prerequisite training and knowledge. However, this may not adequately reflect the unique knowledge and skills possessed by physiotherapist practitioners across the ICU settings. Surprisingly, this survey clearly illustrated the variability in qualifications that physiotherapists employed in ICUs possessed. It was shown that 47.5% of physiotherapists had diplomas (physiotherapist assistants PTA) followed by 32.5% with Master's degrees (first physiotherapy specialists') and only 20% had Bachelors degrees in physiotherapy (Second physiotherapy specialists') according to their rank in the NCMHP.

This data is comparable to the findings reported by Sigera et al. (2016), who indicated that 94.4% of physiotherapists who work in the ICU in Sri Lanka were diploma holders. However, in a study conducted in India, Kumar and Shergill (2013) reported that 59% of physiotherapists working in the ICU had postgraduate physiotherapy qualifications.

One explanation for this variance in qualifications could be an indicator of the change that the physiotherapy profession has experienced during previous years. The history of physiotherapy in Sudan shows that the profession commenced as a low-status profession (Rhodes in 1989). As result, the numerous physiotherapists who worked in the field were often poorly trained due to limitations in their formal training. However, there has been a slow and steady change in the profession,

beginning by establishing a firm base in Sudan, especially at the capital Khartoum, with many new developments in the universities. These included physiotherapy education programmes with improved standards of academic training, resulting in the graduation of qualified physiotherapists with Bachelor's degrees (Haugland, Sørtdahl, Salih & Salih, 2014). While this shows a new trend and enhanced development of the profession over the past decade (Haugland, Sørtdahl, Salih, & Salih, 2014), there are still many physiotherapists in Sudan with only diploma qualifications.

This variance in qualification is associated with a difference in knowledge and skills among physiotherapists, which might be reflected in the inconsistency of their applied practice across ICUs settings. There are multiple studies showing the variability of physiotherapy practice in the ICU between countries, provinces, and specific critical units (Chaboyer, Gass & Foster, 2004; Norrenberg & Vincent, 2000; Jones, Hutchinson & Oh, 2009).

In terms of the type of employment (permanent or contract) of physiotherapist in the ICU, this study showed that the majority of physiotherapists (62.5%) had their clinical postings or duties in the ICU based on rotations from the general wards, with 22.5% of them delivering on-call physiotherapy services for patients in the ICU. Only 15% of the physiotherapists surveyed in this study were permanently posted in the ICU. Previous studies have shown a range of 66 – 96 % of physiotherapists in ICU being on call (66% in Australia, 79% in India, 83% in Europe, and 96% in South Africa) (Chaboyer, Gass & Foster, 2004; Kumar, Maiya & Pereira, 2008; Norrenberg & Vincent, 2000; Van Aswegen & Patterson, 2005). This difference in physiotherapists' employment type could be influenced by mixed factors such as specific hospital employment systems and facilities, the number of physiotherapists in hospitals and the number of physiotherapists available to provide services in the ICU settings.

The type of physiotherapy treatment delivered to patients in the ICU differed significantly depending on the patient's conditions (clinical scenario) (Hodgin, et al., 2009). The patients differ in terms of medical diagnosis and clinical scenarios but all share the need for frequent assessment and management by physiotherapists in the ICU. Regardless of the patient heterogeneity, the physiotherapist must be able to prioritise, identify the aims of treatments, ensure safety, and add therapeutic value (Stiller & Phillips, 2003; Zeppos, Patman, Adsett, Bridson & Paratz, 2007). This study revealed that physiotherapy was likely to be routinely provided to ICU patients with neurological and medical conditions (25% and 24% respectively). Likewise, Hodgin, et al. (2009) reported that patients with neurological conditions are highly in need of physiotherapy interventions relative to other conditions in the ICU. This is appropriate, given the evidence supporting the benefits of physiotherapy services in the ICU, in preventing, halting, or reversing the impairments caused by neurological disorders (Bhat, Chakravarthy & Rao, 2014).

This study showed that chest physiotherapy and rehabilitation exercises were the main roles fulfilled by physiotherapists across ICUs settings in Khartoum State. In this respect, it corresponds to findings reported in Australia and New Zealand, looking at the physiotherapy treatment approaches used in the ICU (Berney, Haines & Denehy, 2012; Denehy & Berney, 2013).

The current study showed that Sudanese physiotherapists largely utilised limb exercises (71%), mobilisation (62.5%), and positioning (40.5%) as therapeutic interventions in the management of patients in the ICU. These practices were mostly used by physiotherapists treating critically ill patients in the ICU with neurological (25%), medical (24%), and respiratory conditions (17%).

This finding corresponds to an observational cohort study done by Skinner et al. (2015) to investigate the usual physiotherapy care for patients in the ICU during

acute hospitalisation. This study found that 42% of physiotherapists believed that exercise was indicated in all ICU patients. In this study, they found that active-assisted or free active exercise was the most common form of exercise prescribed in the ICU with the aim of maintaining or restoring strength, flexibility, and endurance (Skinner, Berney, Warrillow & Denehy, 2008).

There is evidence showing that the early mobilisation of patients in the ICU is both safe and effective (Li. et al., 2012; Clark et al., 2013). With regard to positioning, Chaboyer, Gass and Foster (2004) in Australia showed that the practice of positioning patients when in the ICU was reported to occur in 100% of the cases. This is in contrast to Europe (90%) (Norrenberg & Vincent, 2000), and India (75%) (Kumar, Maiya & Pereira, 2008). In addition, a study by Thomas et al. (2006) demonstrated that a high percentage of physiotherapists (83%) agreed that rationale for positioning patients are associated with preventing pressure necrosis and improving patient comfort.

In interpreting the current study findings in terms of the relation between the patient common conditions addressed that need physiotherapy in the ICU, with the most frequent interventions applied by physiotherapists, it was recognized that patients with neurological conditions were reported to be most common in this study. Whereas, positioning was found to be the most frequent physiotherapy intervention applied in the ICUs. These findings are consistent with strong evidence showing the beneficial effects of positioning and limb exercises for patients in the Neurosurgical ICU (Olkowski et al, 2012; Brimiouille, Moraine, Norrenberg & Kahn, 1997). These studies validate and support the reality of the current study findings.

Concerning chest physiotherapy practices in the ICU, this study found that several manual airway clearance techniques and chest manipulation were used by physiotherapists while treating patients in the ICU. The most common techniques

were percussion (68%), vibration (56%), suctioning (40.5%), and postural drainage (26.5%). This corresponds with some European and Australian studies showing that chest physiotherapy, including manual airway clearance techniques is the primary responsibility of physiotherapists in the ICU used to prevent respiratory complications (Chaboyer, Gass & Foster, 2004; Norrenberg & Vincent, 2000). Furthermore, chest physiotherapy has been shown to be effective in the prevention of ventilator-associated pneumonia VAP (Ntoumenopoulos, Presneill, McElholum & Cade, 2002).

This study showed that there was little involvement of the physiotherapist (0.5%) during the implementation and supervision of non-invasive continuous positive airway pressure (CPAP). This is aligned with a South African study showing a similar finding, with 0.5% of physiotherapists involved in CPAP (Van Aswegen & Patterson, 2005).

This study indicated that manual hyperinflation technique was not being used among Sudanese physiotherapists working in the ICU (0%). This is in contrast to findings in developed countries such as Australia, where manual hyperinflation technique was commonly used by physiotherapists (92%) in the ICU for critically ill patients. In Hong Kong, about 31% of physiotherapists used the same technique in the ICU (Jones, Hutchinson & Oh, 2009). There are three possible reasons for participants of this study not using manual hyperinflation technique. Firstly, it could be due to a lack of trained and experienced physiotherapists who are able to apply the technique. Secondly, the lack of availability of hyperinflation bags in the ICU may contribute to the limited use. Thirdly, other HCPs in the ICU team may be responsible for applying this technique.

This study also reported on the equipment used by physiotherapists while treating patients in the ICU. It indicated that 44.5% of the physiotherapists frequently use suctioning equipment, and 16.5% of them used spirometers. In comparison, a Sri

Lankan survey stated that 97.1% of physiotherapists use suctioning equipment and 79.8% use spirometers (Sigera et al., 2016). In addition, the current study revealed that there were certain items of equipment, such as hyperinflation bags, chest support and neuromuscular electrical stimulator (NES) that were never used by these participants.

With regards to the duration and frequency of physiotherapy sessions in the ICU, participants in this study indicated that physiotherapy services are available on a regular basis in the ICU. In this study, 94% of the surveyed physiotherapists stated that 1-2 session per day is an ideal frequency for patients in the ICU, regardless of their medical conditions. This finding is consistent with another study conducted in Australia, UK and Hong Kong, where the authors recommended 1-2 session as an average number of treatment sessions per patient per day. The current study found that the average duration of treatment sessions lasted 24 minutes, similar to the range to the session durations found in Hong Kong, which lasted 15-20 minutes (Jones, Hutchinson & Oh, 2009). This study, therefore found that the frequency and duration of physiotherapy sessions in the ICU was similar to the standard practice in other countries.

## **5.6 Strengths and limitations of the current study**

The main strengths of this study are reflected in the fact that this study was carried out in 17 hospitals, including governmental, private, police, and army hospitals that were located in the main provinces within Khartoum State. Furthermore, the sample size in this study was relatively large (n=541), especially when compared to sample sizes of other, similar studies in different countries; in the United States (482), in South Africa (90), and in India (99) (Van Aswegen & Patterson, 2005; Kumar, Maiya & Pereira, 2008; Hodgin, et al., 2009). As a result, the findings of this study

may reflect exactly the knowledge, attitudes, and practices of all the HCPs regarding physiotherapy management in the ICU in Khartoum State. Another strength of this study is that all ICU staff - irrespective of their professions – was recruited, in order to ensure that diverse opinions were gathered from all team members in the ICU.

The main limitation of this study related to the inclusion of hospitals where physiotherapy service is provided which could lead to the bias in the result in term of knowledge and attitude of HCPs regarding physiotherapy management in the ICU. Extra limitation regarding a scoring system because by using the overall knowledge score that collapsing all questions to specific score a valuable information was lost. Therefore, it's not clear from result where the current gaps in their knowledge are.

Another limitation, the sample of participants was deliberately restricted to staff members who were working in ICU settings, excluding other medical staff in different hospital departments. Therefore, these findings do not represent the general views of HCPs in other hospital specialities about physiotherapy management in the ICU.

Furthermore, one of the study limitations is that the survey gathered subjective data from physiotherapists regarding their applied practices in the ICU, rather than using actual observational data. This could have introduced bias as physiotherapists could have over reported their practices

## **5.7 Summary**

This study is the first to directly survey the ICU team members about knowledge, attitude and practice regarding physiotherapy management in the ICU in Sudan, particularly in Khartoum State. This chapter summarises and discussing the findings regarding knowledge and attitude of other Health Care Professionals (HCPs) about physiotherapy management in the ICU. It also discussed the current physiotherapy

practices applied in the ICU in term of types of practices, equipment used as well as the frequency and duration of the treatment session. It links similar studies to this one through findings in the literature that present a rationale and interpretation of the results obtained in this survey. Furthermore, it concludes by discussing the main strength of the study with regard large sample size. As well as it addressed the limitations such as restricted the participant's sample to staff members in ICU while excluding other medical staff.

## **6 CHAPTER SIX: SUMMARY, CONCLUSION, CLINICAL IMPLICATIONS AND RECOMMENDATIONS**

### **6.1 Introduction**

This chapter presents the summary, conclusion, clinical implications and recommendations that emerged from the findings of the study. The summary section presents an overview of the entire thesis about knowledge, attitudes and practice regarding physiotherapy management of patients admitted to ICU in Khartoum State. The conclusion is based on the results of the study. Furthermore, the clinical implications of the study are identified, and recommendations are outlined based on the findings of the study.

### **6.2 Summary**

Physiotherapy is a cornerstone of management of patients in the ICU, where Physiotherapists, as rehabilitation experts, form an important part of the inter-professional team that cares for critically ill patients in intensive care units (ICUs) worldwide.

The study aimed to determine the knowledge, attitudes and practices regarding the physiotherapy management of patients in the ICU in Khartoum State – Republic of Sudan. In order to achieve this aim, the study determined the following:

- Health care professionals' knowledge with regards to physiotherapy management in the ICU.
- Health care professionals' attitudes towards physiotherapists working in the ICU.
- The association between variables such as demographic features, knowledge, and attitudes of HCPs.
- The current physiotherapy practices applied to patients in ICUs in Khartoum state.

The study used a quantitative method that utilised two survey instruments; a questionnaire and checklist. These instruments were evaluated comprehensively by applying validity testing, reliability testing and pilot testing.

A total of 501 questionnaires and 200 checklists were used to collect information from the HCP participants who were working in the ICUs in 17 hospitals, located in Omdurman, Khartoum, and Bahari provinces in Khartoum state.

The results showed that a majority of HCPs (74.7%) had adequate knowledge about the physiotherapy management of patients in the ICU, and that 97% of them demonstrated positive attitudes towards physiotherapists working in ICU settings. Statistical tests showed a significant positive relationship between knowledge and attitudes, suggesting that those HCPs with more knowledge were more likely to demonstrate a positive attitude towards physiotherapy. With regard to the common physiotherapy practices utilised in ICUs within Khartoum state, the study indicated that manual airway clearance techniques (MACTs) were the most frequently used chest physiotherapy techniques in the ICU. Limb exercises, mobilisations, and positioning were frequently used for patients in the ICU patients as part of their physiotherapy management. However, manual hyperinflation was reported by these participants to never have been used by physiotherapists in the ICU. In addition, participants recommended the use of equipment, such as suctioning equipment, spirometers and, and nebulisers. Participants also reported that hyperinflation bags, chest support and neuromuscular electrical stimulation (NES) had never been used.

Furthermore, participants reported that 1-2 sessions of treatment per patient per day are an ideal frequency in the ICU patient, regardless of their medical conditions. Participants also indicated that 24 minutes was the average duration of physiotherapy sessions in the ICU.

### **6.3 Conclusion**

This research reflects the real situation of physiotherapy profession in the ICUs by providing an informative and detailed picture of the Knowledge, attitudes, and practices regarding physiotherapy management of patients admitted to Intensive

Care Units in Khartoum State, Sudan. The study identified that HCPs working in the ICU team that participated in this study have adequate knowledge and positive attitudes regarding physiotherapy management in the ICU. It also identified that chest physiotherapy and rehabilitation were the most frequent approaches used in the physiotherapy management of critically ill patients in the ICU.

#### **6.4 Clinical implications and relevance**

This thesis has several relevant and noteworthy clinical implications. Firstly, it provides new information to the health sectors in Sudan about the level of knowledge, attitudes and practices regarding physiotherapy management in the ICU among HCPs in Khartoum State. In addition, it also identified the priorities and resources required for the improvement of the physiotherapy profession in the ICU.

Secondly, the study emphasises the necessity of physiotherapy care in the management of patients in the ICU, as well as the value of the physiotherapist as part of the multidisciplinary team. This addition to HCPs knowledge will contribute to enhanced teamwork in the ICU, and accordingly improve the quality of care of the patients. Thirdly, the research findings are informative for the Sudanese Physiotherapy Association, detailing the current trends of physiotherapy care in the ICU, and identifying the differences between addressed practices used by physiotherapists in Khartoum with what internationally accepted. As a result, physiotherapists may gain a more informed understanding and appreciation of their role in the critical care setting, as well as provide increased opportunities for further professional development, leading to improved standards of service delivery in Sudanese ICUs.

Finally, the overall study outcomes add to the international body of knowledge, given that there are no previous studies in Sudan on the knowledge, attitudes, and practices regarding physiotherapy management of patients admitted to ICUs. The Ministry of Health and other related authorities will be alerted to the study findings to improve the planning and delivery of these services.

## 6.5 Recommendations

Based upon the study findings further research in critical care physiotherapy in Sudan is recommended. These recommendations are:

- The study recommends more emphasis on training of physiotherapists in the ICU. The training must focus on certain practices that are not being used by physiotherapists in the ICU such as manual hyperinflation. In addition, further research into the use of manual hyperinflation by physiotherapists in the ICU as part of their management of the patients should be undertaken.
- Future research is recommended which should include direct observational studies in order to identify the actual physiotherapy practices used in ICU.
- In depth clinical studies should be performed in order to determine the effectiveness of physiotherapy interventions for patients who survive from critical illness, with an added emphasis on the determination of the specific types of patients' conditions which will be most efficacious.
- Future surveys should be conducted in order to investigate physiotherapists' roles in rehabilitation in the ICU. This is in addition to the factors that may affect the provision of physiotherapy service interventions for critically ill patients in the ICU.
- The Sudanese physiotherapists should also engage in post-graduate studies especially in the critical care physiotherapy field.
- The Sudanese physiotherapists association should provide opportunities for further professional development courses.

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## 8. APPENDICES

### Appendix A: Survey Questionnaire

Knowledge and attitudes of health care professionals regarding physiotherapy management of patients admitted to intensive care units in Khartoum state

#### Section A: Demographic Data

✓ Please answer the following questions. All response will remain confidential

1. Gender:  Male  Female
2. Which age group do you belong to:  
 22 – 27  28 – 33  34 – 39  40 – 45  46 -51  52 and above
3. What type of hospital are you employed in?  
 Governmental  Private
4. What is your profession?  
 Doctor  Nurse  Consultant  Dietician  
 Medical technicians  Other, Please specify other\_\_\_\_\_
5. What is your employment type?  
 Full -Time  Part-Time  On call  other, please explain\_\_\_\_
6. Duration of clinical experience in your profession: month/year:\_\_\_\_\_
7. In which ICU setting are you currently working (You can select more than one option)  
 General Medical ICU  Surgical ICU  Neurological ICU  Pediatric ICU  
 Coronary Care Unit (CCU)  Mixed High Dependency Unit (HDU)  
 Trauma ICU  Neonatal ICU  Others, specify\_\_\_\_\_
8. Duration of experience in ICU: month/year:\_\_\_\_\_

#### Section B: Knowledge Regarding Physiotherapy Management of Patients in the ICU

✓ For each of the following statement about physiotherapy management in ICU, please indicate whether you think they are TRUE or FALSE by ticking in appropriate box

Statement	True	False	I don't know
1. Physiotherapy is integral part of the management of patients in ICUs			
2. Physiotherapy service is provided to ICU patients during the recovery from critical illness			
3. Physiotherapist can provide services in different type of ICU like (CCU and HDU)			
4. The lack of early physiotherapy care involvement in patients admitted to ICU associated with increased pulmonary and functional complications			
5. The most common techniques used by physiotherapists in the ICU are limb exercises and breathing exercises			
6. Incontinence care like (Catheter ) is part of physiotherapy care for ICU patients			
7. Early Physiotherapy management prevent delay in weaning from mechanical ventilation for ICU patient			
8. Manual hyperinflation (MH) One of the physiotherapy intervention for ICU patients			
9. Chest physiotherapy can improve the respiratory function of patient admitted to ICU			
10. Mobilization technique by physiotherapist can improve functional status of patient in ICU			
11. Physiotherapist can provide diet therapy service for ICU patients			
12. Percussion, vibrations and suction are techniques used by physiotherapist to treat patients in ICU			
13. Physiotherapy management reduce the length of stay (LOS) of patients in the ICU			
14. Physiotherapy interventions have a negative impact on the quality of life of patients managed in the ICU			

### Section C: Attitudes towards Physiotherapists Working in ICU

✓ Please mark each statement below according to how much you agree or disagree with it.

✓ N.B: Please don't leave blank

Statement	Agree	Neutral	Disagree
1. It is necessary to have physiotherapy care services in the ICU			
2. Physiotherapist participation in management of patients in ICU is essential and must be considered			
3. In any hospital there is urgent need to employ respiratory physiotherapist that deal with pulmonary complications of patients in the ICU			
4. From your experience, physiotherapist has important role in management of ICU patient			
5. It's important to have teamwork between the Physiotherapist and other Healthcare Professionals in ICU to improve patient care.			
6. Physiotherapist must be a part of routinely medical staff round in ICU			
7. Sending request to physiotherapist to attend the patients in ICU is essential			
8. Physiotherapist should always participate with other medical staff members in case discussion regarding patient's progress in ICU			
9. Physiotherapist should be involve in decision regarding patient weaning from mechanical ventilation in ICU			
10. Physiotherapy care for patients managed in the ICU is effective			
11. The referral between medical staff and physiotherapist regarding ICU patients is rarely practiced			
12. Physiotherapist should be involved with other medical staff in discharge decision regarding ICU patients			

*Thank you for your participation!*

## Appendix B

استبيان حول معرفة ومواقف المتخصصين في الرعاية الصحية فيما يتعلق بتقديم خدمة العلاج الطبيعي للمرضى في وحدات العناية المكثفة في ولاية الخرطوم

### القسم (أ) البيانات الديموغرافية

الرجاء الإجابة على الأسئلة التالية. سيتم الحفاظ على سرية الإجابات.

١. النوع:  ذكر  أنثى

٢. ما هي الفئة العمرية التي تنتمي إليها:

٢٧-٢٢  ٢٨-٣٣  ٣٤-٣٩  ٤٠-٤٥  ٤٦-٥١  ٥٢ فما فوق

٣. ما هو نوع المستشفى الذي تعمل به:  حكومي  خاص

٤. ما هو تخصصك؟

طبيب  ممرض  استشاري  أخصائي تغذية علاجية

طبيب تقني  أخرى (من فضلك حدد) .....

٥. نوع الخدمة؟

دوام كامل  دوام جزئي  عند الطلب

أخرى (من فضلك اشرح) .....

٦. فترة الخبرة السريرية في تخصصك: شهر/سنة؟ .....

٧. في أي وحدات العناية المكثفة تعمل حالياً (يمكن اختيار أكثر من إجابة واحدة)؟

وحدة العناية المكثفة العامة  وحدة العناية المكثفة الجراحية

وحدة العناية المكثفة للأعصاب  وحدة العناية المكثفة للأطفال

وحدة العناية المكثفة لأمراض القلب  وحدة العناية الفائقة المختلطة

وحدة العناية المكثفة للصدمات  وحدة العناية المكثفة للأطفال حديثي الولادة

أخرى (حدد) .....

٨. فترة الخبرة في وحدة العناية المكثفة: شهر/سنة .....

القسم (ب) معرفة إدارة العلاج الطبيعي للمرضى في وحدة العناية المكثفة

الرجاء توضيح إذا ما كنت تعتقد صحة أو خطأ العبارات التالية حول إدارة العلاج الطبيعي في وحدة العناية المركزة، وذلك بوضع علامة في الخانة المناسبة:

العبرة	صحيحة	خطأ	لا أعلم
١. العلاج الطبيعي جزء أساسي من إدارة المرضى في وحدات العناية المكثفة			
٢. تقدم خدمات العلاج الطبيعي للمرضى في وحدات العناية المكثفة خلال التعافي من الأمراض الخطيرة			
٣. يستطيع أخصائي العلاج الطبيعي تقديم الخدمات في مختلف أنواع وحدات العناية المكثفة مثل (وحدة العناية المكثفة لأمراض القلب CCU، وحدة العناية الفائقة المختلطة HDU)			
٤. يرتبط عدم توفير خدمات العلاج الطبيعي مبكراً للمرضى في وحدات العناية المكثفة بزيادة المضاعفات الرئوية والوظيفية			
٥. أكثر التقنيات التي يستخدمها أخصائيي العلاج الطبيعي في وحدات العناية المكثفة هي تمارين الأطراف وتمارين التنفس			
٦. الرعاية المقدمة في حالة سلس البول مثل (القسطرة) هي جزء من خدمات العلاج الطبيعي للمرضى في وحدات العناية المكثفة			
٧. توفير خدمات العلاج الطبيعي المبكرة يمنع التأخر في التخلص من استخدام التنفس الاصطناعي لمرضى وحدة العناية المكثفة			
٨. المضخة اليدوية هي واحدة من أساليب العلاج الطبيعي المستخدمة لمرضى وحدة العلاج الطبيعي			
٩. العلاج الطبيعي للصدر يمكن أن يحسن وظائف التنفس لمرضى وحدات العناية المكثفة			
١٠. تقنيات الحركة التي يستخدمها أخصائيي العلاج الطبيعي يمكن أن تحسن الحالة الوظيفية للمرضى في وحدات العناية المكثفة			
١١. أخصائيي العلاج الطبيعي يستطيع أن يقدم خدمات العلاج الغذائي للمرضى في وحدات العناية المكثفة			

			١٢.الصفق/النقر، الاهتزاز والشفط هي أساليب يستخدمها أخصائي العلاج الطبيعي لعلاج مرضى وحدات العناية المكثفة
			١٣.تقديم خدمات العلاج الطبيعي يقلل من طول فترة بقاء المرضى في وحدة العناية المكثفة
			١٤.العلاج الطبيعي له آثار سلبية على نوعية حياة المرضى في وحدات العناية المكثفة

### القسم (ج) المواقف تجاه أخصائيي العلاج الطبيعي العاملين في وحدات العناية المكثفة

الرجاء وضع علامة في المكان المناسب توضح درجة الموافقة أو عدم الموافقة على العبارات أدناه:

ملحوظة: رجاء، لا تترك فراغاً

العبارات	أوافق	محايد	لا أوافق
١.توفير خدمة العلاج الطبيعي في وحدات العناية المكثفة أمر ضروري			
٢. مشاركة أخصائيي العلاج الطبيعي في علاج المرضى في وحدات العناية المكثفة أمر أساسي يجب مراعاته			
٣. توجد حاجة ملحة في جميع المستشفيات لتوظيف أخصائيي علاج طبيعي تنفسي يمكنه التعامل مع المضاعفات الرئوية للمرضى في وحدات العناية المكثفة.			
٤. من خلال تجربتك، لأخصائيي العلاج الطبيعي دور هام في علاج المرضى في وحدات العناية المكثفة.			
٥. من المهم أن يكون هناك فريق عمل يضم أخصائيي علاج طبيعي بالإضافة إلى الممارسين الصحيين الآخرين في وحدة العناية المكثفة لتحسين الرعاية الصحية المقدمة للمرضى.			
٦. ينبغي أن يكون أخصائيي العلاج الطبيعي جزءاً من الفريق الطبي خلال الجولات الروتينية في وحدات العناية المكثفة			
٧. طلب حضور أخصائيي العلاج الطبيعي لمعاينة المرضى في وحدات العناية المكثفة أمر أساسي			
٨. ينبغي أن يشارك أخصائيي العلاج الطبيعي دائماً مع أعضاء الفريق الطبي في مناقشة حالة المرضى وتقديمهم العلاجي في وحدات العناية المكثفة			
٩. ينبغي أن يشارك أخصائيي العلاج الطبيعي في قرار فصل التنفس الصناعي عن المرضى في وحدات العناية المكثفة			
١٠.العلاج الطبيعي فعال للمرضى في وحدات العناية المكثفة			

			١١. لا تتم إحالة مرضى وحدات العناية المكثفة ما بين الفريق الطبي وأخصائي العلاج الطبيعي إلا نادراً
			١٢. ينبغي أن يشارك اخصائي العلاج الطبيعي مع أفراد الفريق الطبي في قرار خروج المرضى من وحدات العناية المكثفة

شكراً لمشاركتك

**Appendix C: Survey Checklist**  
**Physiotherapist practices in ICU**

**Section A: Hospital Information**

1. Type of hospital:  Governmental     Private
2. Number of beds in ICU: \_\_\_\_\_

**Section B: Physiotherapist profile / Personal information**

1. Gender:  Male     female
2. Which age group do you belong to:  
 22 – 27     28 – 33     34 – 39  
 40 – 45     46 -51     52 and above
3. Please indicate the highest physiotherapy qualification you have attained :  
 Diploma in physiotherapy     Bachelor degree in physiotherapy  
 Masters in physiotherapy     PhD in physiotherapy     Other, Please specify \_\_\_\_\_
4. Current position as physiotherapist:  
 New graduated (with temporary registration in Sudanese National Council for Medical & Health Profession)     Physiotherapy Assistant  
 Second physiotherapy specialist     First physiotherapy specialist  
 Physiotherapy consultant     Other, Please specify \_\_\_\_\_
5. Duration of experience as physiotherapist: month/year: \_\_\_\_\_
6. Duration of experience in ICU: month/year: \_\_\_\_\_
7. State the area of ICU where you worked in or currently working. (You can select more than one option)  
 General Medical ICU     Surgical ICU     Neurological ICU     Pediatric ICU  
 Coronary Care Unit (CCU)     Mixed High Dependency Unit (HDU)  
 Trauma ICU     Neonatal ICU     Others, specify \_\_\_\_\_
8. Your employment type in the ICU:  On rotation from general wards     On call in ICU     Permanent in ICU

### Section C: Patient general information

✓ Please complete the sections by provide information regarding your patient physiotherapy management in ICU.

1. Patient diagnosis: \_\_\_\_\_

2. Which of the following reasons for the patient referral or admission to ICU:

Shock  Respiratory Failure  Pneumonia  Aspiration  Cardiac Failure

Renal Failure  Trauma  General surgery  Infectious diseases

Oncology  vascular problems  Gastrointestinal Disorders  Endocrine disorders

Neurological Disorders  Drug Ingestion and Drug Overdose

Organ Transplant  Others, please specify \_\_\_\_\_

3. Length of overall physiotherapy treatment session for patient mentioned above :

➤ Duration of session (In minute) \_\_\_\_\_

➤ Frequency of session (Exact Number) \_\_\_\_\_

### Section D: Physiotherapist practices in ICU

✓ Please tick on the physiotherapy techniques that you have been applied for patient mentioned above in ICU. (You can select more than one option)

A. Manual airway clearance techniques

Percussion

Vibration

Suctioning

Chest manipulation and suctioning

Postural drainage

B.  Positioning (Supine, side-lying, prone, sitting, etc.)

A.  Limb exercises

B.  Mobilization

C.  Manual Hyperinflation (MHI)

D.  Assisted Coughing/huffing

E.  Breathing exercises

F.  Implementation & supervision of noninvasive continuous positive airway pressure (CPAP)

- G.  Nebulization
- H.  DVT Protocol
- I.  Counseling
- J.  Other, Please specify \_\_\_\_\_

### **Section E: Equipment's used regularly in ICU**

✓ Please tick on the equipment that you used for physiotherapy treatment of patient mentioned above. (You can select more than one option)

- A.  Suction equipment's
- B.  Nebulizer
- C.  Hyperinflation bags
- D.  Chest support
- E.  Cervical collars
- F.  Positive expiratory pressure (PEP) Bottle
- G.  Spirometer
- H.  Neuromuscular electrical stimulation (NES)
- I.  DVT Socks
- J.  Others, Please specify \_\_\_\_\_

*Thanks*

## Appendix D

### قائمة مرجعية حول ممارسات أخصائي العلاج الطبيعي في وحدات العناية المكثفة

#### القسم (أ) معلومات حول المستشفى:

١. نوع المستشفى:  حكومي  خاص

٢. عدد الأسرة في وحدة العناية المكثفة: .....

#### القسم (ب) معلومات حول أخصائي العلاج الطبيعي/المعلومات الشخصية:

١. النوع:  ذكر  أنثى

٢. الفئة العمرية:  ٢٧-٢٢  ٣٣-٢٨  ٣٩-٣٤  ٤٠-٤٥  ٤٦-٥١  ٥٢ فما فوق

٣. حدد أرفع المؤهلات التي نلتها في تخصص العلاج الطبيعي:

دبلوم العلاج الطبيعي  بكالوريوس العلاج الطبيعي

ماجستير العلاج الطبيعي  دكتوراة في العلاج الطبيعي

أخرى (من فضلك حدد) .....

٤. الوظيفة الحالية كأخصائي العلاج الطبيعي:

خريج حديث (حاصل على تسجيل مؤقت في مجلس المهن الطبية والصحية)

مساعد علاج طبيعي  أخصائي علاج طبيعي ثاني

أخصائي علاج طبيعي أول  استشاري علاج طبيعي

أخرى (حدد) .....

٥. فترة الخبرة السريرية في تخصصك: شهر/سنة؟ .....

٦. فترة الخبرة في وحدة العناية المكثفة: شهر/سنة .....

٧. في أي من وحدات العناية المكثفة تعمل حالياً (يمكن اختيار أكثر من إجابة واحدة)؟

وحدة العناية المكثفة العامة  وحدة العناية المكثفة الجراحية

وحدة العناية المكثفة للأعصاب  وحدة العناية المكثفة للأطفال

- وحدة العناية المكثفة وأمراض القلب
- وحدة العناية المكثفة للمختلطة
- وحدة العناية المكثفة للصددمات
- وحدة العناية المكثفة للأطفال حديثي الولادة
- أخرى (حدد) .....
٨. نظام العمل في وحدة العناية المكثفة:
- ورديات في العنابر العامة
- عند الطلب في وحدة العناية المكثفة
- دوام كامل في وحدة العناية المكثفة

#### القسم (ج) المعلومات العامة حول المرضى

الرجاء إكمال هذا القسم وإعطاء معلومات حول إدارة خدمة العلاج الطبيعي لمريضك في وحدة العناية المكثفة:

١. تشخيص المريض: .....
٢. ما هو سبب تحويل أو دخول المريض لوحدة العناية المكثفة:
- الصدمة العصبية
- توقف التنفس
- الالتهاب الرئوي
- الشفط الرئوي
- قصور القلب
- الفشل الكلوي
- الصدمة النفسية
- الجراحة العامة
- الأمراض المعدية
- الأورام
- مشاكل الأوعية الدموية
- اضطرابات الجهاز الهضمي
- اضطرابات الغدد الصماء
- اضطرابات الجهاز العصبي
- ابتلاع الأدوية أو الجرعة الزائدة
- زراعة الأعضاء
- أخرى، من فضلك حدد .....
٣. طول جلسة العلاج الطبيعي للمريض المذكور أعلاه:
- مدة الجلسة (بالدقائق) .....
- عدد الجلسات (العدد بدقة) .....

#### القسم (د) ممارسات أخصائي العلاج الطبيعي في وحدة العناية المكثفة

الرجاء تحديد أساليب العلاج الطبيعي المطبقة على المريض المذكور أعلاه في وحدة العناية المكثفة (يمكن أن تختار أكثر

من خيار واحد)

- أ.  الصفق/النقر
- ب.  الاهتزاز
- ج.  الشفط
- د.  تحريك الصدر والشفط

- هـ.  التموضع (استلقاء، الاستلقاء على الجانب، الانبطاح، الجلوس، الخ)
- و.  التحريك
- ز.  المضخة اليدوية
- ح.  النزح الوضعي
- ط.  المساعدة على السعال/النفخ
- ي.  تقنيات توسعة الشعب الهوائية يدوياً
- ك.  تمارين التنفس
- ل.  تنفيذ والإشراف على طريقة ضغط المجرى الهوائي الايجابي المستمر الموسع
- م.  استخدام البخاخات
- ن.  بروتوكول الجلطة
- س.  الإرشاد
- ع.  أخرى، رجاء حدد .....

#### القسم (هـ) المعدات المستخدمة بانتظام في وحدة العناية المكثفة

الرجاء، وضع علامة على الأجهزة التي تستخدمها في العلاج الطبيعي للمريض المذكور أعلاه (يمكن أن تحتار أكثر من إجابة واحدة)

- أ.  أجهزة الشفط
- ب.  بخاخ
- ج.  المضخة اليدوية
- د.  دعامات الصدر
- هـ.  دعامة العنق
- و.  زجاجة ضغط الزفير الايجابي (PEP)
- ز.  مقياس التنفس
- ح.  التحفيز الكهربائي العصبي العضلي
- ط.  جوارب الجلطة
- ي.  أخرى، رجاء حدد .....

شكراً



## Appendix E

### UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

*Tel: +27733849286 Fax: 9591217*

E-mail: [tsabeeh.alfadil@yahoo.com](mailto:tsabeeh.alfadil@yahoo.com)

#### CONSENT FORM

**Title of Research Project:** Knowledge, attitudes and practices regarding physiotherapy management of patients admitted to Intensive Care Units in Khartoum State

The study has been described to me in language that I understand. My questions about the study have been answered. I understand what my participation will involve and I agree to participate of my own choice and free will. I understand that my identity will not be disclosed to anyone. I understand that I may withdraw from the study at any time without giving a reason and without fear of negative consequences or loss of benefits.

**Participant's name**.....

**Participant's signature**.....

**Date**.....

---

Consent Form  
September 2014

Version Date: 15

## Appendix F



### UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

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E-mail: [tsabeeh.alfadil@yahoo.com](mailto:tsabeeh.alfadil@yahoo.com)

#### استمارة الموافقة

عنوان البحث المقترح: المعرفة، المواقف والممارسات تجاه إدارة العلاج الطبيعي للمرضى في وحدات العلاج المكثف بولاية الخرطوم

تم شرح موضوع الدراسة لي بلغة أفهمها. وتمت الإجابة عن الأسئلة التي طرحتها حولها. أدرك ما ستشمله مشاركتي في هذا البحث، وستكون مشاركتي بناء على اختياري ووفقاً لإرادتي الحرة. أدرك أنه لن يتم الكشف عن هويتي لأحد. وأدرك أن بإمكانني الانسحاب من الدراسة في أي وقت بدون إبداء أي أسباب. ودون خوف من التعرض لعواقب سلبية أو فقدان منفعة ما.

اسم المشارك: .....

توقيع المشارك: .....

التاريخ: .....

Consent Form  
2014

Version Date: 15 September



UNIVERSITY of the  
WESTERN CAPE

## Appendix G

### OFFICE OF THE DEAN: DEPARTMENT OF RESEARCH DEVELOPMENT

08 September 2015

#### To Whom It May Concern

I hereby certify that the Senate Research Committee of the University of the Western Cape approved the methodology and ethics of the following research project by:

Ms T Abd alrahman Alfadil (Physiotherapy)

Research Project: Knowledge attitudes and practices regarding physiotherapy management of patients admitted to Intensive Care Units in Khartoum State.

Registration no: 15/6/5

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

The Committee must be informed of any serious adverse event and/or termination of the study.

*Ms Patricia Josias*

*Research Ethics Committee Officer*

*University of the Western Cape*

Private Bag X17, Bellville 7535, South Africa  
T: +27 21 959 2988/2948 . F: +27 21 959 3170  
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Appendix H  
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E-mail: [tsabeeh.alfadil@yahoo.com](mailto:tsabeeh.alfadil@yahoo.com)

**INFORMATION SHEET**

**Project Title: : Knowledge, attitudes and practices regarding physiotherapy management of patients admitted to Intensive Care Units in Khartoum State**

**What is this study about?** This is a research project being conducted by Tsabeeh Abd alrahman Alfadil at the University of the Western Cape. We are inviting you to participate in this research project because you are a health care professional that is involved in the care of patients admitted to intensive care units. The purpose of this research project is to determine Knowledge, attitudes and practices regarding physiotherapy management of patients admitted to Intensive Care Units in Khartoum State.

**What will I be asked to do if I agree to participate?** You will be asked to complete a questionnaire or a checklist according to your medical speciality. The study will be done in 17 hospitals at Khartoum State. The questionnaire and checklist will be given out and is expected to be completed within 7 days; the researcher will collect them after 7 days.

**Would my participation in this study be kept confidential?**

We will keep your personal information confidential. To help protect your confidentiality, we will keep your personal information confidential and no participant will be named during the process of completing the questionnaire or checklist. To maintain the confidentiality of the data, the researcher will have locked filing cabinets and storage areas to store completed questionnaires and

checklists. In addition identification codes will be used on data forms, and password-protected computer files. The survey will be anonymous and will not contain information that may personally identify you.

If we write a report or article about this research project, your identity will be protected to the maximum extent possible.

**What are the risks of this research?**

There are very few risks associated with participating in this research project. The risk may involve participants feeling uncomfortable when providing information about their colleagues. The risk will be taken care of via complete confidentiality of the information gathered.

**What are the benefits of this research?**

The benefits of the study include: - comprehensive presentation of the level of awareness among HCPs regarding the importance of physiotherapy care in the ICU. The physiotherapists could benefit through better understanding of their role in ICU.

**Do I have to be in this research and may I stop participating at any time?**

Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify.

**What if I have questions?** This research is being conducted by Tsabeeh Abd alrahman Alfadil of the Physiotherapy Department at the University of the Western Cape. If you have any questions about the research study itself, please contact Tsabeeh Abd alrahman Alfadil at +27733849286 – [tsabeeh.alfadil@yahoo.com](mailto:tsabeeh.alfadil@yahoo.com) - Address Kovacs student's village UWC

Should you have any questions regarding this study and your rights as a research participant or if you wish to report any problems you have experienced related to the study, please contact:

Head of Department:

Dr. Mlenzana

Email: [nmlenzana@uwc.ac.za](mailto:nmlenzana@uwc.ac.za)

+27219592542

University of the Western Cape

Private Bag X17

Bellville 7535

Dean of the Faculty of Community and Health Sciences:

Professor Jose Frantz

Email: [chs-deansoffice@uwc.ac.za](mailto:chs-deansoffice@uwc.ac.za)

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University of the Western Cape

Private Bag X17

Bellville 7535

This research has been approved by the University of the Western Cape's Senate Research Committee and Ethics Committee



## Appendix I

UNIVERSITY OF THE WESTERN CAPE  
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E-mail: [tsabeeh.alfadil@yahoo.com](mailto:tsabeeh.alfadil@yahoo.com)

### ورقة المعلومات

عنوان البحث المقترح: المعرفة، المواقف والممارسات تجاه إدارة العلاج الطبيعي للمرضى في وحدات العلاج

المكثف بولاية الخرطوم

### ما هو موضوع الدراسة؟

سيقوم بإجراء هذا البحث تساييح عبد الرحمن الفاضل من جامعة ويسترن كيب بجنوب أفريقيا. ندعوك للمشاركة في هذا البحث لأنك من العاملين في مجال الرعاية الصحية ذات الصلة بتقديم الرعاية للمرضى في وحدات العناية المكثفة. الغرض من هذه الدراسة هو تحديد المعرفة، المواقف والممارسات تجاه إدارة العلاج الطبيعي للمرضى في وحدات العناية المكثفة بولاية الخرطوم.

ما الذي سيطلب مني عمله في حال موافقتي على المشاركة؟

سيطلب منك ملء استبيان أو قائمة مرجعية تبعاً لتخصصك الطبي. سيتم إجراء الدراسة في ١٧ مستشفى بولاية الخرطوم. سيتم تسليم الاستبيانات والقوائم ومن المتوقع أن يكتمل ملئها خلال ٧ أيام؛ ستقوم الباحثة بجمعها بعد مضي ٧ أيام.

### هل سيتم الحفاظ على سرية مشاركتي في هذه الدراسة؟

سيتم الاحتفاظ بسرية معلوماتك الشخصية. وللمساعدة في حماية خصوصيتك سنقوم بالحفاظ على سرية معلوماتك الشخصية ولن يتم استخدام أسماء المشاركين خلال عملية ملء الاستبيانات والقوائم المرجعية. للحفاظ على سرية البيانات، ستحتفظ بها الباحثة في خزانات ملفات مغلقة في أماكن تخزين مخصصة لحفظ الاستبيانات والقوائم المرجعية المكتملة. علاوة على ذلك، سيتم استخدام

أرقام تعريفية خاصة لاستمارات المعلومات وستحفظ في ملفات كمبيوتر محمية بكلمات مرور. ستكون البيانات المسحوبة مجهولة المصدر ولن تحوي أية معلومات يمكن من خلالها التعرف على هويتك الشخصية.

في حالة كتابة تقرير أو مقالة عن مشروع البحث، سيتم حماية هويتك لأقصى الحدود الممكنة.

### ما هي مخاطر المشاركة في هذا البحث؟

يوجد القليل جداً من المخاطر المرتبطة بمشاركتك في هذا البحث. قد يتضمن ذلك احساس المشاركين بعدم الراحة عند إعطاء معلومات حول زملائهم. وسيتم الحد من من هذه المخاطر بتوفير السرية الكاملة للمعلومات التي سيتم الحصول عليها.

ما هي فوائد هذا البحث؟

الفوائد المترتبة على هذه الدراسة تشمل: العرض الشامل لدرجة الوعي لدى العاملين في الرعاية الصحية نحو أهمية توفير الرعاية والعلاج الطبيعي في وحدة العناية المكثفة. يمكن للمتخصصين في العلاج الطبيعي الاستفادة من خلال إدراكهم لدورهم في وحدة العناية المكثفة بشكل أفضل.

هل يجب علي المشاركة في هذا البحث أم يمكنني الانسحاب منه في أي وقت؟

مشاركتك في هذا البحث طوعية تماماً. ويمكنك اختيار عدم المشاركة فيه بالمرّة. إذا قررت المشاركة في هذا البحث، يمكنك الانسحاب من المشاركة في أي وقت. إذا قررت عدم المشاركة في هذا البحث، أو إذا انسحبت من المشاركة فيه في أي وقت، فلن يترتب على ذلك أي عقوبات أو خسارة أي منفعة.

ماذا لو كان لدي أسئلة؟

ستقوم تسابيح عبد الرحمن الفاضل من قسم العلاج الطبيعي بجامعة ويسترن كيب بإجراء هذه الدراسة. إذا كان لديك أية أسئلة حول هذه الدراسة البحثية، فنرجو منك التكرم بالاتصال بتسابيح عبد الرحمن الفاضل على الهاتف – +27733849286 البريد الإلكتروني [tsabeeh.alfadil@yahoo.com](mailto:tsabeeh.alfadil@yahoo.com) – أو العنوان: قرية كوفاكس الطلابية جامعة ويسترن كيب. إذا كانت لديك أية استفسارات حول هذه الدراسة وحقوقك كمشارك في البحث أو إذا كانت لديك الرغبة في الإبلاغ عن أية مشاكل تعرضت لها وذات صلة لهذه الدراسة، فنرجو منك الاتصال بـ:

Head of Department:

Dr. Mlenzana

Email: [nmlenzana@uwc.ac.za](mailto:nmlenzana@uwc.ac.za)

+27219592542

جامعة ويسترن كيب

17خدمة البريد

بيلفيل 7535

او

Dean of the Faculty of Community and Health Sciences:

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تمت الموافقة على هذا البحث من قبل المجلس الأعلى للبحوث بجامعة ويسترن كيب

10 January 2017

**RE: Editing of MSc thesis  
Tsabeeh Alfadil (3523504)**

To whom it may concern:

This is to confirm that the MSc thesis of Ms Tsabeeh Alfadil, the title of which is: KNOWLEDGE ATTITUDES AND PRACTICES REGARDING PHYSIOTHERAPY MANAGEMENT OF PATIENTS ADMITTED TO INTENSIVE CARE UNITS IN KHARTOUM STATE”, has been proofread and edited for submission to the University of the Western Cape.

Kind regards



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