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# DELIRIUM IN CRITICALLY ILL PATIENTS AND ITS ASSOCIATION WITH PATIENT FACTORS AND OUTCOMES IN ADULT INTENSIVE CARE UNITS

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A research report submitted to the
Faculty of Health Sciences, University of the Witwatersrand, Johannesburg
in partial fulfilment of the requirements for the degree
of
Master of Science in Nursing

Johannesburg, 2018

# DECLARATION

I, Azania Lekalakala, declare this research report is my own work. It is being submitted for the degree of Master of Science (in Nursing) at the University of the Witwatersrand, Johannesburg. It has not previously been submitted for any degree or examination at this or any other university.

Signature …….

……day of …… 2018

Protocol Number: M170543

# DEDICATION

This study is dedicated to all the Intensive Care Nurses, my colleagues as well as friends in the unit, maintain the diligence, consistency, empathy and team work. God is using you to serve his people, so continue doing it with love and zeal as that is where it is glorified.

# ACKNOWLEDGEMENTS

I would like to first and fore mostly give glory to the almighty God, who positioned me and made it possible.

I would like to thank the following people who were by my side through this fruitful amazing journey, who helped by contributing to this report and also encouraged to keep up my tenacity and make sacrifices.

To both my supervisors Professor Shelley Schmollgruber and Professor Judith Bruce, who have encouraged, supported and sacrificed a lot to help me produce this report, I am greatly thankful from the depth of my heart.

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And also to the apple of my eye Bongani and best friend Letlhogonolo Mathebe, thank you for the support, understanding and the words of encouragement throughout my journey.

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# ABSTRACT

**Background:** Delirium is a frequent problem in the intensive care unit and associated with increased mortality, prolonged duration of ICU stay and increased cost. Failure by health care professionals to recognise the developing signs of delirium may have an adverse effect of long-term outcomes (quality of life, cognitive decline and independent functionality). Global guidelines have been developed for the early detection and management of delirium. It is argued that routine nurse-led screening for delirium using a validated screening tool will allow early detection and timely implementation of management strategies that reduce severity and/or duration. No studies to date were found in the South African setting on this topic. Without this essential information, appropriate and suitable nursing interventions for delirium will not be able to be developed. Therefore this South African study intended to explore the incidence of delirium in critically ill patients in the adult intensive care units.

**Setting:** The setting for this study was the adult intensive care units of a 1,200 bedded university affiliated public hospital and tertiary level institution in Johannesburg. These intensive care units were: trauma and general intensive care units.

**Aim:** The purpose of this study was to determine the incidence of delirium in critically ill patients in the adult intensive care units of a university-affiliated public hospital in Johannesburg, and to explore the relationships between delirium, patient clinical factors and outcomes.

**Design and Methods:** A quantitative-descriptive and longitudinal design was utilised in this study. The total sample comprised 82 (n = 82) patients from the ICUs between the period 1.07.2017 to 30.9.2017. Random sampling method was utilised. Data was collected by means of a researcher developed checklist built on items from two validated questionnaires: Richmond Agitation and Anxiety Scale (RAAS) and Confusion Assessment Method for ICU (CAM-ICU).

**Results**: Overall 82 (n = 82) patients participated in this study, and more than one-third tested positive for delirium when CAM-ICU method was used during their length of stay in ICU. It should be noted that two-thirds of the sample of patients were surgical cases, and average length of stay in ICU was 6 days. Six patients who had delirium had a death outcome after 218 days in ICU, but these results showed no statistical significance (IR 2.62; CI 0.56 – 16.10; p=0.916). Eight clinical factors in this study were statistically significantly ($p<0.000$) associated with patients having delirium or not, and most important were medication (p=0.030), physical restraint (p=0.025), and severity of critical illness ($p<0.001$). Further, the characteristics of >60 years of patients who had tested positive for delirium were mostly male (83.3%), with tertiary level education (50.0%), and on midazolam medication (83.3%).

**Clinical Implications**: These findings have implications for nursing care because they highlight the importance of regular screening for delirium and addressing modifiable factors that contribute to delirium, such as the use of physical restraint and medication titrations.

**Conclusion**: These findings suggest patients are at risk for delirium in these ICUs, and current best practice measures to prevent or combat the incidence of delirium should be put into place.

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# LIST OF ABBREVIATIONS

The following abbreviations are used consistently throughout the study

| | |
|---|---|
| APA | American Psychiatric Association |
| APACHE II | Acute Physiological and Chronic Health Evaluation version II |
| CAM-ICU | The Confusion Assessment Method for the Intensive Care Unit |
| DSM-IV | Diagnostic and Statistical Manual of Mental Disorders |
| ICDSC | The Intensive Care Delirium Screening Checklist |
| ICU | The Intensive Care Unit |
| RASS | The Richmond Agitation Sedation Scale |
| SANC | South African Nursing Council |
| SAPS II | Simplified Acute Physiology Score version II |
| ABCDE bundle | Awakening and Breathing Trial Choice sedatives and analgesics, Daily Delirium monitoring and Early mobilization, exercise |

# CHAPTER ONE

## OVERVIEW OF THE STUDY

### 1.0 INTRODUCTION

This chapter provides an outline of the study, which entail the background, problem statement, purpose, objectives and significance of the study. The assumptions of the researcher will be discussed and operational definitions will be defined. An overview of the research methodology used, validity and reliability of the study and ethical considerations will be described.

The main focus of this study is on delirium, particularly in the Intensive Care Unit (ICU), as it is related to a high mortality and morbidity rate, prolonged time on a mechanical ventilator, prolonged hospital length of stay, cognitive deterioration and increased hospital financial cost (Balas *et al*., 2012; Devlin *et al*., 2012; DiLibero *et al*., 2016; Maritz *et al*., 2011).

### 1.1 BACKGROUND OF THE STUDY

Delirium is an acute and fluctuating cause of a mental state different from the patient's normal state. Delirium is defined in the American Psychiatric Association's (APA) Diagnostic and Statistical Manual of Mental Disorders (DSM-V) (APA, 2013), as a disturbance of consciousness and cognition. The syndrome occurs often in critically ill patients hospitalised in the intensive care units. It is recognised as an acute form of brain dysfunction, whereby hallucinations and anxiety are common features (Roberts *et al.*, 2005; Gusmao-Flores *et al.*, 2012). The patients may display varying degrees of consciousness

with paranoid ideas, disorientation, and memory and language difficulty. According to the APA (2013) the condition usually develops over a short period of time (hours to days) and fluctuates over a period of time.

Various factors are cited as significant in the development of ICU delirium: advanced age, hypoxia, electrolyte disturbances, urinary retention, pain, sepsis, alcohol and medication withdrawal symptoms are reported as most significant (Inouye *et al.,* 2001; Van Rompaey *et al.,* 2008). Physical restraint significantly increases the incidence of delirium (OR 3.2; 95% CI 1.9 – 5.2) (Micek *et al.,* 2005). Disturbances of sleep, medication with sedatives and opioids are also said to contribute to delirium (Samuelson, Lundberg & Fridlund., 2007; Svenningsen *et al*., 2013).

Delirium can be categorised into three subtypes of ICU delirium (i) hyperactive delirium manifested by restlessness, psychomotor hyperactivity, aggression and emotional liability; (ii) hypoactive delirium is which the patient is apathetic, lethargic, has slow psychomotor responses, with depressive features and extended responses; (iii) mixed delirium, where there are elements of both hyper- and hypoactive delirium (Roberts, 2004). Of the three types of delirium in the intensive care patients, the mixed form and hypoactive form are more common and constitute up to 55% and 44% (Peterson *et al.,* 2006; Pandharipande *et al.,* 2007).

The reported incidences of ICU delirium vary greatly from 16% to 85% of patients observed to be affected (Bergeron *et al.,* 2001; Ely *et al.,* 2001; Truman & Ely, 2003). Delirium in the intensive care unit may be difficult to diagnose, especially if patients are intubated and sedated (Devlin *et al.,* 2007). Screening tools that take this into account have been

developed. The Intensive Care Delirium Screening Checklist (ICDSC) focuses on thought content, whereas the Confusion Assessment Method of ICU (CAM-ICU) concentrates on arousal and thus may be influenced by factors such as variation in sedation, which may cause fluctuations in levels of consciousness (Skrobik, 2003; Roberts, 2004). Bergeron *et al.* (2001) reported the incidence of delirium between 16 to 19% in a mixed medical/surgical ICU population with a mean Acute Physiological and Chronic Health Evaluation (APACHE) version II scores of 14 and 15. In contrast, when Ely *et al.* (2001) use the CAM-ICU they reported the incidence of delirium as 87 and 83%, respectively, in a medical ICU with a mean APACHE II score of 19.

These figures are likely to rise even further with the current trend for advanced age patients with more complex co-morbidity to be admitted to ICU with patients offered more sophisticated treatment modalities. Anxiety and agitation is commonly reported in the mechanically ventilated patient with an incidence that ranges from 16% to 80% (Chlan, 2003; Kress *et al.,* 2003; Jaber *et al.,* 2006; Tate *et al.,* 2012). The length of ICU stay may also influence delirium incidence with patients staying less than 24 hours reporting fewer (8%) hallucinations events than patients remaining in excess of 24 hours (36%) (Rundshagen *et al.,* 2002). Delirium is associated with long-term cognitive deficits and functional deficits that significantly reduce quality of life (Pisani *et al.,* 2009; Barr *et al.,* 2013).

Psychiatrists are rarely involved in ICU care, yet research shows that ICU patients have been underdiagnosed by the ICU nursing and medical staff in up to 70% of cases (Truman & Ely, 2003; Mehta *et al.,* 2007; Patel *et al.,* 2013). It is now recognised that development of ICU is associated with a 15 to 60% increase in morbidity and mortality (Pisani *et al.,* 2009). The ICU and hospital length of stay are prolonged (Thomason *et al.,* 2005) and there is a higher

requirement for nursing care (McDonnell & Timmons, 2016), together with an increased risk of the agitated patient removing life-preserving devices such as endotracheal and nasogastric tubes (Happ, 2000; Kiekkas, *et al.,* 2013).

While most health care professionals can identify when a patient becomes agitated, confused and irrational (Miller & Ely, 2006), diagnosing the lethargic patient as delirious is difficult (Girard, Pandharipande & Ely., 2008; Tate *et al.,* 2012). Failure by health care professionals to recognise the developing signs of delirium may have an adverse effect of long term outcomes and therefore a comprehensive nursing assessment should be started routinely from admission (Barr *et al.,* 2013).

## 1.2 PROBLEM STATEMENT

Many studies, conducted overseas, have indicated that the incidence rate of delirium in ICU patients ranges from 16% to 86%. A high index of suspicion exists as this has a significantly negative impact on patient outcomes such as: increased morbidity, length of ICU and hospital stay, costs and mortality (Balas *et al*., & Boot, 2012). Also it has been argued, based on high level scientific evidence that routine nurse-led screening for delirium using a validated screening tool will allow for early detection (Boot, 2012) and timely implementation of management strategies that reduce severity and/or duration. No studies to date in the South African context were found on this topic. Without this essential information, appropriate and suitable nurse-led interventions for delirium will not be able to be developed. Therefore this South African study intends to investigate the incidence rate of delirium and its associations to patient factors and outcomes.

## 1.3 PURPOSE OF THE STUDY

The purpose of this study was to determine the incidence of delirium in critically ill patients in the adult intensive care units of a public hospital in Johannesburg, and to explore the relationships between delirium, patient factors and outcomes.

## 1.4 OBJECTIVES

The objectives of the study were:

- To estimate the incidence of delirium in critically ill patients in the adult intensive care units.
- To determine the relationship between incidence of delirium and patient outcomes.
- To describe the relationship between delirium and patient factors.
- To identify the demographic profiles of patients >60 years tested CAM-ICU positive for delirium

## 1.5 SIGNIFICANCE OF THE STUDY

This study intends to determine the incidence of delirium in patients receiving treatment in two South African intensive care units, and thereby create an awareness and comprehensive understanding of the presentation of delirium in this clinical setting. Without this knowledge it makes it difficult to implement appropriate preventative measures for critically ill patients who are fully dependent on nurses for all their healthcare needs. It is also hoped that by knowing the incidence of delirium in our patients that this may help to align South African

practices with international evidence-based and best practice recommendations that support the call for routine delirium screening in all critically ill patients.

## 1.6 KEY VARIABLES

Definitions for the purpose of the study are as follows:

- **Critically ill patient**

The critically ill patient is characterised by the presence of actual or potential life-threatening health problems, which include the requirement for continuous observation and interventions in an intensive care unit to prevent complications and restore health where possible. For the purpose of this study critically ill patients health problems will encompass medical and surgical elective or emergency diagnostic categories.

- **Delirium**

Delirium is a defined as a condition that is characterized by several features. These include: (a) decreased attention, (b) develops suddenly (usually in hours to a few days), (c) is change from the patient's usual baseline, (d) will fluctuate in severity throughout the day, (e) disturbance to cognition (memory, orientation, perception), and (f) these features cannot be explained by another disorder (APA, 2013).

- **Incidence**

Incidence refers to the occurrence, rate or frequency of a given medical condition in a population within a specified period of time (Glantz, 2012). In this particular case, it refers to the occurrence, rate or frequency of delirium in critically ill patients receiving treatment in the adult intensive care units as determined by an overall CAM-ICU positive score.

- **Patient factors**

Patient clinical factors include age, gender, ICU admission type, and severity of illness, use of sedatives and analgesics, use of mechanical ventilation, use of physical restraints and length of ICU stay that may have an association with the incidence of delirium in critically ill patients (Micek *et al.,* 2005).

- **Outcome**

An outcome is a health state of the patient resulting from health care. It is supported by evidence that the measure has been used to detect the impact of one or more clinical intervention (Agency for Health Care and Research, 2016). In this study, the outcome (discharge or death) will be measured.

## 1.7 OVERVIEW OF THE RESEARCH METHODOLOGY

The research methodology refers to the overall plan that guides the study to have control over factors that could interfere with the desired outcome. A non-experimental, quantitative,

descriptive design was utilised to achieve the study objectives. The study respondents were critically ill patients on admission to two adult ICUs at a 1,200 bed capacity university affiliated, public sector and tertiary hospital in Johannesburg, using a data collection checklist developed by the researcher from two well-known and validated assessment tools (Ely *et al.*, 2001; Sessler *et al.*, 2002). The two (n=2) ICUs included the General ICU and Trauma ICU.

Ethical clearance and permission to conduct the study was obtained from the relevant University Research Committees, the Department of Health and the hospital. Participation in the study was voluntary and respondents were free to withdraw at any point in time.

After permission was given by the hospital and ICU unit managers, initial consent was obtained from the family members on behalf of their loved ones, and a retrospective consent was obtained from the patient on discharge from ICU in the general ward. Descriptive and inferential statistics were used to analyse the results of the study, with statistical software STATA version 13 used for data analysis. Reliability of the study was maintained by ensuring the researcher was the sole data collector, the sample size was achieved by random sampling and the data was verified by a biomedical statistician to ensure accuracy of the findings.

## 1.8 LAYOUT OF THE STUDY

The layout of the study will be as follows.

Chapter one : Overview of the study

Chapter two : Literature review

| | | |
|---|---|---|
| Chapter three | : | Research design and methods |
| Chapter four | : | Data analysis and discussion of findings |
| Chapter five | : | Summary of the study, main findings, recommendations and conclusions. |

## 1.9 SUMMARY

This chapter provided an overview of the study beginning with the background of the study. It introduced the problem statement, purpose of the study, objectives of the study, and the significance of the study. The researcher's operational definitions and overview of the research methodology were described and ethical consideration was considered.

The next chapter will discuss the literature review.

# CHAPTER TWO

## LITERATURE REVIEW

### 2.1 INTRODUCTION

This chapter presents the literature reviewed for the study. A literature review is a critical written summary of the current evidence on a research problem (Polit & Beck, 2008). The main purpose of the literature review is to convey to the reader what is already known about the topic of interest (Burns & Grove, 2011). According to De Vos *et al.* (2011) it also helps the researcher to situate the findings from a study in the current body of knowledge.

This chapter provides an overview of caring for patients in intensive care, delirium including its definition, subtypes, pathophysiology, and use of sedation, incidence and risk factors. Followed by the impact of delirium on ICU patients, managing delirium within the current best practice strategies, delirium assessment tools and nursing care of delirious patients in ICU.

The search was conducted using electronic databases available through the University of Witwatersrand Academic Library – CINAHL (Cumulative Index to Nursing and Allied Health Literature) with SCOPUS, EBSCO HOST and MEDLINE (Medical Literature on Line accessed through PUBMED). To search PUBMED the MeSH (Medical Subject Headings) were used. Journal articles were hand searched in respected national journals and books.

## 2.2 CARING FOR PATIENTS IN INTENSIVE CARE

The Intensive Care Unit (ICU) is a complex environment which requires a different set of skills from an ICU nurse to look after a critically ill patient and being able to recognise any changes in the patient's condition and respond accordingly to those changes (Fitzgerald *et al*., 2016). Sutton and Jaden (2016) describe ICU as a fast-paced, complex, continuously evolving environment that gives provision to quality nursing care. In the nursing practice, there is a connection between the nurse along with the patient and family in an environment that emphasises both humanism and compassion, regardless of the use of sophisticated technology (Morton & Fontaine, 2013).

The critically ill patients are monitored in ICU within close proximity to the nurse, and each other along with noise from equipment, such as blinking monitors, intravenous (IV) pumps and mechanical ventilators in use to care for the patient (Morton & Fontaine, 2013). There are psychological, emotional and environmental stressors which critically ill patients undergo, and the nurse helps them manage the numerous stressors (Morton & Fontaine, 2013). The perceived fears, stressors along with changes can be altered by nurses to meet the demands of both patients' and their families' lives (Baird, 2014). In the nursing interventions of caring for a critically ill patient including the stressors management through, promoting rest and sleep, constant reorientation, providing the patient as well the family with information and being culturally sensitive (Morton & Fontaine, 2013; Kram *et al*., 2015). According to the literature nurses not only care for critically ill ICU patients but also care for patients who have ICU delirium, which has adverse patient outcomes which include both prolonged ICU and hospital admission (Baird, 2014; Morton & Fontaine, 2013).

## 2.3 DELIRIUM

Delirium is described as an acute brain dysfunction, presenting with features of disturbances in consciousness, cognition, attention and perception, the disturbances develop from hours to days (over a short period), and fluctuates during the day (APA, 2013). **Table 2.1** displays the four hallmarks of delirium.

**Table 2.1** DSM-IV Diagnostic criteria for delirium

| **DSM-IV diagnostic criteria for delirium** |
|---|
| a. A disturbance of consciousness (that is, reduced clarity of awareness of the environment, with reduced ability to focus, sustain, or shift attention) |
| b. A change in cognition (e.g. memory impairment) or a perceptual disturbance |
| c. The onset of hours to days, and tendency to fluctuate |
| d. Evidence from the history, physical examination or laboratory findings that the disturbance is caused by the direct physiological consequences of a general medical condition |

**Sources**: DSM-V (APA, 2013)

Delirium is associated with a high mortality and morbidity rate, more extended hospitalization or ICU admission, along with cognitive process decline and increased costs (Balas *et al*., 2012; Brummel *et al*., 2013; Devlin, Brummel & Fellow, 2012; Lee & Kim, 2014; Maritz *et al*., 2011; Spronk *et al*., 2009; Van Rompaey *et al*., 2008). Brummel *et al*. (2014) adds that ICU patients who have delirium are delirious for a more extended period and are prone to develop cognitive impairment or die. The literature states that various terms were used to refer to delirium, such as ICU psychosis, ICU syndrome, encephalopathy, acute

confusional state as well as acute brain failure. According to Girard, Pandharipande and Ely (2008) including Wells (2012), the recommendations of the APA (American Psychiatry Association) are adhered to by the critical care literature. Also, there is agreement amongst experts that the term "delirium" is used when describing the brain dysfunction syndrome.

Historically critical care clinicians had taken brain dysfunction lightly, as they were accustomed to cardiac, pulmonary and renal dysfunction as the cause of both morbidity and mortality (Girard, Pandharipande and Ely, 2008). Wells (2012), Brummel *et al*. (2013) and Van Rompaey *et al*. (2008), point out that, delirium had been historically accepted as inevitable and not harmful, as a result of critical illness by health professionals. Brummel *et al*. (2013) emphasise that ICU clinicians disregarded regular monitoring of the brain as though it was not of great importance to patients, while they regularly and routinely monitored other organs (the heart, lungs and kidneys). Delirium is still under-recognised regardless of the adverse outcomes related to its development (Mistarz *et al*., 2011).

According to Collinsworth *et al*. (2016) delirium has a high prevalence in ICU, it affects 35% to 80% of critically ill patients, and mechanically ventilated patients are prone to it due to the frequent use of deliriogenic analgesics, sedatives and hypnotics for patient comfort. In ICU mechanical ventilation conventional treatment included deep sedation and muscle relaxants in some cases, although in the past decade the adverse outcomes brought by deep sedation entailed, prolonged mechanical ventilation, ICU admission and in particular inability to assess patients mental status (Svenningsen *et al*., 2013). It will be required of ICU nurses to care for patients with delirium on a regular basis due to its high prevalence (Wells, 2012). The development of delirium not only negatively impacts critically ill patients, but it also affects the patient's family, healthcare providers and the healthcare

system as well (Balas *et al*., 2012, Brummel *et al*., 2013; Olson, 2012; Pianto & Biancofiore, 2016). Sosnowski *et al*. (2015) further state that impaired recovery from critical illness is a significant public health issue, as family members frequently become informal caregivers, leading to altering family relationships and affecting financial security.

### 2.3.1 Subtypes

Delirium is further categorised through symptoms of its sub-types with which patients present. The three subtypes of delirium are as follows: (i) hyperactive, (ii) hypoactive and (ii) mixed delirium. The categorisation of these subtypes is dependent on both the patient's level of psychomotor activity and alertness (Arif & Grap, 2009; Girard, Pandharipande & Ely, 2008; Olson, 2012).

#### 2.3.1.1 Hyperactive delirium

Hyperactive delirium is characterised by restlessness and agitation. Also, the patient attempts to pull out and remove medical equipment in place and emotional lability (Allen & Alexander, 2012; Arif & Grap, 2009). Patients can become combative posing potential harm to themselves and others around them due to the presence of agitation accompanied by hallucinations, delusions and paranoia (Arif & Grap, 2009). The literature states that hyperactive delirium symptoms are easily recognisable and it has a better patient outcome. According to Peterson *et al.* (2006), hyperactive delirium is present in about 1.6% of ICU patients.

#### 2.3.1.2 Hypoactive "quiet" delirium

Hypoactive delirium is characterised by lethargy, flat affect, withdrawal, apathy as well as decreased responsiveness (Hardin-pierce, 2010; Olson, 2012). Hypoactive delirium is misdiagnosed with depression, as there are similarities (Marchington, Carrier & Lawlor, 2012). In the study of Peterson *et al*. (2006), they found that in about 43.5% of patients tested positive for hypoactive delirium. The literature points out that this subtype has a poor patient outcome.

#### 2.3.1.3 Mixed delirium – hypo-/hyperdelirium

Truman and Ely (2003) describe the mixed delirium subtype as a concomitant or successive form of some of the features of both hyperactive and hypoactive delirium. Initially, the symptoms of one subtype occur then resolve, revealing the different subtype symptoms (Olson, 2012). According to Peterson *et al*. (2006) study, this subtype of delirium accounts for 54.9%, making it the most commonly occurring subtype.

### 2.3.2 Pathophysiology

The exact pathophysiology of delirium is poorly or not understood (Ali *et al*., 2011; Boot *et al*., 2012; Girard, Pandharipande & Ely, 2008). The literature points out theories that are causative, which involve neurotransmitter imbalance in the brain, sepsis and inflammation initiating disruption of the blood-brain barrier, medications and hypoxia leading to low oxidative metabolism (Ali *et al*., 2011; Allen & Alexander, 2012; Gunther, Morandi & Ely, 2008).

#### 2.3.2.1 Neurotransmitter imbalance

An imbalance of neurotransmitters associated with delirium specifically involve an excess of acetylcholine and depletion of dopamine, these work in opposition and when imbalanced neural instability and unpredictable neurotransmission occurs (Girard *et al*., 2012; Gunther, Morandi & Ely, 2008). Gama aminobutyric acid (GABA), serotonin, endorphins and glutamate are other neurotransmitters that may play a part in the delirium pathogenesis (Girard *et al*., 2012; Gunther, Morandi & Ely, 2008).

#### 2.3.2.2 Sepsis

Gunther, Morandi and Ely, (2008) elaborate that, with sepsis either a known or suspected infection which is leading to systemic inflammatory response syndrome, often presents with delirium and represents possibly the most common causal factor for ICU delirium. Sepsis may have access point through the acute central nervous system (CNS) and brain damage through degradation of the blood-brain barrier as well as neurological inflammation (Gunther, Morandi & Ely, 2008).

#### 2.3.2.3 Inflammation and Impaired oxidative metabolism

Inflammation has a significant role in the dysfunction of many organs due to critical illness, and the development of ICU delirium which is possibly contributed by inflammatory abnormalities brought by endotoxins and cytokines (Girard, Pandharipande & Ely, 2008). A cascade of endothelial damage, thrombin formation and microvascular compromise is begun by the release of inflammatory mediators (tumour necrosis factor-α, interleukin-1 and other

cytokines and chemokines) during critical illness (Girard *et al*., 2012). Girard *et al*. (2012) elaborate further that, inflammation may stimulate brain dysfunction by decreasing blood flow through the formation of macroaggregates of fibrin, platelets, neutrophils and erythrocytes in the cerebral vasculature, by constricting cerebral vasculature through activation of α1-adrenoceptors or by the interference of neurotransmitter synthesis or transmission. It was hypothesised that delirium is due to cerebral insufficiency, a vital factor in the pathogeneses of multiple organ dysfunctions in critical illness, through an EEG study that lead to a belief that there is a reduction in brain metabolism (Girard, Pandharipande & Ely, 2008).

### 2.3.3 Use of Analgesics and Sedative Medications

It is the norm in ICU to administer analgesics and sedatives to critically ill mechanically ventilated patients, to relieve pain, anxiety, for performing invasive procedures and lessening ventilator dyssynchrony according to literature. Moreover, the nurses are mainly responsible for the administration of both these analgesics and sedative agents to the patient. Sedative agents are primarily indicated to enable patients to endure mechanical ventilation in ICU by maintaining a balance between patient comfort as well as ventilator synchrony (Balas *et al*., 2012; Bourne, 2008; Hughes *et al*., 2012). In deciding on which sedative agent to use, the decision should be based upon clinical presentation, indication for sedation, pharmacology of the drug as well as side effects (Iakovou, Lama & Tsegaye, 2013). Literature indicates midazolam, lorazepam, diazepam, propofol and dexmedetomidine as the commonly used sedative medications in ICU along with morphine, fentanyl and remifentanil (analgesics).

There are adverse effects associated with the administration of these medications, some of them include prolonged mechanical ventilation, particularly with continuous sedative infusions as opposed to intermittent boluses (Balas *et al*., 2012; Bray *et al*., 2004; Girard, Pandharipande & Ely, 2008; Iakovou, Lama & Tsegaye, 2013). Bray *et al*. (2004) further adds that with continuous sedation infusions there is more of a need to do computed tomography (CT) scan, to evaluate mental status alterations. In an ICU routine administration of sedatives and analgesics, failing to titrate them for patient comfort to light, instead of a deep level of sedation will increase delirium and lengthen mechanical ventilation (Devlin & Pohlman, 2014; Iakovou *et al*., 2013). Hofso and Coyer (2007), point out that under-sedation as well is related to a variety of complications, namely tachycardia, hypertension, increased cardiac afterload, contractility and arrhythmias. There needs to be a balance between under and over-sedation when ensuring that the patient is comfortable, orientated, pain-free and co-operative with careful balancing of light sedation (Bourne, 2008; Panthmanathan & McClure, 2015).

**Table 2.2** displays the effects of sedation.

**Table 2.2** Effects of sedation in the intensive care unit

| | |
|---|---|
| Over sedation | • Poor cough/respiratory depression<br>• Hypotension/bradycardia<br>• Immune depression<br>• Renal failure<br>• Immobility<br>• Failure to recognize cerebral insult<br>• Delirium<br>• Post traumatic disorder |
| Adequate sedation | • Tolerance to mechanical ventilation<br>• Calm and cooperative patient<br>• Communicative patient<br>• Avoidance of pain<br>• Promotion of normal sleep-wake cycles |
| Under sedation | • Pain, Anxiety, Agitation<br>• Hypertension/tachycardia<br>• Hypoxia<br>• Hypercarbia<br>• Ventilator asynchrony<br>• Post-traumatic disorder |

**Source:** Panthmanathan & McClure (2015)

The Pain, Agitation and Delirium (PAD) guidelines recommend a light level of sedation as it is related to improved clinical outcomes, although ensuring patient comfort (Barr *et al*., 2013; Iakovou, Lama & Tsegaye, 2013). Panthmanathan and McClure (2015), contends that not all patients will require light sedation, there will be certain exclusion (severe acute lung injury, increased intracranial pressure) criteria to optimise mechanical ventilation. There are sedation scales specifically designed to reduce or limit the use of sedation, which is linked with positive clinical outcomes. Bray *et al*. (2004), argues that many sedation scales define the categories of sedation without giving guidance about titrating the therapy. The Ramsey Sedation Scale (RSS); Riker Sedation-Agitation Scale and the Richmond Agitation Sedation Scale (commonly utilised) are some of the sedation scales being utilised.

Pain relief is crucial, and it tends to be under-treated due to the following reasons, adverse effects (respiratory depression and haemodynamic compromise), lack of knowledge of

proper knowledge in proper pain assessment and addiction potential of opioids (Hughes *et al*., 2012). Literature emphasis that pain experienced by critical patients adds to their stress response causing sleep deprivation and also causes delirium as well. Brummel and Girard (2014) point out that, patients may be wrongly sedated instead of being given analgesics due to unassessed and untreated pain. The use of mechanical ventilation, sedatives and altered level of consciousness makes critically patients unable to self-report their pain (Barr *et al*., 2013; Iakovou, Lama & Tsegaye, 2013).There are most valid and reliable behavioural pain scales (the Behavioural Pain Scale (BPS) and the Critical Care Pain Observation Tool (CPOT) for adult ICU patients, whom are unable to self-report and having intact motor function as well as observable behaviours (Barr *et al*., 2013; Iakovou, Lama & Tsegaye, 2013).

### 2.3.4 Incidence

There is 60– 80 % occurrence of delirium in mechanically ventilated patients and 20- 40% in non-ventilated patients in ICU (Brummel *et al*., 2014). According to Allen & Alexander (2012), Hayhurst *et al.* (2016) and Scott *et al.* (2013) depending on patient population and delirium screening method the incidence of delirium will differ broadly.

### 2.3.5 Risk Factors

Delirium has contributing risk factors, which are categorised into predisposing and precipitating. The interaction of both predisposing and precipitating risk factors is the cause of delirium in individuals (Van Rompaey *et al*., 2008).

#### 2.3.5.1 Predisposing risk factors

Girard, Pandharipande and Ely (2008) as well as Olson (2012) classify predisposing risk factors of delirium as factors that are present at the time of ICU admission. Allen and Alexander (2012), describe predisposing risk factors as factors that are less modifiable due to the patient's overall health before ICU admission. These risk factors include advanced age (≥65 years), visual/hearing impairment, and severity of current illness, chronic illness, tobacco and alcohol usage (Allen & Alexander, 2012; Bergeron *et al*., 2001; Girard, Pandharipande & Ely, 2008).

#### 2.3.5.2 Precipitating risk factors

They are risk factors that are absent on ICU admission and are most modifiable (Allen & Alexander, 2012; Girard, Pandharipande & Ely, 2008). According to Vasilevskis *et al*. (2010) precipitating risk factors occur after ICU admission and can be referred to as iatrogenic risk factors as well. The practice of ICU medication usages such as benzodiazepines and opioids contributes to modifiable risk factors (Allen & Alexander, 2012). Metabolic disturbances, changes in sodium, calcium as well as blood urea and nitrogen levels, infections, sleep deprivation, dehydration and immobility are other precipitating risk factors (Allen & Alexander, 2012; Bergeron *et al*., 2001; Girard, Pandharipande & Ely, 2008). The two modifiable universally experienced risk factors for ICU patients are sleep deprivation as well as sedative and analgesic medications exposure (Girard, Pandharipande & Ely, 2008).

## 2.4 IMPACT OF DELIRIUM ON INTENSIVE CARE PATIENT

Delirium is associated with adverse patient outcomes which have both short and long-term effects, which are discussed in the next section.

### 2.4.1 Short term

The impact of delirium on ICU patients is associated with both increased ICU and hospital length of stay, prolonged mechanical ventilation, unplanned extubations and removal of catheters as well as increased mortality (Balas *et al*., 2012; van den Boogaard *et al*., 2013; Brummel *et al*., 2013; Hughes *et al*., 2012). ICU delirium is also associated with increased health care costs as well, which impact negatively on the health care system (Balas *et al*., 2012; Brummel *et al*., 2013; Devlin *et al*., 2008; Hughes *et al*., 2012; Olson, 2012). Literature also states that ICU patients will be at an increased risk of being both physically and chemically restrained, also developing associated mechanical ventilation complications, such as ventilator-associated pneumonia.

### 2.4.2 Long-term

Wolters *et al*. (2016) stated that delirium is associated with a decline in cognitive function, a large number of ICU survivors develop long-term mental health matters (Mistarz *et al*., 2011) such as post-traumatic stress, anxiety and depression. Balas *et al*. (2012) highlighted that, except delirium influencing patients' survival of critical illness, it is also associated with reduced long-term functional, physical and cognitive outcomes (DiLibero *et al*., 2016). DiLibero *et al*., (2016) elaborates further that, overall there will be a reduced quality of life.

## 2.5 MANAGING DELIRIUM

Trorlic´*et al*. (2016) points out that delirium management is regarded to be a crucial in routine ICU patients' care, which is endorsed by the national and international guidelines (Barr *et al*., 2013). The literature states that in the management of delirium, the cause must first be identified and followed by treatment. The main focus of both preventing and managing delirium should non-pharmacologically address the primary cause and manage behavioural disturbances to enhance, maximise functional status as well as improve clinical outcomes (Iakovou, Lama & Tsegaye, 2013; Inouye *et al*., 2014). There are evidence-based multidisciplinary approaches in the management of delirium, referred to as "bundles". According to Mistraletti *et al*. (2012) the ABCDE bundle entail daily management of the critically ill patient care, which are the following features, interruption of sedation (Awakening and Breathing Trial), ventilator support, the choice in non-deliriogenic sedatives and analgesics (Choice sedatives and analgesics), daily monitoring for delirium (Daily delirium monitoring) and early mobilization and rehabilitation (Early mobilization, exercise). Ely (2017), emphasises ICU liberation collaboration initiative which is being implemented across 76 ICU's, it facilitates implementation of pain, agitation, and delirium guidelines with the use of the ABCDEF bundle, which is illustrated in **figure 2.1.**

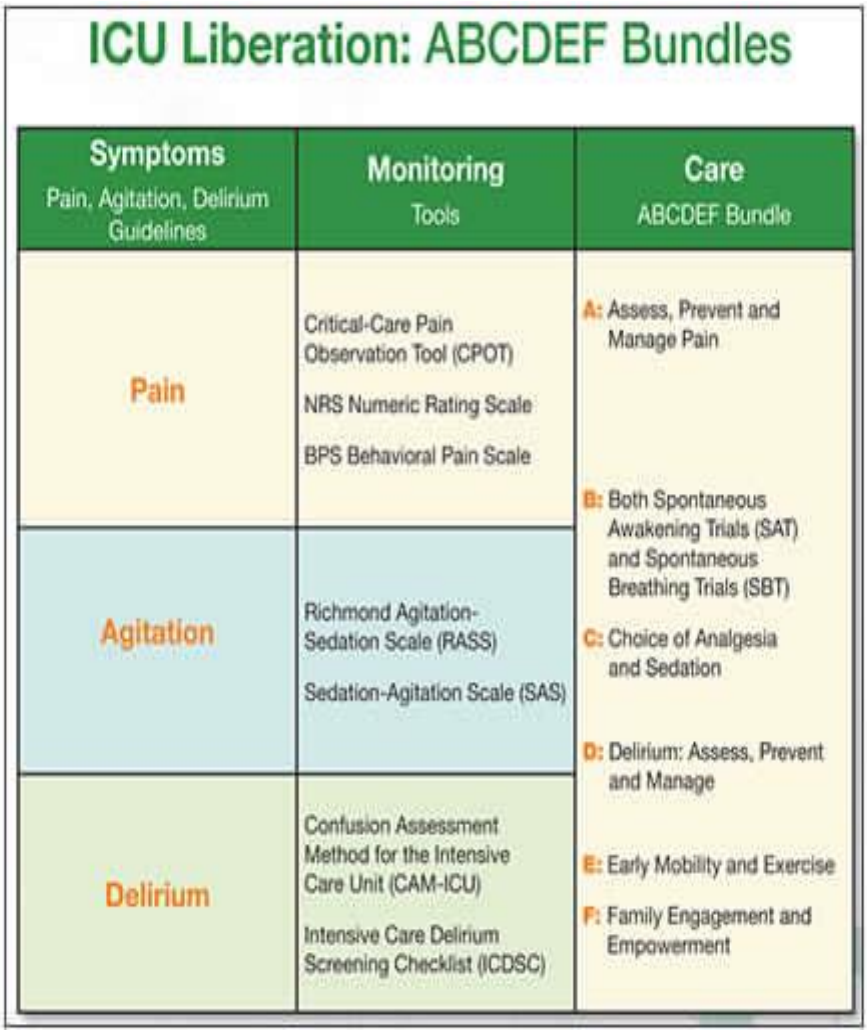



**Figure 2.1** ICU liberation through the use of ABCDEF Bundles

**Source**: Adapted from Balas *et al.* (2012) and American Society of Critical Care Medicine Available at: www.iculiberation.org

The implementation of the ABCDE bundle components results in an improved and increased neurological outcomes as well as survival, promotion of functional recovery post-critical illness and determine to decrease mechanical ventilation duration and ICU/hospital stay (Balas *et al*., 2012; Mistraletti *et al*., 2012). Boehm, Vasilevskis and Mion (2016), further added that the bundle is safe to use, have reduced delirium days and increase mobility. The bundle consists of three components which intertwine with one another, namely 1) coordination of awakening and breathing trials, response 2) monitoring and management of

delirium and 3) early mobility (Balas *et al*., 2012). **Figure 2.2** displays these bedside treatments.

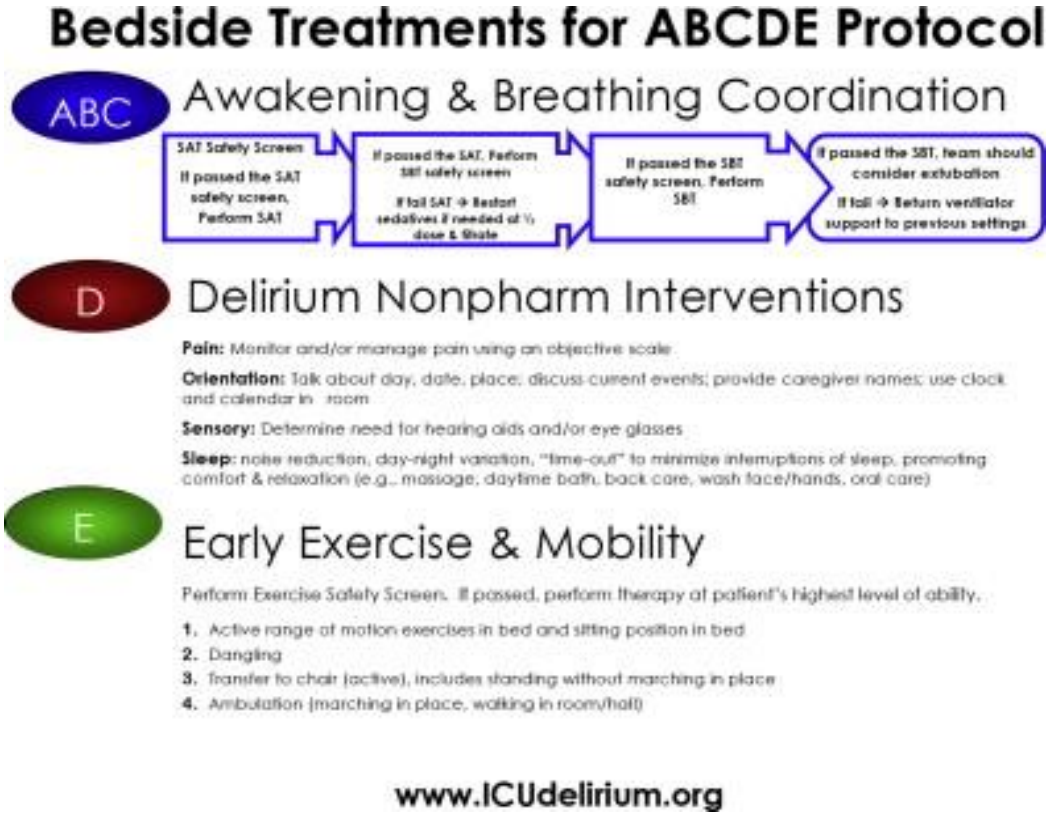



**Figure 2.2** Bedside treatments for ABCDE Protocol

**Sources:** Balas *et al*. (2012) available at www.ICUdelirium.org.

Nurses play a significant role in the implementation of the bundle, which entail nurse lead-sedation/analgesia protocol(s), such as daily interruption of sedation known as spontaneous awake trials (SATs) (Balas *et al*., 2012). According to randomised controlled studies, the coordination of both spontaneous awakening and breathing trials have led to a decreased duration on mechanical ventilation, a shorter ICU and hospital length of stay (Balas *et al*., 2012; Hughes *et al*., 2012; Iakovou, Lama & Tsegaye, 2013).

The recommendation of the ABCDE bundle is to expand collaboration between disciplines, standardising ICU process and prevent over-sedation as well as extended mechanical ventilation which leads to both ICU delirium and weakness (Boehm, 2016). The bundle has the potential to reduce the incidence of delirium as well as its duration and impacting positively on other patient outcomes like mortality, ICU and hospital length of stay (LOS) and physical function (Balas *et al*., 2012; Kram *et al*., 2015; Pinto & Biancofiore, 2016).

Kram *et al*. (2015) points out barriers involved in the implementation of the ABCDE bundle which are both intervention and organisational related matters, which are communication and care coordinates challenges, knowledge deficits, workload concerns along with documentation burden and lack of respect among disciplines. According to Devlin and Pohlman (2014), identifying an appropriate interdisciplinary team, promoting teamwork, consistency and accountability in ICU are the prerequisites to the success of the bundle. The literature emphasises that for the bundle to be useful, there are elements that should be carried out involving effective and consistent communication amongst the multidisciplinary team as well documenting (Devlin & Pohlman, 2014).

## 2.6 DELIRIUM ASSESSMENT TOOLS

The literature emphasises the significance of delirium screening in the ICU setting, as critical care clinicians are unable to recognise delirium in their patients. Wells (2012) elaborates that, literature has identified the adverse effects of delirium on patient outcomes which makes it paramount that it is no longer accepted as a regular part of ICU stay. Studies from Australia and Europe, thus suggest that delirium screening tools are more sensitive than routine bedside nurses' clinical assessments (Eastwoods *et al*., 2012). Özsaban and Acaroglu

(2015) state that, neurological assessment of a critically ill patients should be preceded by a Glasgow Coma Scoring System (GCS) followed by a delirium assessment, although patients which are appropriately responsive will be the only ones assessed for delirium (Amado & Kallenbach, 2017) as it needs an interactive communication dialogue. In a critical care setting, delirium can be diagnosed with the use of validated screening tools, the Confusion Assessment Method for ICU - CAM-ICU and Intensive Care Delirium Screening Checklist (ICDSC) by non-psychiatrists in 2 minutes (McPherson *et al*., (2013). There is a variety of delirium screening tools available, which are not only restricted to the CAM-ICU and the Intensive Care Delirium Screening Checklist (ICDSC). There is also the nursing delirium screening scale (Nu-DESC), delirium observation screening scale (DOSS). The Neelon and Champagne Confusion Scale (NEECHAM), and Delirium-O-Meter (DOM) are some of the delirium specific tools (Devlin *et al.,* 2012).

Devlin *et al*. (2012) point out that, the Confusion Assessment Method for ICU (CAM-ICU) and the Intensive Care Delirium Screening Checklist (ICDSC) are tools with the highest psychometric strength amongst other developed ICU delirium screening tools. The CAM-ICU and ICDSC have the highest psychometric strength amongst the other established delirium screening tools (Devlin, 2012). Both of these tools are reliable and validated tools which can also be easily used by critical care nurse for a quick patient assessment (Olsen, 2012). The CAM-ICU and the ICDSC both have an excellent sensitivity (detect delirium if present) although the ICDSC has a low specificity (detect delirium even if is not present) compared to the CAM-ICU (Devlin *et al*., 2012; Kallenbach & Amado, 2017). The low specificity of the ICDSC is because of patients with dementia, coma or any other psychiatric/neurological condition that mimic delirium were not excluded from the original ICDSC validation study (Devlin *et al*., 2012; Kallenbach & Amado, 2017).

### 2.6.1 The Confusion Assessment Method for Intensive Care Units (CAM-ICU)

The CAM-ICU tool comprises of a two-step approach. Initially, the Richmond Agitation Sedation Scale (RASS) evaluates the level of consciousness (Morandi *et al*., 2012). To alleviate deeper than required levels of sedation and pain the use of validated tools are required, the most commonly used sedation tool is the RASS scale, which is reliable and has a low personal variability (Mistraletti *et al*., 2012). The RASS is recognised for assessing the level of alertness, in monitoring change and can be used in medication titration to avoid oversedation (Hall *et al*., 2012). **Table 2.4** provides an overview of the RASS tool.

**Table 2.3** The Richmond Agitation-Sedation Scale (RASS)

| Score | Label | Description |
|---|---|---|
| +4 | Combative | Overly combative or violent; immediate danger to staff. |
| +3 | Very Agitated | Pulls or removes the tube(s) or catheter(s) or has aggressive behaviour towards staff |
| +2 | Agitated | Frequent non-purposeful movement or patient-ventilator dyssynchrony |
| +1 | Restless | Anxious or apprehensive but movements not aggressive or vigorous |
| 0 | Alert and Calm | |
| -1 | Drowsy | Not fully alert but has sustained (more than 10 seconds) awakening, with eye contact to voice |
| -2 | Light Sedation | Briefly (less than 10 seconds) awakes with eye contact to voice |
| -3 | Moderate Sedation | Any movement (but no eye contact) to voice |
| -4 | Deep sedation | No response to voice but any movement to physical stimuli |
| -5 | Unarousable | No response to voice or physical stimuli |

**Source:** Adapted from Sessler *et al*. (2002), Devlin *et al.* (2012) and Ely *et al*., (2004)

The CAM-ICU was modified initially from the Confusion Assessment Method (CAM), developed to be used in ICU environments for the critically ill, non-verbal, intubated and ventilated patients (Bruno & Warren, 2010). This tool is valid as well as reliable for use at the bedside by critical care nurses. It provides a quick and thorough patient assessment according to the DSM-VI criteria (Bourne, 2008; Gunther, Morandi & Ely, 12008; Pun *et al*., 2005).

Devlin *et al*. (2012) elaborate on how the CAM – ICU assesses the four key diagnostic features of delirium: (1) acute change or fluctuation in mental status from the baseline, (2) inattention, (3) altered level of consciousness and (4) disorganised thinking.

- ***Feature 1*** uses clinical information to assess the patient's mental status and is positive if the patient exhibits a change in mental status from his/her pre-hospital baseline or demonstrate a fluctuating mental status over a past 24 hours.
- ***Feature 2*** asks the patient to complete a test of attention (e.g. asking the patient to squeeze the examiners' every time the patient hears the letter "A" as the examiner spells out S-A-V-E-H-A-A-R-T). ***Feature 2*** is tested positive if the patient makes more than two errors during the examination (e.g. squeezes on letters other than "A" or fails to squeeze on the letter "A").
- ***Feature 3*** evaluates the level of consciousness with the use of sedation scale [e.g. Richmond Agitation Sedation Scale (RASS) is positive if the patient's level of consciousness is anything but alert and calm.
- ***Feature 4*** evaluates disorganised thinking by asking the patient to perform a multi-step task (e.g. holding up two fingers and then adding a third) and by answering four yes/no questions (e.g. do fish live in the sea?). ***Feature 4*** is tested positive if the patient is unable to follow the command or misses more than one of the questions.

The CAM-ICU is considered positive if features 1 and 2 and either 3 or 4 are present. However, if the patient was found to be in a state of deep sedated (RASS ≤-4) they cannot be evaluated with the CAM-ICU until they are more awake.

**Figure 2.3** presents an overview of the CAM-ICU worksheet.

## CAM-ICU Worksheet

| Feature 1: Acute Onset or Fluctuating Course | Score | Check here if Present |
|---|---|---|
| Is the patient different than his/her baseline mental status?<br>OR<br>Has the patient had any fluctuation in mental status in the past 24 hours as evidenced by fluctuation on a sedation/level of consciousness scale (i.e., RASS/SAS), GCS, or previous delirium assessment? | Either question Yes → | ☐ |
| **Feature 2: Inattention** | | |
| **Letters Attention Test** (See training manual for alternate **Pictures**)<br><br>Directions: Say to the patient, *"I am going to read you a series of 10 letters. Whenever you hear the letter 'A,' indicate by squeezing my hand."* Read letters from the following letter list in a normal tone 3 seconds apart.<br>S A V E A H A A R T or C A S A B L A N C A or A B A D B A D A A Y<br>**Errors are counted when patient fails to squeeze on the letter "A" and when the patient squeezes on any letter other than "A."** | Number of Errors >2 → | ☐ |
| **Feature 3: Altered Level of Consciousness** | | |
| Present if the Actual RASS score is anything other than alert and calm (zero) | RASS anything other than zero → | ☐ |
| **Feature 4:Disorganized Thinking** | | |
| **Yes/No Questions** (See training manual for alternate set of questions)<br><br>1. Will a stone float on water?<br>2. Are there fish in the sea?<br>3. Does one pound weigh more than two pounds?<br>4. Can you use a hammer to pound a nail?<br><br>**Errors are counted when the patient incorrectly answers a question.**<br><br>**Command**<br>Say to patient: "Hold up this many fingers" (Hold 2 fingers in front of patient) "Now do the same thing with the other hand" (Do not repeat number of fingers) *If the patient is unable to move both arms, for 2nd part of command ask patient to "Add one more finger"<br><br>**An error is counted if patient is unable to complete the entire command.** | Combined number of errors >1→ | ☐ |

| Overall CAM-ICU | | |
|---|---|---|
| Feature 1 plus 2 and either 3 or 4 present = CAM-ICU positive | Criteria Met → | ☐ CAM-ICU Positive (Delirium Present) |
| | Criteria Not Met → | ☐ CAM-ICU Negative (No Delirium) |

**Figure 2.3** Overview of the CAM-ICU worksheet (Westley Ely and Vanderbilt University, 2002)

### 2.6.2 The Intensive Care Delirium Screening Checklist

The Intensive Care Delirium Screening Checklist (ICDSC) is an eight-item instrument established from the DSM-IV criteria, as well as other features of delirium that evaluates (Devlin *et al*., 2012): (1) altered level of consciousness, (2) inattention, (3) disorientation, (4) hallucinations or delusions (5) psychomotor agitation/retardation, (6) inappropriate speech/mood, (7) sleep/wake cycle disturbances and (8) symptom fluctuation. According to Pun and Ely (2007), each presenting symptom will be scored 1 out of 8, and the score 4≥ suggests the presence of delirium.

**Table 2.4** provides an overview of the Intensive Care Delirium Checklist (ICDSC).

**Table 2.4** The Intensive Care Delirium Screening Checklist

| |
|---|
| 1. Altered level of consciousness, choose ONE A-E<br>Note: May need to reassess patient if current or recent administration of sedation therapy.<br>A. No response to intense and repeated stimulation (loud voice and pain) Score, None<br>B. Response to intense and repeated stimulation, Score 1<br>C. Response to mild and moderate stimulation, Score 1<br>D. Normal wakefulness, score 0<br>E. Exaggerated response to normal stimulation, Score 1 |
| 2. Inattention Score 1 point for any of the following abnormalities<br>A. Difficulty in following commands OR<br>B. Easily distracted by external stimuli OR<br>C. Difficulty in shifting focus |
| Does the patient follow you with their eyes?<br>3. Disorientation Score 1 point for anyone obvious abnormality<br>A. A mistake in either time, place or person |
| Does the patient recognise any of the caregivers who have cared for him/her and not recognize those who have not? What kind of place are you in? (list examples)<br>4. Hallucinations or Delusions Score 1 point for either:<br>A. Equivocal evidence of hallucinations or behaviour due to hallucinations (Hallucination=perception of something which is not there with NO stimulus)OR<br>B. Delusions or gross impairment of reality testing (Delusion=false belief that is fixed/unchanging)<br>Any hallucination now or over the past 24h? Are you afraid of the people or the things around you? [fear that is inappropriate to the clinical situation] |
| 5. Psychomotor agitation/retardation<br>A. Hyperactivity requiring the use of additional sedative drugs or restraints to control potential danger (e.g. pulling IV lines or hitting staff) OR<br>B. Hypoactive or clinically noticeable psychomotor slowing or retardation<br>Based on documentation and observation over shift by the primary caregiver |
| 6. Inappropriate Speech or Mood Score 1 point for either:<br>A. Inappropriate, disorganised, incoherent speech OR<br>B. Inappropriate mood related to situation or events |
| 7. Sleep/Wake Cycle Disturbance Score 1 point for:<br>A. Sleeping less than 4 hours at night OR<br>B. Waking frequently at night (do not include the wakefulness initiated by medical staff or load environment) OR<br>C. Sleep ≥4 during day<br>Based on primary caregiver assessment |
| 8. Symptom Fluctuation Score 1 point for:<br>Fluctuation of any of the above items (Add 1-7) over 24h (e.g. from one shift to another)Based on primary caregiver assessment |
| TOTAL ICDSC SCORE: (Add 1-8) |

**Source:** Adapted from Bergeron *et al*. (2001), Devlin et al., (2004) and Pun & Ely (2007)

## 2.7 NURSING CARE OF THE PATIENT WITH DELIRIUM

Volland, Fisher and Drexter (2015) along with Zamoscik, Godbold and Freeman, (2017) elaborate that, in order to alleviate ICU delirium and effectively treat it, there needs to be an understanding of the risk factors and events that can cause an episode, and address the underlying causes (Iakovou *et al*., 2013). Zamoscik, Godbold and Freeman, (2017) further added rationalising drug regimens, to avoid polypharmacy. Intensive care nurses are in the best position to assess patients for delirium, early symptoms recognition, and identifying patient vulnerabilities as well as precipitating factors (Boot, 2012; Devlin *et al*., 2008; Olson, 2012; Wells, 2012; Zamoscik, Godbold and Freeman, 2017). Truman and Ely (2003) further point that, as nurses role puts them in the best position in early recognition of delirium, identification of the causes and providing nursing care with insight and therefore improving patient quality care as well as outcomes.

As soon as delirium is detected, keeping the patient safe becomes primary nursing care (Fraught, 2014). Nurses are in a favourable position in modifying patients' risk factors concerning pharmacological treatment review during daily ward rounds, to ensure that the patients' current medication is not adding to their delirium (Boot, 2012).

The fluctuating nature of delirium warrants that ICU nurses do assessments with a validated tool at least 8 or 12 hourly per shift (Pun *et al*., 2005; Van den Boogaard *et al*. (2013). The ABCDE bundle can also be included in the nursing care of patients with delirium. The nurses have an essential role in the implementation of the bundle; they are responsible for the interruption of sedation (spontaneous awakening trials) and respiratory therapist in spontaneous breathing trials (Balas *et al*., 2012; Iakovou *et al*., 2013).

Volland, Fisher and Drexler (2015) state that, the incidence of delirium can be reduced up to 33% by addressing the following six risk factors which entail cognitive, sleep deprivation, immobility, dehydration, visual and hearing impairment. Zamoscik, Godbold and Freeman (2017), emphasises the significance of early implementation of non-pharmacological interventions (patient reorientation, early mobilisation and sleep promotion) as they address other risk factors that may precipitate delirium.

### 2.7.1 Nurses Perceptions

In an Australian study done by Wells (2012) concerning ICU nurses' beliefs and perceptions about delirium assessment, nurses identified two barriers which were, difficulty in assessing intubated patients and the complexity of screening tools. Wells (2012) identified the lack of knowledge regarding delirium assessment tools, as literature elaborates that both the CAM-ICU and ICDSC are easy and able to be used on intubated ventilated patients. A study incorporating the CAM-ICU at the bedside of 96 trauma ICU nurses' routine nursing care indicated that 17% sensed that it enhanced patient care, 43% sensed it as easy to use and 64%sensed their assessments being accurate (Eastwoods *et al.*, 2012). Moreover, about one-third of the nurses sensed a significant barrier of the CAM-ICU being the time used to administer it and the minority of the physicians regarding the results important (Eastwoods *et al*., 2012).

### 2.7.2 Nursing Care related to Non-pharmacological Interventions

The non-pharmacological interventions primarily entail, the frequent orientation of the patient and explaining procedures to the patient and also introducing oneself as well as other

healthcare providers. The promotion of regular sleep-wake cycle, performance of frequent re-orientation, early mobility and optimization (strategize to minimize noise and light, cluster activities not to disturb the patient) of the patient's environment (Barr *et al*., 2013; Kram *et al*., 2015; Pun & Ely, 2007; Truman & Ely, 2003). In maintaining normal circadian rhythm and allowing restorative sleep, modifying the ICU environment can assist in decreasing noise levels and light exposure (Iakovou *et al*., 2013).

Inouye *et al*. (2014) emphasise that the principal focus of both the prevention and management of delirium be in addressing the underlying causes (Truman and Ely, 2003) including the management of non-pharmacologically behavioural disturbances to improve clinical outcomes, maximise functional status and enhance recovery. Nurses have a significant role in educating patients' families about delirium, its manifestation, fluctuating and temporary nature to allay their anxiety and also encourage them to help re-orientate the patient (Boot, 2012; Truman & Ely, 2003).

### 2.7.3 Nurses' Experience of Caring for ICU Patients with Delirium

In caring for confused, lethargic, agitated or restless patients with delirium, demands a more hands-on approach and therefore adding more workload for nurses (Olson, 2012). A study by LeBlanc and colleagues (2018:94) findings pointed out the following: "the essence of the experience of intensive care nurses caring for adults patients with delirium can be described as *finding a way to come through it*, and participants were challenged to find ways to provide safe, person-centred-care, in order to help patients to come through the temporary state of delirium". There were six themes that arose from the findings in this study: "*it's Exhausting; Making a Picture of the Patient's Mental Status; Keeping Patients Safe; it's a Really Big*

*Job; Everyone is Unique; Riding it Out with Families; and Taking Every Experience With You"*. Iakovou *et al*. (2013), points out that symptoms (agitation, delusions, hallucinations and inappropriate behaviours) brought on by delirium can contribute to the patient being challenging to care for, burden and stress health care providers as well as informal carers.

### 2.7.4 Sleep Deprivation and Delirium

Sleep serves as an essential biological function for physiological rest as well as emotional well-being, and there specific contributors that add to sleep disruption, such as pain, environmental noise and underlying illness (Watson, Ceriana & Fanfulla, 2012; Pun & Ely, 2007). The relationship between sleep and delirium is not well considered, although sleep disturbance as well as the quality of sleep impacts negatively on protein synthesis, cellular immunity and energy expenditure and also leading to negative impacts on both cardiopulmonary and cognitive systems (Pun & Ely, 2007). In 90% of patients with delirium, there have been reports of sleep-wake cycle disturbances, ranging from napping as well as nocturnal insomnia and even worse disturbances such fragmentation and cycle reverse (Hall *et al*., 2012). It has been indicated by studies conducted in cardiac surgical patients that sleep deprivation can be the cause of delirium, result from it or produce a lower clinical threshold for it (Watson, Ceriana & Fanfulla, 2012). According to Allen and Alexander (2012), Barr *et al*. (2013) and Girard, Pandharipande and Ely (2008) sleep deprivation in critically patients increases the level of physiological stress and maybe a contribution to delirium development.

Neurotransmitters acetylcholine and dopamine imbalances have an association with sleep deprivation, and also there is another neurotransmitter tryptophan (Watson, Ceriana &

Fanfulla, 2012). Tryptophan depletion could lead to a reduction in both serotonin as well as melatonin levels, and poor sleep hygiene followed afterwards by delirium may be linked to melatonin levels (Hughes *et al*., 2012). According to Allen and Alexander (2012) and Girard, Pandharipande and Ely (2008) ICU patients on average, sleep only for 2 hours per day and they experience random eye movement of less than 6 % of their sleep. Sleep fragmentation caused by patient-ventilator synchrony may have a role in the manifestation of brain dysfunction in mechanically ventilated patients (Watson, Ceriana & Fanfulla, 2012).

### 2.7.5 Restraints in ICU

Morton and Fontaine (2013), defines restraints in critical care as any drug or a device that is utilised to limit mobility and accessibility of the patient to his body. The use of physical restraint is commonly used in ICU; there is also a chemical and psychological form of restraints in use (Bray *et al*., 2004; Hine, 2007). Up to 75% of mechanically ventilated adult patients have been physically restrained once during their ICU stay (Rose *et al.*, 2016). Literature elaborates that the justification and emphasis of their use in an ICU context are to protect restless and agitated patients from self - harm through the removal of invasive lines (such as endotracheal tubes or arterial lines).

Physical restraints were not intended to cause harm to the patient, regardless of their significance, they can result in both physical (skin and nerve damage, pressure sores, impaired circulation) and psychological (increased agitation, anxiety, fear, anger) harm (Rose *et al.*, 2016). Suliman, Aloush and Al-Awamreh (2017) point out that, physical restraints assist nurses to keep patients safe by controlling sudden patient movement, yet they could be considered as a form of assault/false imprisonment by patients or their families.

According to literature the commonly used type of physical restraints is mittens, limb, wrists and waist restraints. Kram *et al*. (2015) elaborate that, critically ill patients who develop delirium are prone to the use of restraints and self-extubation, which are some of the related complications. Restraints should only be considered if other therapeutic measures are not sufficient (Suliman, Aloush and Al-Awamreh 2017) and they should not be used to replace both human and environmental resources (Hofso & Coyer, 2007).

A psychological form of restraint occurs when a patient is deceived, believing that he/she is still restrained while the wrist restraints are still attached but untied (Happ, 2000; Hine, 2007). Studies that were done indicated that physically restrained patients could self-extubate themselves regardless of the use of physical restraints, as they do not prevent the interference of treatment (Hine, 2007; Hofso & Coyer, 2007; Rose *et al*., 2016). The physical restraints instead, exacerbate and increases the occurrence of agitation in critically ill patients (Bray *et al*., 2004).

### 2.7.6 Pharmacological Treatment of Delirium

Haloperidol has been recommended by the Society of Critical Care Medicine (SCCM) guidelines for treating delirium, although there are no drugs approved for treating delirium (Holly *et al*., 2013; Pun & Ely, 2007; Truman & Ely, 2003). When it comes to the pharmacodynamics of haloperidol, which is a typical antipsychotic that blocks D2 dopamine receptors, which subsequently improves the hallucinations, delusions as well as unstructured thought patterns (Girard, Pandhsripande & Ely, 2008). According to Shim and Leung (2012) in one study conducted, the results indicated that haloperidol was effective in treating delirium occurrence than it is in preventing its occurrence. Boot (2012) further points out

that, without identifying the cause of delirium haloperidol will just proceed to treat the manifestation of delirium.

However, it is contraindicated by the PAD guidelines for patients with torsades de pointes to use haloperidol (Barr *et al*., 2013). Also, it is vital to identify patients with a history of cardiac disease, prior the use of haloperidol as it predisposes them to QT prolongation, extrapyramidal symptoms and neuroleptic malignant syndrome (Allen & Alexander, 2012; Pun & Ely, 2007; Truman & Ely, 2003).

### 2.7.8 Dementia and Delirium in Elderly Patients

In elderly patients' dementia and delirium are co-morbid, dementia being a predisposing factor for delirium and dementia being a sign of an emerging delirium (Hall *et al*., 2012).**Table 2.4** assists with the recognition of delirium from dementia features as it not simple to recognise delirium without a validated tool, especially when they have a hypoactive (quiet subtype) delirium. According to Peterson *et al*. (2006) hypoactive delirium has been associated with older age (≥65 years). In hospitalised elderly patients, delirium is one of the most common complications (Witlox *et al*. 2010). According to Balas *et al*. (2012), about 30 to 62% of elderly patients present with delirium during their ICU stay. Ely *et al*. (2001) and Wells *et al*. (2012) further elaborate that, in critically ill elderly patients, prevalence rates are as high as 87%, due to their multiple comorbidities which may hinder the recognition of delirium symptoms Traynor *et al*., (2015).

Moreover, critically ill elderly patients have a higher risk for delirium of which is it thought to be caused by intrinsic and extrinsic factors, which entail impairments in activities of daily

living (ADL), pre-existing cognitive impairment (dementia), depression, severity of illness, outpatient use of benzodiazepines or narcotics (Balas *et al*., 2012; Girard, Pandharipande & Ely, 2008; Pisani et al., 2007). **Table 2.4** displays these differences.

**Table 2.4** Differences between delirium and dementia

| | **Delirium** | **Dementia** |
|---|---|---|
| **Clinical Feature** | | |
| Onset | Acute | Insidious |
| Course | Fluctuating | Slowly progressive |
| Duration | Hours to weeks | Months to years |
| Sleep/wake cycle | Always disrupted | Sleep fragmented |
| **Mental Status** | | |
| Level of Consciousness | Disturbed, a person less aware of the environment, and less able to focus, sustain or shift attention. | Usually normal until late in the course of the illness. |
| Behaviour | Activity often abnormally decreased (somnolence) or increased (agitation, hyperviligence). | Normal to Slow, inappropriate. |
| Speech | Maybe hesitant, slow or rapid, incoherent. | Difficult in finding words, aphasia. |
| Mood | Fluctuating, labile, from fearful or irritable to normal or depressed. | Often flat, depressed. |
| Thought processes | Disorganized, may be incoherent. | Impoverished, speech gives little information |
| Thought content | Delusions are common, often transient. | Delusions may occur |
| Perception | Illusions, delusions, often visual | Hallucinations may occur |
| Judgement | Impaired | Increasingly impaired over illness course |
| Orientation | Disorientated, especially with time. A known place may seem unfamiliar | Becomes impaired in the late stages of illness |
| Attention | Fluctuates, person becomes easily distracted, unable to concentrate | Unaffected until late in the illness. |
| Memory | Immediate and recent memory impaired | Recent memory and learning impaired |

**Source:** Adapted from Hall *et al*. (2012)

## 2.8 SUMMARY

This chapter discussed the literature review conducted for the study. The literature provided an overview of caring for patients in ICU, delirium, the impact of delirium on ICU patients, managing delirium, the use of delirium assessment tools and nursing care of delirious patients in ICU.

The next chapter will discuss the research design and methodology used in the study.

# CHAPTER THREE

## RESEARCH METHODOLOGY

### 3.1 INTRODUCTION

Research methodology discusses the steps, procedures and strategies took in data gathering and analysing in a study (Polit & Beck, 2010). This chapter elaborates on the research designs and methods used in this study. It will discuss the research design and methods, which entail the research setting, study population, sample and sampling, data collection, the instrument used, including the validity and reliability. Finally, the ethical considerations, validity and reliability of the whole study will be considered and elaborated.

### 3.2 RESEARCH DESIGN

In this study, a descriptive-quantitative and longitudinal design was utilised. This study intended to put into place two validated and well-known instruments, namely The Richmond Agitation and Sedation Scale (RASS) and Confusion Assessment Method for Intensive Care Units (CAM-ICU) to determine the incidence of delirium in critically ill patients in two South African adult intensive care units. The study also intended to determine positive and negative CAM-ICU scores and comparisons were made between these two study groups.

#### 3.2.1 Quantitative

Quantitative research entails, the investigation of phenomena that lend themselves to precise measurement and quantification, often involving a rigorous and controlled design (Polit &

Beck, 2010). In this study, quantitative research was utilised, as the incidence of delirium was measured and described in critically ill patients in adult intensive care units. A researcher-developed data collection checklist was used to collect the negative and positive numeric information for analysis and interpretation.

### 3.2.2 Descriptive

Descriptive designs are used to gain more information in a particular field through the provision of a picture of the phenomenon as it occurs naturally. It describes the variables to answer the research question, and there is no intention of establishing a cause-effect relationship (Brink, Van Der Walt & Van Rensburg, 2012). It could be used to develop theory, to determine what others are doing in similar circumstances, to identify problems with current practice and to justify current practices (Botma *et al*., 2010).

In this study, the purpose of using a descriptive design was to describe the incidence of delirium and the relationship between delirium, patient factors and outcomes in critically ill patients. A researcher administered data collection checklist was used to collect data.

### 3.2.3 Longitudinal

A longitudinal study collects data on respondents over an extended period (Brink, Van Der Walt & Van Rensburg, 2012). According to Polit and Beck (2010), a longitudinal design entails collection of data at multiple points over a period. This study was considered to be longitudinal as data was collected over a period i.e. from the admission of the patient to ICU until discharge of the patient from the ICU to a general ward in the hospital.

## 3.3 STUDY SETTING

The study was conducted in the trauma and multi-disciplinary Intensive Care Units (ICU's) at one university-affiliated public sector tertiary level hospital in Johannesburg, Gauteng province. Trauma and multi-disciplinary ICU's consists of patients with multiple organ failures, which require highly specialised care. It is also a referral hospital, which receives referrals from other hospitals and clinics, transfers within and outside as well. These units provide treatment to approximately 692 (N=692) patients per annum (Schmollgruber, 2015).

Patient acuities and practices are similar to these units. The nurse-patient ratio is one nurse to one patient over a 24 hour period. This institution is an academic hospital, which trains nursing, medical and physiotherapists students for clinical experience. The nursing staff entails, both ICU trained and untrained nurses who hold a general nursing qualification.

In these ICU's intensivists and registrars, carry the responsibility of performing integrated care of patients and consistent participation in ICU activities in the management of patients. The nurses' responsibility entails critically ill patient assessments, supportive care and monitoring of haemodynamic parameters (vital signs), and physiotherapists assist with passive and active exercises to prevent muscle atrophy and contractures and mobilise chest secretions.

## 3.4 RESEARCH METHODS

### 3.4.1 Population

In this study, the population comprised of all patients receiving treatment in intensive care units (n=2) at a public hospital in Johannesburg. According to the admission records, a total of 796 patients were treated in these intensive care units in 2016, and the mortality rate was an estimated 20%. This translated into an estimated 199 patients over a three month period (1.07.2016 to 30.9.2016).

Because not all patients could be included in the study, the following inclusion criteria was applied:

- Patients admitted to either trauma or multidisciplinary ICU during the study period;
- If they are at least 18 years of age;
- Had an expected ICU length of stay of greater than 36 hours; and
- Provided written informed consent obtained.

Exclusion criterion included patients within a hospital length of stay greater than 96 hours before ICU admission and those admitted following a neurological insult, altered mental state or with a past medical history of dementia or delirium. The reason was to control for enrolling patients into the study who may already have suffered from delirium upon ICU admission.

### 3.4.2 Sample and Sampling

Random sampling was used to select the study participants. The sample size was not pre-determined but established over a three month study period, which was 1.07.2017 to 30.09.2017. A more extensive sample is targeted to ensure the validity of the study findings. However, it was estimated from previous studies and the unit statistics that the anticipated sample size could be expected to be a minimum of 80 (n=80) patients in this study period (Schmollgruber, 2015).

- **The final study sample was constituted as follows:**

In this study, two adult ICUs were used as the study sub-sites. Approximately a total of 522 patients were admitted to the ICUs during the period of 1.07.2017 to 30.9.2017. Of these patients, 416 were excluded on the grounds of not meeting the study related inclusion criteria and the study related procedures. This left 106 patients for inclusion in the study. In preparation for data analysis a further 24 patients were excluded on the basis of length of stay (<36 hours) in ICU and measured RASS scored (score -5) which rendered the researcher unable to use the CAM-ICU method. **Figure 3.1** displays these results.

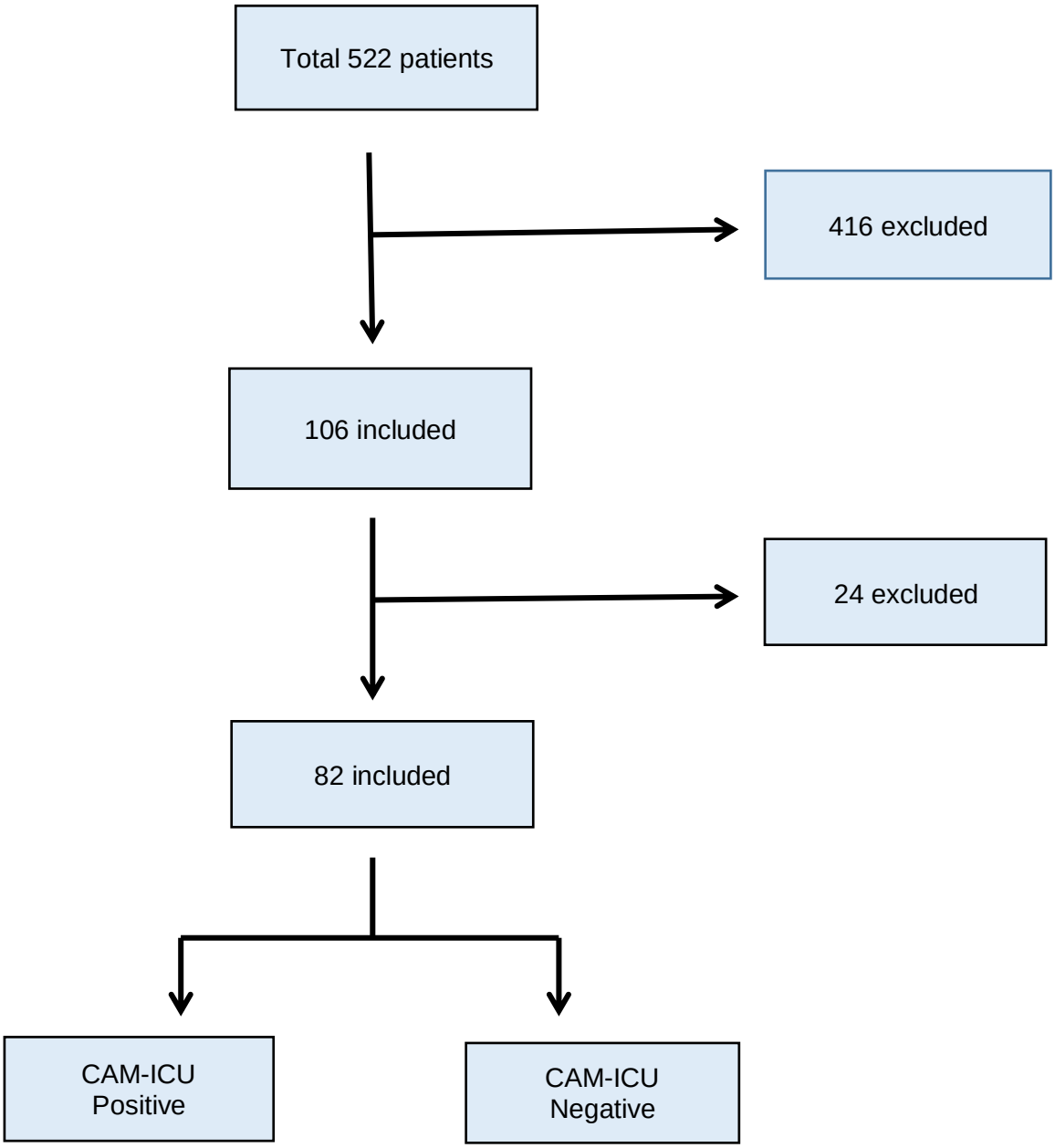



**Figure 3.1** Constitution of the study sample

### 3.4.3 Data Collection

#### 3.4.3.1 Instrument

The Confusion Assessment Method (CAM) developed by Inouye et al. (2001) and adapted for ICU (CAM-ICU) by Ely *et al.*, (2001) identified in the literature and validated in previously published studies was used to achieve the study objectives.

Assessment of delirium using the CAM-ICU comprised a two-step approach whereby four features from the DSM-IV was assessed. The first step was to assess the level of consciousness the Richmond Agitation Sedation Scale (RASS) (Sessler *et al.,* 2002) was built into the CAM-ICU (Ely *et al.,* 2001). The RASS provided a 10 point scale to measure level of consciousness i.e. A RASS score of + 4 = combative; + 3 = very agitated; + 2 = agitated; + 1 = restless; 0 = alert and calm; - 1 = drowsy; - 2 = light sedation; - 3 = moderate sedation; - 4 = deep sedation and - 5 = unarousable. However, at deeper levels of consciousness (i.e. RASS – 4 & - 5) it is difficult to assess content because the patient is non-responsive, and in those situations, CAM-ICU was not assessed, this referring the patient as "unable to assess". However, at lighter levels of consciousness (i.e. RASS – 3 to + 4) patients were able to display at least the beginnings of meaningful responsiveness (i.e. responsive to voice), and in these situations, CAM-ICU is assessed (Ely *et al.,* 2001).

The second step was the assessment of the content of consciousness, which comprised four features: *feature 1* = acute change or fluctuating course of mental status; *feature 2* = inattention; *feature 3* = altered level of consciousness; *feature 4* = disorganised thinking. The CAM-ICU comprises attention to screening examinations by using letter testing with or

without additional recognition of standardised pictures as described previously (Ely *et al.*, 2001). The test was judged positive, that was the patient is considered delirious if feature 1 plus 2 and either feature 3 or 4 is present, i.e. Overall Cam-ICU = Feature 1 plus 2 and either 3 or 4 present = CAM-ICU positive (Ely *et al.,* 2002).

3.4.3.2 Validity and reliability of the instrument

Reliability and validity of CAM-ICU was assessed by the developers in the sample of the original study (Ely *et al.,* 2001), and a pilot study involving a sample of 38 patients admitted to the adult ICUs, where two critical care nurses and one medical intensivist daily ratings were compared against the reference standard, a delirium expert who used delirium criteria from the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV), demonstrated high inter-rater reliability for their CAM-ICU ratings with Kappa statistics of 0.84, 0.79 and 0.95, respectively ($p<0.01$). The two nurses and medical intensivist sensitivities when using the CAM-ICU compared with the reference standard were 95%, 96% and 100%, respectively, whereas their specificities were 93%, 96% and 89%, respectively (Ely *et al.,* 2001). Also, the CAM-ICU has demonstrated similar sensitivities and specificities when used in independent studies to identify delirium (Ely *et al.,* 2001; Devlin *et al.,* 2008; Svenningsen *et al.,* 2013).

3.4.3.4 Procedure

Permission was sought from the CEO of the hospital being requested to participate in the study. Once permission has been obtained from the institution, the permission from the

Director for Nursing Services was sought, and after that, the Medical Director and Nurse Unit Manager of the respective ICU was also approached for permission.

The researcher visited the ICUs (n=2) and observed the respective admission register for selection of patient participants. Because of the nature of the critical illness and the study procedures, data collection began on admission for treatment in the ICU a temporary surrogate informed consent was obtained from the family (**Appendix C**). Those relatives who agreed with their family member to participate in the study were given an information letter outlining the study and its procedures. A retrospective consent form was also given to the patient during the recovery period, i.e. on discharge from ICU to a general ward in the hospital (**Appendix D**).

In this study gender, age, admitting diagnosis, the reason for admission, the severity of illness was collected during the first 24 hours, ventilator days and use of sedatives and analgesic medication and restraints was collected daily from the ICU charts as this was subject to individual variation. Length of stay in ICU was collected to determine patient outcomes.

All patients were assessed using the validated version of RASS and CAM-ICU by the researcher at least twice a day from admission to discharge (to the ward or another ICU) or death. These data were collected by the researcher at the same time, i.e. in the morning and evening. The additional assessment was performed if the patient's mental status changed a note was entered by the researcher on the ICU chart, and the doctor in charge of the patient was be notified.

Daily delirium status was determined using three CAM-ICU score outcomes. These were a positive CAM-ICU score, negative CAM-ICU and unable to assess CAM-ICU. Data was captured on a researcher-developed data collection sheet (**Appendix A**).

### 3.4.4 Data Analysis

In preparation for the data analysis, patient's length of stay in ICU and hospital was calculated from the admission date to ICU. Descriptive and comparative statistics were used to determine the incidence of delirium in both positive and negative CAM-ICU study groups.

Categorical data were tabulated into minimum, maximum and percentile values, and each continuous variable was calculated into minimum, maximum, mean and standard deviation. Bivariate associations between delirium and the categorical variables were performed using *Chi-Square* and *Fisher's exact* statistics as appropriate, and between delirium and continuous variables by *t-test*. In all analyses, a p-value of 0.05 or less was chosen to detect statistical significance. Statistical assistance was obtained from a biomedical statistician from the Medical Research Council (MRC).

When estimating the incidence of delirium in intensive care units (**objective 1**), a standard statistical software package was used. STATA version 13 survival status was employed to compute the incidence of delirium. Two groups were created, whereby Exposure = 1 CAM-ICU positive scores and NON-EXPOSURE = 0 CAM-ICU negative scores. The incidence rate, incidence rate ratios and 95% confidence interval were determined. Statistical tests for significance was performed using *Chi-square*.

When describing the relationship between delirium, patient factors and outcomes (**objective 2).** Bivariate associations between delirium and categorical variables were performed using chi-square statistics.

When describing the relationship between delirium and outcomes (**Objective 3).** Two outcomes were used in this study, namely discharge and death. When analysing LOS in ICU and LOS in hospital patients who died were excluded. The rationale being that some deaths may have occurred due to other reasons unrelated to delirium. Bivariate analysis of delirium and patient outcomes were performed using t-test.

When identifying the demographic profiles of patients >60 years who tested CAM-ICU positive for delirium (**objective 4**). The data was stratified into one group by less than 60 years and another, greater than 60 years age group to look at the demographic variables by subgroups: delirium exposed (0) and non-delirium exposed (1) cases.

## 3.5 PILOT TESTING

Pilot testing was conducted before the commencement of the main study. The data collection tool was used on five (n=5) patients in another suitable ICU at the selected study site. Pilot testing is a small-scale trial run of all aspects planned for use in the main study. Its purpose was to help the researcher to fine-tune the study for the main inquiry and to determine whether the methodology, sampling, instruments and analysis are adequate and appropriate (De Vos *et al.,* 2011). The results from the pilot testing procedure was not used in the main study.

## 3.6 ETHICAL CONSIDERATIONS

In conducting this study, human participants were involved in the study. Hence ethical matters were addressed. Ethical considerations should be linked throughout the research phases, from the conceptualisation, planning and implementation, including writing a report up until the dissemination phase (Botma *et al*., 2010; Brink *et al*., 2012). As a university student in the Faculty of Health Sciences, another ethical requirement is to abide by the Declaration of Helsinki in medical research in protecting, taking responsibility and ensuring proper conduct of human experimentation.

### 3.6.1. South African Nursing Council (SANC)

Ethics forms the core of the nursing profession, according to SANC (2005) the code of ethics in the nursing profession is there to prompt nurses of the responsibility on their shoulders to protect, promote and restore the health of individuals and communities, it also functions as nurses declaration. The nursing practitioners' acts pertain to respecting human rights which take into account, cultural rights, right to life, right to choice and dignity without consideration to age, colour, creed, culture, disability or illness, gender, sexual orientation, nationality, politics, race or social status (SANC, 2005).

### 3.6.2 Permission to Conduct Research

Permission was obtained to conduct research through the submission of protocols to the University Postgraduate Committee. The committee for research on Human Subjects (Medical) of the University of the Witwatersrand granted the application for clearance to

conduct research. And also permission to conduct research through application to the hospital was obtained from the Hospital Management and Department of Health (Gauteng) (refer **Appendix E**).

### 3.6.3 Informed Consent

Informed consent is an ethical principle which entails respondents voluntarily agreeing to participate in a research study whereby they have a full understanding of the study prior the study begins (Brink *et al*., 2012). Patients' family members (on behalf of the patient) were invited to participate in the study and were informed that they were free to voluntarily give consent or decline, and also to withdraw from the study anytime they wished to without any penalties involved (refer **Appendix C**). Moreover, a retrospective written consent was obtained from the patient during the recovery period after the patient was discharged from the ICU to a hospital ward (refer **Appendix D**).

### 3.6.4 Confidentiality and Anonymity

Confidentiality ethical principle pertains to the identity of the research respondent being only known to the study investigators (Brink *et al*., 2012). The handling of respondents' personal information by ensuring that only the researchers directly involved in the study have access to the information and that information was not willingly or unintentionally shared with other people except if the person whose confidence it is has consented to share the information (Botma *et al*., 2010).

In this study, confidentiality was attained through preventing the publication of information in a manner that rebels against the respondents and raw data not accessible to other people and individuals are known to the respondents. Moreover, generated code numbers were used during data collection and reporting to protect respondents was applied.

**Anonymity** is the protection of the respondents' confidentiality, in such that even the researcher is unable to link the individuals with their provided data (Polit & Beck, 2010).

In this study, respondents' anonymity was implemented through safely storing their information on my personal computer, with the use of a password to keep the document protected. Regarding the storage of completed surveys, the university requires researchers to keep them for five years before they can be destroyed (shredded).

## 3.7 VALIDITY AND RELIABILITY OF THE STUDY

Reliability was maintained by ensuring consistency and accurate recording of data. This was achieved through compliance of the researcher with the data collection tool and guidelines (Ely, 2014). Inter-rater reliability was established by using a second rater to ensure consistency in data collection. The level of accuracy was set at >95% accuracy in the paired assessments. Being a prospective study, there was no manipulation of the variables, and this prevented a threat to internal validity. A prospective study also made it easier to investigate results obtained during the data collection and look for alternative causes that yielded results obtained. External validity was ensured by selecting a large sample for the study, which was generated from the intensive care units. This ensured that a characteristic sample was

representative of those of the population from which it was drawn, thus enhancing the generalizability of the results (Polit & Beck, 2014).

## 3.8 SUMMARY

This chapter discussed the research methodology of the study. It included the design, the study setting, the population (inclusion and exclusion criteria) and sampling described, data collection and analysis discussed, pilot testing and ethical considerations discussed. Methods to ensure validity and reliability described as well as validity and reliability of the tool used in data collection was discussed as well.

The next chapter will discuss the data analysis and results of the study.

# CHAPTER FOUR

## RESULTS AND DISCUSSION OF FINDINGS

### 4.1 INTRODUCTION

This chapter describes the data analysis and results of the study. This was achieved within an exploratory, descriptive, contextual and quantitative design. The population included all patients admitted to the ICUs (n = 2) at a university-affiliated, public sector and tertiary level hospital in Johannesburg. A sample of 82 (n = 82) was obtained by means of simple random sampling. Data were collected by means of a data collection tool (**Appendix A**). Data were analysed by means of descriptive and inferential statistics. Statistical tests included incidence rate comparison, Chi-squared and Fisher's exact tests. Testing was done on at the 0.5% level of significance and insured a power of at least 95% accuracy on findings.

### 4.2 APPROACH TO DATA ANALYSIS

Descriptive statistics were used to present the interpretation of the clinical data of the patient respondent's gender, age, level of education, reason for admission, mechanical ventilation, severity of illness, sedation score, length of stay and outcomes. Frequency distributions were used to provide a coherent picture of the data. Measures of central tendency (mean and standard deviation) and variance (standard deviation) were used to summarise the data. These results are shown in tables **4.1 to 4.7.**

To determine the incidence of delirium among study patients, data was declared as time-dependent data on STATA version 13. The probability of a patient having delirium during

their length of stay (incidence rate of delirium) was calculated. To determine the relationship between incidence of delirium and patient outcome, the probability of a patient with delirium having a 'death' as opposed to 'discharge' outcome was calculated using incidence rate comparison and results are shown in **table 4.8.**

To describe the relationship between delirium and patient factors, frequency tables were computed to determine the proportion of patients with delirium per demographic/patient category and a Chi-squared test (or Fisher's exact test was computed to determine the statistical significance in the proportion differences and the results presented in **table 4.9 and table 4.10.**

To identify the demographic profiles of patients older than 60 years who tested CAM-ICU positive for delirium, frequency tables and Chi-squared test (or Fisher's exact test where appropriate) were computed and the results presented in **table 4.11**

## 4.3 RESULTS AND DISCUSSION OF FINDINGS

### 4.3.1 Section One: Biographical Data

This section presents the biographical data of the patient's gender, age, level of education and reason for ICU admission. The data was obtained by the researcher from the respondents ICU charts and hospital admission records. **Table 4.1** summarises the results of this process for the total sample (n = 82).

**Table 4.1** Frequency distributions of the respondent's biographical data

| Patient variables | Frequency | Percentage |
|---|---|---|
| Gender | | |
| Male | 48 | 58.5% |
| Female | 34 | 41.5% |
| Age | | |
| <40 years | 45 | **54.9%** |
| 40 to 59 years | 1 | 1.2% |
| 60 to 69 years | 21 | 25.6% |
| 70 to 74 years | 10 | 12.2% |
| 75 to 79 years | 4 | 4.9% |
| >80 years | 1 | 1.2% |
| Education | | |
| Unknown | 8 | 9.8% |
| Primary | 25 | 30.5% |
| Secondary | 26 | **43.9%** |
| Tertiary | 13 | 15.9% |
| Reason for admission | | |
| Surgery | 57 | **69.5%** |
| Scheduled surgery | 37 | **45.1%** |
| Medical | 25 | 30.5% |
| Unscheduled surgery | 20 | 24.4% |
| Severity of critical illness (SAPS II) | | |
| 0 to 19 points | 8 | 9.8% |
| 20 to 39 points | 37 | **45.1%** |
| 40 to 59 points | 30 | 36.6% |
| 60 to 80 points | 7 | 8.5% |
| Mechanical ventilation | | |
| Yes | 81 | 98.9% |
| No | 1 | 1.2% |
| Sedation score (RASS) | | |
| Combative – score +4 | 3 | 3.6% |
| Very agitated – score +3 | 11 | 13.4% |
| Agitated – score +2 | 3 | 3.7% |
| Restless – score +1 | 14 | **17.1%** |
| Awake and alert – score 0 | 24 | **29.3%** |
| Drowsy – score -1 | 17 | **20.7%** |
| Light sedation – score -2 | 7 | 8.5% |
| Moderate sedation – score -3 | 1 | 1.2% |
| Deep sedation – score -4 | 2 | 2.4% |
| Unarousable – score -5 | - | - |
| Length of stay in ICU | | |
| < 7 days | 67 | 81.7% |
| >7 to 14 days | 9 | 10.9% |
| >14 to 21 days | 3 | 3.7% |
| >3 weeks | 3 | 3.7% |
| Patient outcome | | |
| Survival | 72 | 87.8% |
| Non-survival | 10 | **12.2%** |

Males accounted for 58.5% (n = 48) and females for 41.5% (n = 34) of the total sample (n = 82). The average age of patients was 39 (median) (IQR 29 – 52) years. The age range of all patients admitted to ICUs was from 19 to 86 years. Thirty-six (43.9%) patients were older than 60 years, whereas 54.9% (n = 45) of all patients were between the ages of 19 to 40 years, and only 1.2% (n = 1) patient was older than 80 years of age. **Figure 4.1** displays these results.

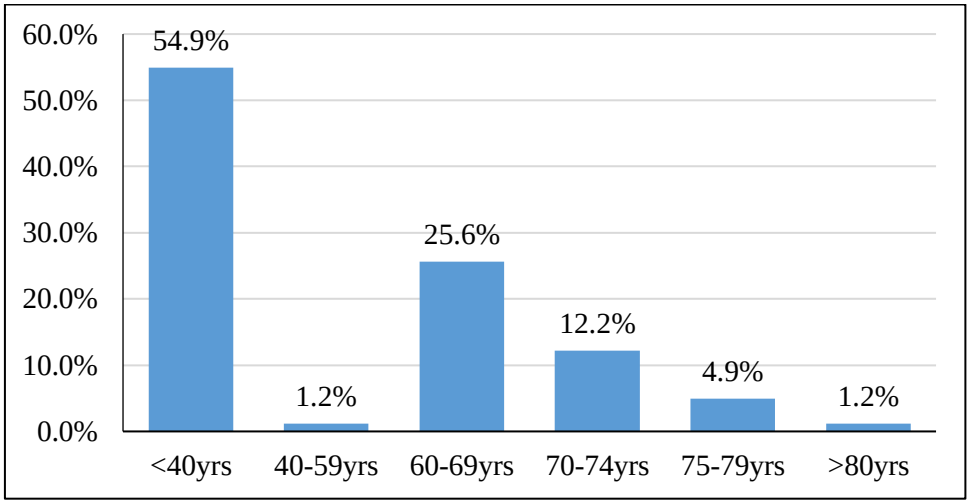



**Figure 4.1** Frequency distributions for age categories

The level of education was higher 43.9% for secondary (high school), whereas 30.5% (n = 26) were primary (elementary school), and 15.9% (n = 13) were tertiary (university or college) education. It was noted that eight (9.8%) of the respondents had no recorded information related to education level in their hospital records.

The reason for ICU admission of patients was higher 69.5% (n = 57) for surgery, and 30.5% (n = 25) were medical cases. Of all surgical patients, scheduled surgery was slightly higher 45.1% (n = 37) than unscheduled surgery, which was 24.4% (n = 20).

Severity of critical illness as indicated by the SAPS II score on admission was 36.8 (SD = 14.3) for the total sample (n = 82), and the range was between seven to 75 points. An analysis between critically ill patients revealed the SAPS II score were highest 45.1% (n = 37) for the categories between 20 to 39 points, followed closely by 36.6% (n = 30) in the categories of 40 to 59 points. In addition, only a small number of critically ill patients had SAPS II scores between 0 to 19 points (n=8; 9.8%) and 60 to 80 points (n = 7; 8.5%), respectively. **Figure 4.2** displays these results.

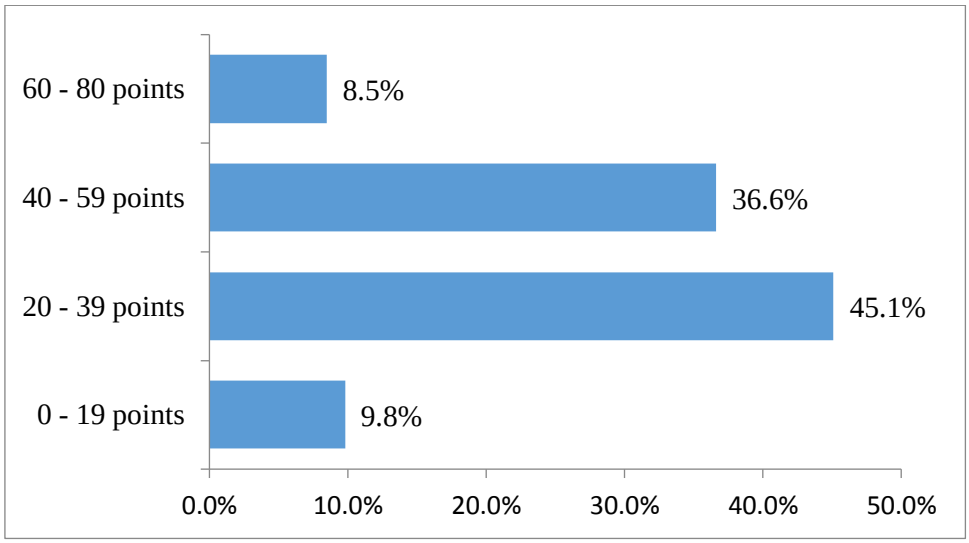



**Figure 4.2** Frequency distributions of severity of critical illness scores

An analysis between critically ill patients sedation scores as indicated by RASS score on admission were highest 29.3% (n = 24) for the categories of "awake and alert", followed by 20.7% (n = 17) and 17.1% (n = 14) in the categories of "drowsy" and "restless" respectively. **Figure 4.3** displays these results.

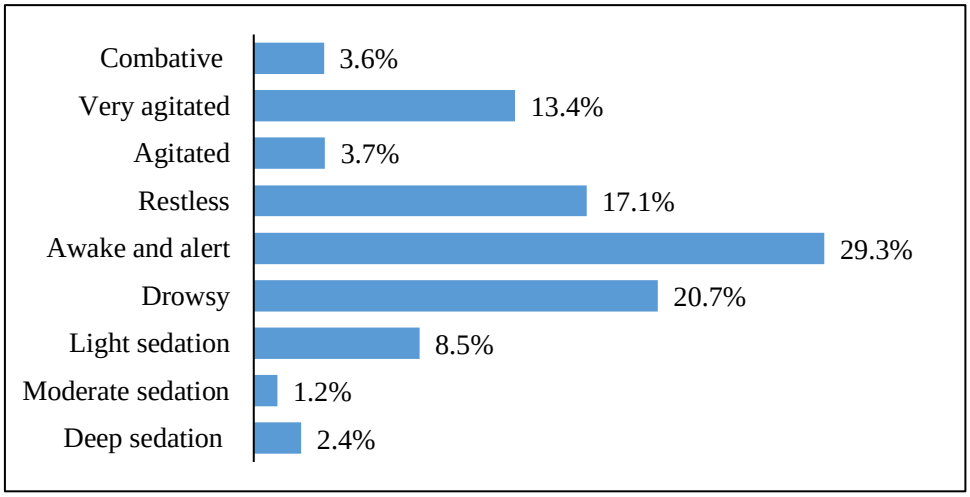



**Figure 4.3** Frequency distributions for RASS score

The mean length of stay for critically ill patients in ICUs was 6.12 (SD = 4.6) days, and the range was between one to 23 days. In addition, an analysis of critically ill patients length of ICU stay revealed the length of stay was highest 81.7% (n = 67) in the less than seven days (<7 days) categories, followed by 10.9% (n = 9) and 3.7% (n = 3) in the more than seven days to fourteen days (>7 to 14 days) and more than fourteen days to twenty-one days (>14 to 21 days, respectively). Only 3.7% (n = 4) of the patients were admitted to ICU for more than three weeks. **Figure 4.3** displays these results.

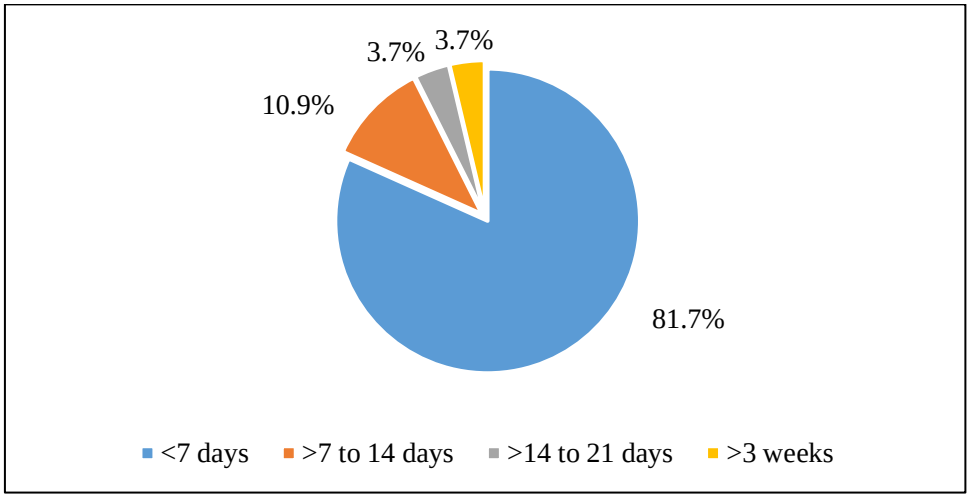



**Figure 4.4** Frequency distributions for length of stay in ICU

Of the total sample (n = 82), the higher 87.8% (n = 72) was indicated for patient survival or 'discharge' from ICU, and 12.2% (n = 10) was for non-survival or 'death' in ICU.

### 4.3.2 Section Two: Severity of Critical Illness (SAPS II Score)

Section two of the data collection instrument related to measurement of severity of critical illness as determined by 15 physiological variables of the SAPS II score. **Table 4.2** summarises the results of this process for the total sample.

**Table 4.2** Frequency distributions for severity of critical illness scores (SAPS II)

| Categorical data | Frequency | Percentage |
|---|---|---|
| "Heart rate | | |
| <40 | 48 | 58.5% |
| 40- 69 | 1 | 1.2% |
| 70 -119 | 25 | 30.5% |
| 120-159 | 7 | 8.6% |
| >160 | 1 | 1.2% |
| Systolic blood pressure | | |
| <70 | 69 | 84.2% |
| 70-99 | 3 | 3.7% |
| 100-199 | 6 | 7.3% |
| >200 | 4 | 4.8% |
| Body temperature | | |
| <39 | 76 | 92.7% |
| >39 | 6 | 7.3% |
| CPAP PaO2/FiO2 | | |
| <100 | 19 | 23.2% |
| 100-199 | 1 | 1.2% |
| >200 | 62 | 75.6% |
| Urinary output/ 24 hours | | |
| <0.500 | 58 | 70.7% |
| 0.500-0.999 | 18 | 22.0% |
| >1.000 | 6 | 7.3% |
| Serum urea (mmol/L) | | |
| <10 | 61 | 74.4% |
| 10-29.9 | 14 | 17.1% |
| >30" | 7 | 8.5% |

**Table 4.2** continued

| Categorical variables | Frequency | Percentage |
|---|---|---|
| "WBC count in 1000/µL | | |
| <10 | 66 | 80.5% |
| 1.0-9.9 | 16 | 19.5% |
| >20 | - | - |
| Serum potassium in mmol/l | | |
| <3.0 | 65 | 79.3% |
| 3.0– 4.9 | 17 | 20.7% |
| >5.0 | - | - |
| Serum sodium in mmol/l | | |
| <125 | 78 | 95.1% |
| 125-144 | 4 | 4.9% |
| >145 | - | - |
| Serum bicarbonate in mmol/l | | |
| >15 | 46 | 56.1% |
| 15-19 | 26 | 31.7% |
| >20 | 10 | 12.2% |
| Serum bilirubin in µmol/L | | |
| <4.0 | 45 | 54.9% |
| 4.0-5.9 | 1 | 1.2% |
| >6.0 | 36 | 43.9% |
| Glasgow Coma Scale | | |
| <6 | 37 | 45.1% |
| 6-8 | 7 | 8.5% |
| 9-10 | 14 | 17.1% |
| 11-13 | 11 | 13.4% |
| 14-15 | 13 | 15.8% |
| Chronic diseases | | |
| None | 60 | 73.2% |
| Metastatic carcinoma | 2 | 2.4% |
| Hematologic malignancy | 12 | 14.6% |
| AIDS" | 8 | 9.8% |

### 4.3.3 Section Three: Serial Measurements of Clinical Data

Section three of the data collection instrument related to serial measurements of mechanical ventilation, medication, physical restraint, and sedation scores (RASS) and CAM-ICU scores. **Table 4.3** summarises the results of the process for the total sample (n = 82).

**Table 4.3** Summary of clinical data obtained from the respondents over time

| Patient variables | Frequency | Percentage |
|---|---|---|
| "Mechanical ventilation | | |
| Yes | 81 | **98.9%** |
| No | 1 | 1.2% |
| Medication | | |
| Morphine | 39 | 47.6% |
| Midazolam | 40 | **48.8%** |
| Propofol | 2 | 2.4% |
| Haloperidol | 1 | 1.2% |
| Physical restraint | | |
| Yes | 61 | **74.4%** |
| No | 19 | 23.2% |
| Unknown | 2 | 2.4% |
| Acute onset or fluctuating course | | |
| Yes | 33 | 40.4% |
| No | 19 | 23.2% |
| Inattention | | |
| Present | 37 | 45.1% |
| Absent | 44 | 53.7% |
| Altered level of consciousness | | |
| Yes | 57 | 69.5% |
| No | 24 | 29.3% |
| Disorganised thinking | | |
| Present | 30 | 36.6% |
| Absent | 51 | 62.2% |
| Overall CAM ICU | | |
| CAM-ICU positive | 32 | **39.0%** |
| CAM-ICU negative | 44 | 53.7% |
| CAM-ICU unsure" | 3 | 3.7% |

**Table 4.3** presented these results. Based on an analysis of respondents clinical data obtained from a sample of 82 (n = 82) patients during the ICU admission period. Findings in this study revealed an overwhelming 98.9% (n = 81) of the patients were mechanically ventilated, when compared with, only 1 (1.2%) non-ventilated patient. A close three-quarters (74.4%; n = 61) of patients had been physically restrained. In terms of medication, 48.8% (n=40) and 47.6% (n = 39) of the patients received midazolam and morphine, respectively. More than one-third (>33%) of patients tested positive for three (acute onset or fluctuating course, inattention, disorganised thinking) features of delirium, whereas more than two-thirds

(>66%) tested positive for altered level of consciousness. More than one-third (39.0%; n = 32) of the patients tested positive for delirium when CAM-ICU method was used.

Out of a total of 502 days, 37.9% (n = 31) of patients displayed features of hyperactive delirium, followed by 20.9% (n = 17) and 22.1% (n = 18) indicated as mixed delirium and hypoactive delirium. **Figure 4.4** displays these results.

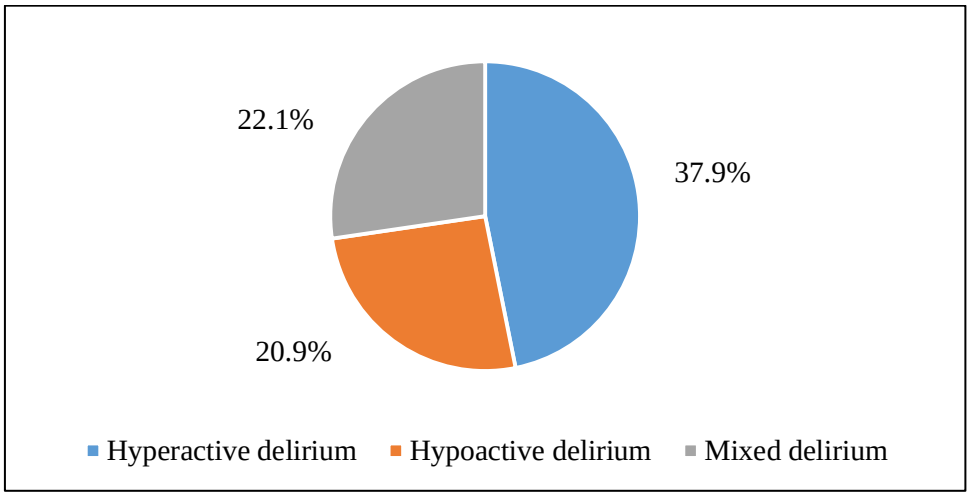



**Figure 4.4** Frequencies for categorisation of delirium by sub-types over time

### 4.3.4 Comparative Statistics

4.3.4.1 Incidence of delirium

A total of 82 (n = 82) critically ill patients in the ICUs were included in the study. Among these 32 (39.0%) had delirium during their length of stay. The average length of stay was 6 days with a minimum length of stay of 1 day and a maximum of 23 days.

**Table 4.4** Relationship between incidence rate of delirium and patient outcome (discharge or death) in adult intensive care patients

| | **Delirium = 1 N=32** | **Delirium = 0 N=50** | **Total N=82** |
|---|---|---|---|
| "Failure time | 6 | 4 | 10 |
| Time in days | 218 | 284 | 502 |
| Incidence rate | 0.03 | 0.01 | 0.02 |
| | **Point estimate** | **95% Confidence Interval** | |
| Incidence rate difference | 0.02 | -0.01 – 0.04 | |
| Incidence rate ratio | **2.61** | **0.56 – 16.10** | |
| Previous fraction exposure | 0.62 | 0.56 – 16.10 | |
| Previous fraction population | 0.41 | -0.80 – 0..94 | |
| p-value" | 0.0916 | | |

The incidence rate calculation results showed a total person time of 502 (n = 502) days with a total of 32 (n = 32) failures (delirium cases) which translates to an incidence rate of 0.06 (CI 0.04-0.09) failures per person day. These results are displayed in **table 4.4**.

4.3.4.2 Relationship between incidence of delirium and patient outcome

The results for the relationship between incidence of delirium and patient outcome are presented in **Table 4.4**

Among the 32 patients who had delirium 6 (18.8%) had a 'death' outcome out of a total of 218 days. The incidence rate ratio was 2.61 (CI 0.56 – 16.10) indicating that delirium was a risk factor for death however the results showed no statistical significance (p=0.0916).

4.3.4.3 Relationship between delirium and patient factors

Data were analysed to determine the differences between delirium and patient factors. When testing for the differences between delirium and population groups Chi-squared tests were used to determine statistical significance ($p<0.05$). Testing was done for delirium and no delirium population groups.

**Table 4.5** shows the relationship between delirium and patient demographic factors and then followed by severity of illness (SAPS II) upon admission score.

**Table 4.5** Relationship between delirium and no delirium and patient demographic factors

| Patient variables | Delirium n=32 | | No Delirium n=50 | | Chi-squared p-value |
|---|---|---|---|---|---|
| | n | % | n | % | |
| "Gender | | | | | |
| Male | 19 | 59.4% | 29 | 58.0% | 0.902 |
| Female | 13 | 40.6% | 21 | 49.0% | |
| Age | | | | | |
| <40 years | 17 | 53.1 | 28 | 56.0% | |
| 40 to 59 years | 1 | 3.1 | - | - | |
| 60 to 69 years | 7 | 21.9 | 14 | 28.0% | 0.498 |
| 70 to 74 years | 4 | 12.5 | 6 | 12.0% | |
| 75 to 79 years | 3 | 9.4 | 1 | 2.0% | |
| >80 years | 0 | - | 1 | 2.0% | |
| Education | | | | | |
| Unknown | 4 | 12.5% | 4 | 8.0% | |
| Primary | 10 | 31.3% | 15 | 30.0% | 0.876 |
| Secondary | 14 | 43.8% | 22 | 44.0% | |
| Tertiary" | 4 | 12.5% | 9 | 18.0% | |
| Reason for admission | | | | | |
| Scheduled surgery | 19 | 59.4% | 18 | 36.0% | |
| Medical | 8 | 25.0% | 17 | 34.0% | 0.104 |
| Unscheduled surgery | 5 | 15.6% | 15 | 30.0% | |
| Mechanical ventilation | | | | | |
| Yes | 32 | 100.0% | 49 | 98.0% | 0.610 |
| No" | - | - | 1 | 2.0% | |

**Table 4.5** continued

| Patient variables | Delirium n=32 | | No Delirium n=50 | | Chi-squared p-value |
|---|---|---|---|---|---|
| | n | % | n | % | |
| Medication | | | | | |
| Morphine | 19 | 59.4% | 20 | 44.0% | |
| Midazolam | 11 | 34.4% | 29 | 58.0% | **0.030*** |
| Propofol | 2 | 6.2% | - | - | |
| Haloperidol | - | - | 1 | 2.0% | |
| Physical restraint | | | | | |
| Yes | 29 | 90.6% | 32 | 64.0% | **0.025*** |
| No | 3 | 9.4% | 16 | 32.0% | |
| Unknown | 2 | 2.4% | - | - | |
| Acute onset or fluctuating course | | | | | |
| Yes | 31 | 96.6% | 2 | 4.0% | **<0.001*** |
| No | 1 | 3.1% | 47 | 96.0% | |
| Inattention | | | | | |
| Present | 29 | 90.6% | 8 | 16.0% | **<0.001*** |
| Absent | 3 | 9.4% | 41 | 82.0% | |
| Altered level of consciousness | | | | | |
| Yes | 32 | 100.0% | 25 | 50.0% | **<0.001*** |
| No | - | - | 24 | 48.0% | |
| Disorganised thinking | | | | | |
| Present | 28 | 87.5% | 2 | 4.0% | **<0.001*** |
| Absent | 4 | 12.5% | 47 | 94.0% | |
| Overall CAM-ICU | | | | | |
| CAM-ICU positive | 32 | 100.0% | - | - | |
| CAM-ICU negative | - | - | 44 | 88.0% | **<0.001*** |
| CAM-ICU unsure | - | - | 3 | 6.0% | |
| | **Delirium (n = 32)** | | **No Delirium (n = 50)** | | |
| | **median (IQR)** | | **median (IQR)** | | |
| Age | 39 (21.51.5) | | 36 (28-52) | | 0.232 |
| Length of stay | 5 (4-7) | | 4 (3-6) | | 0.051 |
| | **Mean (SD)** | | **Mean (SD)** | | |
| Severity of illness" | 45.7 (14.5) | | 31.1 (10.9) | | **<0.001*** |

Key: * = statistically significant

Findings indicated for this study, of the fifteen clinical items for the differences between patients with delirium (n = 32) and no delirium (n = 50) study groups, only eight items (53.0%) were statistically significantly different ($p<0.05$). Included were i) medication, ii)

physical restraint, iii) acute onset or fluctuating course, iv) inattention, v) altered level of consciousness, vi) disorganized thinking, vii) overall CAM-ICU and viii) severity of illness were significantly associated with delirium. In other words in terms of these items, patients with delirium and no delirium are not likely to have the same values on these clinical items. No significant difference was found on the remaining clinical items. It can be extrapolated that medication, physical restraint, acute or fluctuating course, inattention, altered level of consciousness, disorganized thinking, overall CAM-ICU and severity of illness were significantly associated with delirium. Results of this process are presented in **table 4.5.**

Data were then analysed to determine where the difference might lie in the SAPS II scores between delirium (n = 32) and no delirium (n =50) population groups. The approach was like the latter, however this time the Fisher's Exact test was employed to proportionate the difference. **Table 4.6** presents the results of this process.

**Table 4.6** Relationship between delirium and patient factors (severity of illness upon admission)

| Patient variables | Delirium n=32 | | No Delirium n=50 | | Fisher's exact test p-value |
|---|---|---|---|---|---|
| | n | % | n | % | |
| "Heart rate | | | | | |
| <40 | 21 | 65.5% | 27 | 54.0% | |
| 40- 69 | 1 | 3.1% | - | - | |
| 70 -119 | 10 | 31.3% | 15 | 30.0% | 0.072 |
| 120-159 | - | - | 7 | 14.0% | |
| >160 | - | - | 1 | 2.0% | |
| Systolic blood pressure | | | | | |
| <70 | 27 | 84.4% | 42 | 84.0% | |
| 70-99 | 2 | 6.3% | 4 | 8.0% | 0.301 |
| 100-199 | - | - | 3 | 6.0% | |
| >200 | 3 | 9.4% | 1 | 2.0% | |
| Body temperature | | | | | |
| <39 | 29 | 90.6% | 47 | 94.0% | 0.674 |
| >39" | 3 | 9.4% | 3 | 6.0% | |

**Table 4.6** continued

| Categorical variables | Delirium | | No Delirium | | p-value |
|---|---|---|---|---|---|
| | n | % | n | % | |
| CPAP PaO2/FiO2 | | | | | |
| <100 | 4 | 12.5% | 15 | 30.0% | |
| 100-199 | 1 | 3.1% | - | - | **0.018*** |
| >200 | 27 | 84.4% | 35 | 70.0% | |
| Urinary output/ 24 hours | | | | | |
| <0.500 | 20 | 63.5% | 38 | 76.0% | |
| 0.500-0.999 | 7 | 21.9% | 11 | 22.0% | 0.077 |
| >1.000 | 5 | 15.6% | 1 | 2.0% | |
| Serum urea (mmol/L) | | | | | |
| <10 | 20 | 62.5% | 41 | 82.0% | |
| 10-29.9 | 8 | 25.0% | 6 | 12.0% | 0.142 |
| >30 | 4 | 12.5% | 3 | 6.0% | |
| WBC count in 1000/µL | | | | | |
| <10 | 22 | 68.8% | 44 | 88.0% | |
| 1.0-9.9 | 10 | 31.3% | 6 | 12.0% | **0.046*** |
| >20 | - | - | 3 | - | |
| Serum potassium in mmol/l" | | | | | |
| <3.0 | 26 | 81.3% | 39 | 78.0% | 0.787 |
| 3.0– 4.9 | 6 | 18.8% | 1 | 22.0% | |
| >5.0 | - | - | - | - | |
| "Serum sodium in mmol/l | | | | | |
| <125 | 30 | 93.8% | 48 | 96.0% | 0.641 |
| 125-144 | 2 | 6.3% | 2 | 4.0% | |
| >145 | - | - | - | - | |
| Serum bicarbonate in mmol/l | | | | | |
| >15 | 16 | 50.0% | 30 | 60.0% | 0.404 |
| 15-19 | 13 | 40.6% | 13 | 26.0% | |
| >20 | 3 | 9.4% | 7 | 14.0% | |
| Serum bilirubin in µmol/L | | | | | |
| <4.0 | 14 | 43.7% | 31 | 62.0% | |
| 4.0-5.9 | - | - | 1 | 2.0% | 0.101 |
| >6.0 | 21 | 65.6% | 18 | 36.0% | |
| Glasgow Coma Scale | | | | | |
| <6 | 7 | 21.9% | 30 | 60.0 | |
| 6-8 | 5 | 15.6% | 2 | 4.0 | |
| 9-10 | 3 | 9.4% | 11 | 22.0 | **<0.001*** |
| 11-13 | 8 | 25.0% | 3 | 6.0 | |
| 14-15 | 11 | 34.4% | 4 | 8.0 | |

**Table 4.6** continued

| Categorical variables | Delirium | | No Delirium | | p-value |
|---|---|---|---|---|---|
| | n | % | n | % | |
| Chronic diseases | | | | | |
| None | 24 | 75.0 | 36 | 72.0% | |
| Metastatic carcinoma | 2 | 6.3 | - | - | **0.011*** |
| Hematologic malignancy | 1 | 3.1 | 11 | 22.0% | |
| AIDS" | 5 | 15.6% | 3 | 6.0% | |

Key: * = statistically significance

Findings indicated that of the 15 SAPS II items, only four (26.7%) variables were statistically significantly ($p<0.05$) different at the sub-item scores. Included were: i) WBC count, ii) ventilation $PaO_2/FiO_2$ ratio, iii) Glasgow Coma Scale and iv) type of chronic illness. In other words these sub-items reflected a pattern of opposite higher and lower scores at sub-item level between delirium and no delirium population groups, respectively. It can be extrapolated from these findings that CPAP PaO2/Fio2, WBC count, Glasgow coma scale and type of chronic disease to be significantly associated with patients having delirium or not having delirium. Results of this process are summarised in **table 4.6**.

4.3.4.4 Demographic profiles of patients >60 years tested CAM-ICU positive for delirium

The demographic profiles of patients >60 years who tested CAM-ICU positive for delirium are shown in **Table 4.7** below.

**Table 4.7** Demographic profiles of patients with delirium

| Categorical variables | Frequency | Percentage |
|---|---|---|
| "Gender | | |
| Male | 5 | 83.3% |
| Female | 1 | 16.7% |
| Education | | |
| Unknown | 1 | 16.7% |
| Primary | 1 | 16.7% |
| Secondary | 1 | 16.7% |
| Tertiary | 3 | 50.0% |
| Reason for admission | | |
| Scheduled surgery | 1 | 16.7% |
| Medical | 5 | **83.3%** |
| Unscheduled surgery | - | - |
| Mechanical ventilation | | |
| Yes | 6 | 100.0% |
| No | - | - |
| Medication | | |
| Morphine | 1 | 16.7% |
| Midazolam | 5 | **83.3%** |
| Propofol | - | - |
| Haloperidol | - | - |
| Other antipsychotics | - | - |
| Physical restraint | | |
| Yes | 5 | **83.3** |
| No | 1 | 16.7% |
| Unknown | - | - |
| Acute onset or fluctuating course | | |
| Yes | 6 | 100.0% |
| No | - | - |
| Inattention | | |
| Present | 6 | 100.0% |
| Absent | - | - |
| Altered level of consciousness | | |
| Yes | 6 | 100.0% |
| No" | - | - |

In total, there were 14 (n = 14) patients who were older than 60 years. Among these patients 6 (42.9%) tested positive for delirium when CAM-ICU method was used. The characteristics of patients who were aged >60 years who had delirium were as follows: majority were male (83.3%), with tertiary education (50.0%), having experienced physical restraint (83.3%) and on midazolam medication (83.3%). All patients >60 years who had delirium experienced inattention, altered level of consciousness and disorganized thinking.

**Table 4.8** Median scores for patients with delirium older than 60 years

| | **Median (IQR)** | |
|---|---|---|
| "Length of stay in ICU | 4.5 (4-5) | - |
| Severity of illness" | 60 (50-53 | - |

The mean length of stay in ICU for patients older than 60 years who tested positive for delirium was 4.5 days, and the range was between 4 to 5 days.

Severity of illness as indicated by the SAPS II score on admission was 60 points for the total sample (n=6) and the IQR range was between 50 to 53 points.

## 4.4 DISCUSSION OF FINDINGS

The purpose of this study was to determine the incidence of delirium in critically ill patients in the adult intensive care units of a public hospital in Johannesburg and to explore the relationships between delirium, patient factors and outcomes.

The distribution of the sociodemographic data revealed the majority (55.4%; n = 48) of patients were male. This finding is similar to 52.5% as indicated in an extensive international

study by Salluh *et al.* (2010), and another study (Roberts *et al.*, 2005) that reported 58.4% in their sample of Australian and New Zealand patients. However, this current study's findings are slightly lower and higher than reported in two other studies, respectively. For example, in one study by Kanova *et al.* (2017), they reported that 63% of their Czechoslovakian sample were males, and in another study (Kwizera *et al.*, 2015) indicated that 48% of their patients were male out of a sample of 160 Ugandan patients.

In this study, most (56.1%; n = 46) of the patients were aged between the ages of 19 to 40 years, followed by 43.9% (n = 36) who were older than 60 years. From these findings, it can be extrapolated in this study that a slightly younger population tend to dominate in the sample when compared with, an older population group. These findings are consistent with studies conducted overseas. Whereby, in one study by Kwizera *et al.* (2015) it was indicated as 36.6 years for the average age in their study, and another study (Sharma *et al.*, 2012) reported that the average age was 43.4 years in their sample of Indian patients. This current study's findings are lower than the average age reported in the European studies by Kanova *et al.* (2017), Salluh *et al.* (2010) and Ryan *et al.* (2012), which were reported as 68, 62, and 66 years, respectively.

Most (43.9%; n = 26) of the patients had a secondary level education. From these findings, it can be extrapolated that most patients had on average at least 12 years of education. This level of education implies that patients were able to participate in the study because the medium of language was English, of which they would be able to understand and interact well when tested using CAM-ICU. This finding is higher than a study (Grover *et al.*, 2018) that reported on an average of 8.1 years of education in their sample of patients.

The reason for admission of patients was higher (69.5%; n = 57) for surgery, and 30.5% (n = 25) were medical cases. These findings are not consistent with the reason for admission of patients in European and Australasian studies. Whereby in one study Salluh *et al.* (2010) indicated that 64% of their European sample were admitted for medical reasons, whereas elective and emergency surgery represented around 21%, and similarly, another study (Roberts *et al.* ,2005) also reported that two-thirds (66%) of their Australasian sample were medical patients, and one-third (33%) represented surgical cases. However, this current study's findings are similar in-part to one study (Kanova *et al.*, 2017) that reported 71% (out of 322 respondents) were surgical patients, whereas only 17% (n = 56) and 12% (n = 40) were admitted with a medical condition or as trauma cases, respectively. The latter study's findings are lower than the findings in this current study, whereby it was found that out of all (69.5%) surgical cases, 24.4% (n = 20) and 45.1% (n = 37) were trauma-related and scheduled surgical cases, respectively.

Almost all (98.9%; n = 81) the patients were mechanically ventilated. This finding is higher than similar studies conducted in Europe. Whereby in the study conducted by Kanova *et al.* (2017) it was indicated that 48% of all patients were mechanically ventilated, and another study (Salluh *et al.*, 2010) reported that 52% (out of 497 respondents) of all patients were mechanically ventilated. Furthermore, this study's findings are similar in-part to other studies, whereby Roberts *et al.* (2005) and Spronk *et al.* (2009) and Svenningsen *et al.* (2013) reported that almost all (>89%) patients in their respective samples were mechanically ventilated.

The mean severity of critical illness (SAPS II score) was 36.8 (SD = 14.3) for the total sample (n = 82), and the range was 68 points. This finding is lower than the average of 49

points (range 40 to 51 points) reported in the European study of Salluh *et al.* (2010). However, findings in this study are consistent with trends of similar local studies, where Schmollgruber (2015) reported the mean SAPS II score was 34.83 (SD 13.30) points for patient's admission to ICU, and the range was 71 points for the total sample.

Related to sedation (RASS) scores, more than one quarter (29.3%; n = 24) of patients were awake and alert on admission to ICU, followed closely by 20.7% (n = 17) who were drowsy, and 17.1% (n = 14) who were restless. Regarding these values "hyperactive delirium is defined with persistently positive RASS, from restless (+1) through agitation (+2-3) to combative state (+4). Negative RASS from drowsy (-1) through light (-2) to moderate sedation (-3) is characteristic of hypoactive delirium. The mixed type is considered with both positive and negative RASS value" (Kanova *et al.*, 2017:189). In this current study, over a period of 502 days, more than one-third (37.9%; n = 31) of patients displayed characteristics of hyperactive delirium, when compared with, 22.1% (n = 18) and 20.9% (n = 17) as mixed delirium and hypoactive delirium, respectively. These findings share similarities in-part to one study (Kanova *et al.*, 2017), whereby it was indicated that 49% (n = 36) of patients had values for hyperactive delirium when compared with, a lower 20% (n = 15) of patients presenting with hypoactive delirium.

Related to the length of stay in ICU, the mean length of stay in ICU was 6.12 (SD=4.6). Most (81.7%; n = 67) patients were admitted to ICU for less than seven days. These findings are consistent with other similar studies conducted overseas. Whereby, in one study by Kanova *et al.* (2017) it was indicated that average length of ICU stay was 3 days and ranged from 1 to 7 days, and another study (Salluh *et al.*, 2010) reported 10 days (range 4 to 24 days) amongst their sample of 497 patients.

Related to patient outcomes, more than three-quarters (87.8%; n = 72) of patients survived and were successfully discharged from ICU, whereas 10 (12.2%) of patients did not survive and died in ICU. The latter finding indicated for non-survival in this current study is slightly lower than 16.7% (out of 83) reported in the study of Salluh *et al.,* (2017).

Out of a total sample of 82 patients, more than one-third (39.0%; n = 32) had delirium during their length of stay in ICU. It was noted that the average length of stay in ICU was 6 days. The former finding is similar to one study conducted by Kanova *et al.* (2017), whereby it was indicated as 34.2% (n = 52) in their sample of patients, and another study (Salluh *et al.,* 2010) that reported a value of 32.2% among their sample of patients. This current study's findings are higher than other studies that reported the incidence of delirium as 23.2% (De Castro *et al.,* 2014), 22.1% (Kanova *et al.,* 2017) and 24.3% (Grover *et al.,* 2018). Furthermore, these current study findings are lower than approximately 57%, and 48% found among Ugandan (Kwizera *et al.,* 2015) and Australian and New Zealand (Roberts *et al.,* 2005) patient populations, respectively.

Among the 32 patients who had delirium 6 (18.8%) had a 'death' outcome out of a total of 218 days. The incidence rate ratio was 2.61 (CI = 0.56-16.10) indicating that delirium was a risk factor for death, however, the results showed no statistical significance (p=0.0916). This characteristic was also explored in other similar studies conducted overseas. Whereby, in one study Roberts *et al.* (2005) found that the death rates both in ICU and in the hospital were slightly higher for delirious rather than non-delirious patients, although this was not statistically significant.

Out of all 11 patient factors tested in this study, only six factors were statistically ($p<0.05$) significantly associated with patients having delirium or not having delirium. Included were: medication ($p=0.030$), physical restraint ($p=0.025$), acute onset of fluctuating course ($<0.001$), inattention ($p = <0.001$), altered level of consciousness ($p<0.001$) and disorganised thinking ($p<0.001$) and overall CAM-ICU ($p<0.001$).

Out of 15 severity of critical illness (SAPS II) items, only four were statistically ($p <0.05$) significantly associated with patients having delirium or not having delirium. Included were: CPAP/ PaO2/FiO2 ratio ($p=0.018$), WBC in 1000µ/L ($p=0.046$), Glasgow Coma Scale ($p<0.001$) and type of chronic disease ($p=0.011$).

The *fourth objective* was to identify the demographic profiles of patients >60 years tested CAM-ICU positive for delirium.

In total there were 14 patients who were older than 60 (> 60) years. Among these patients 6 (42.8%) had delirium. This finding is higher than one study conducted by Grover *et al.* (2018), whereby it was indicated that 35.5% (out of 152) of their patients screened positive for delirium on CAM-ICU. Furthermore, this study's findings are also similar to another study (De Castro *et al.,* 2014) that reported 42.8% (out of 84) of their study sample in the Netherlands tested positive for delirium were aged between 60 to more than 75 years.

In this current study, the characteristics of patients who were aged >60 years who had delirium were as follows: the majority were male (83.3%), with tertiary education (50.0%), having experienced physical restraint (83.3%), and on midazolam medication (83.3%). All

patients >60 years who had delirium experienced inattention, altered level of consciousness and disorganised thinking.

In the study of De Castro *et al.* (2014) the characteristics of patients >60 years were as follows: the majority were female (69%; n = 25), and on midazolam and morphine medication (28% and 75%), respectively. All patients (16.9%; n = 36) tested positive for three out of four features of delirium when tested with CAM-ICU (De Castro *et al.*, 2014). Whereas in the study of Grover *et al.* (2014), the majority (60.1%) of all patients >60 years who tested positive for delirium were male, 80.7% were on midazolam and had an average level of 6.21 years of education. The latter finding as described by these authors words was considered as "less educated" when compared with, an average of 8.95 years of education in their non-delirious group of patients (Grover *et al.*, 2014). Other authors concurred that low educational attainment is associated with delirium as it may be related to cognitive reserve (Jones, Yang & Zhang, 2006; Vasilevskis *et al.*, 2013). Furthermore, these findings are lower than the level of education in this current study, whereby about 50% of these patients had a tertiary level education, which on average would translate into the equivalent of three to four years of college or university level education.

However, the former studies are limited in that neither authors commented on the association of physical restraints and delirium in their sampled population (De Castro *et al.*, 2014; Grover *et al.*, 2014). This fact should also be taken into consideration in this current study's findings because most (83.3%) of the patients older than 60 years who tested positive for delirium had experienced physical restraints. Studies generally agree that the incidence of delirium is higher in patients with physical restraint. In a recent study (Pan *et al.*, 2018) reported that 39.8% (out of 447) of patients who had been physically restrained developed

delirium, and the risk increased greatly (26.30 times) in patients with restraints for more than six days.

## 4.5 SUMMARY

The chapter discussed the descriptive and comparative statistics that were used to describe and analyse the data collected. The data and interpretation of findings were presented. The following chapter will discuss the limitations of the study, summary of the research results, conclusions and recommendations.

# CHAPTER FIVE

# SUMMARY OF THE STUDY, MAIN FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

## 5.1 INTRODUCTION

This is the last chapter of the report which presents the summary of the study, discussion of the results and conclusion of the study. This will be followed by a discussion regarding limitations of the study, recommendations of the study, nursing practice, nursing education, the institution and further research on this area.

## 5.2 SUMMARY OF THE STUDY

### 5.2.1 Purpose of the Study

The purpose of this study is to determine the incidence of delirium in critically ill patients in the adult intensive care units of a public hospital in Johannesburg, and to explore the relationships between delirium, patient factors and outcomes.

### 5.2.2 Objectives

Objectives were to:

- Estimate the incidence of delirium in critically ill patients in the adult intensive care units.
- Describe the relationship between delirium, patient factors and outcomes.

- Identify the demographic profiles of patients >60 years tested CAM-ICU positive for delirium.

### 5.2.3 Methodology

Before conducting the study, permission was obtained to conduct research through the submission of protocols to the University Postgraduate Committee (see Appendix G). The committee for research on Human Subjects (Medical) of the University of the Witwatersrand granted the application for clearance to conduct research (see Appendix E). And also permission to conduct research through application to the hospital was obtained from the Department of Health (Gauteng) and hospital management (see Appendix F). Permission to utilise the data collection tool was granted by the authors (Ely *et al*., 2002) (See Appendix H).

A pilot study was conducted prior starting with the main data collection in order to refine the methodology and data collection instrument. A descriptive and longitudinal design was conducted to meet the study objectives. Following a second round of consultation with a biostatistician from the Medical Research Centre (MRC), a final sample size of 82 (n=82) was agreed upon (see Figure 3.1 in Chapter three), to ensure a confidence interval of 95% and accuracy to achieve ($p<0.05$) testing. Data collection was taken from 1.07.2018 to 30.09.2018.

Data analysis was done with assistance of a biomedical statistician, therefore descriptive and comparative statistics were used to analyse the data.

## 5.3 SUMMARY OF THE MAIN RESEARCH FINDINGS

The purpose of this study is to determine the incidence of delirium in critically ill patients in the adult intensive care units of a public hospital in Johannesburg, and to explore the relationships between delirium, patient factors and outcomes.

The distribution of patient's socio-demographic and clinical data revealed the majority (55.4%) of the patients were male. Most (56.1%) of the patients were aged between the ages of 19 to 40 years, followed by 43.9% who were older than 60 years and had a secondary level education, respectively. In this study, the reason for admission was higher (69.5%) for surgery, and 30.5% were medical cases. Out of all surgical cases, a higher 45.1% (n = 37) of patients were admitted for scheduled surgery, when compared with 24.4% (n = 20) trauma related cases.

In this study, almost all (98.9%) of the patients were mechanically ventilated. The mean severity of critical illness was 36.8 (SD 14.3) for the total sample, and the range was between 69 points. Related to sedation score, more than one-quarter (29.3%) of patients were awake and alert on admission to ICU, followed closely by 20.7% who were drowsy, and 17.1% who were restless. The mean length of stay in ICU was 6.12 (SD 4.6). Most (81.7%) of the patients were admitted to ICU for less than seven days, and more than three-quarters (87.8%) of patients survived and were successfully discharged from ICU, whereas 10 (12.2%) of patients did not survive and died in ICU. All the measurements in this study were based on average scores of 82 patients over a period of 502 days, which was from admission to ICU to discharge of the patient to the general ward in the hospital.

The *first objective* of this study was to estimate the incidence of delirium in critically ill patients in the adult intensive care units. Findings in this study revealed out of a sample of 82 (n = 82) patients, more than one-third (39.0%; n = 32) tested positive for delirium when CAM-ICU methods were used during their length of stay in ICU. It was noted that on average the length of stay in ICU was 6 days.

The *second objective* of the study was to determine the relationship between the incidence of delirium and patient outcomes. Of those 32 patients who had delirium 6 (18.8%) had a death outcome out of a total of 218 days. The incidence rate was 2.61 (CI = 0.56-16.10) indicating that delirium is a risk factor for death. However, the results showed no statistical significance (p=0.916).

The *third objective* of this study was to describe the relationship between delirium and patient factors. Out of 15 patient factors tested in this study, only eight factors were statistically ($p<0.05$) significantly associated with patients having delirium or not having delirium. Included were medication ($p = 0.030$), physical restraint ($p = 0.025$), acute onset of fluctuating course ($p<0.001$), inattention ($p<0.0001$), altered level of consciousness ($p<0.001$) and disorganised thinking ($p<0.001$), overall CAM-ICU ($p<0.001$) and severity of illness ($p<0.0001$).

Out of the 15 severity of critical illness (SAPS II) sub-items, only four were statistically ($p<0.05$) significantly associated with patients having delirium or not having delirium. Included were: ventilation PaO2/FiO2 ratio ($p = 0.018$), WBC count ($p = 0.046$), Glasgow Coma Scale ($p<0.001$) and type of chronic disease ($p = 0.001$).

The *fourth objective* of the study was to identify the demographic profiles of patients >60 years tested CAM-ICU positive for delirium. In total there were 14 patients who were older than 60 years. Among those patients who were aged >60 years who had delirium were as follows: majority were male (83.3%), with tertiary education (50.0%), having experienced physical restraint (83.0%), and on midazolam medication (83.3%). All patients >60 years who had delirium experienced inattention, altered level of consciousness and disorganised thinking. The mean length of stay in ICU for patients older than 60 years who tested positive for delirium was 4.5 days, and the range was between 4 to 5 days. The severity of illness as indicated by the SAPS II score on admission was 60 points for the total sample (n = 6), and the IQR range was between 50 to 53 points.

## 5.4 LIMITATIONS OF THE STUDY

The following limitations were identified in this study.

- The study sample is small as it was only conducted in two adult ICUs in one central public sector and tertiary hospital in Johannesburg and therefore cannot be generalised to all intensive care units in other provinces and private hospitals.

- The study intended to estimate the incidence of delirium. However, it was limited to a data collection of three months due to the time pressures of the requirements of the degree.

- The study was conducted during a period (July to September 2017) of financial difficulties and budget cuts by the Department of Health which limited the number

of patient admissions to the hospital and resulted in a strain on the intensive care units.

By the limitations that the findings of this study cannot be generalised, the recommendation is made for the study to be repeated to confirm or dispute the accuracy of its findings.

## 5.5 CONCLUSIONS

This study represents one of the first findings of the incidence of delirium in South African adult ICUs. The results of this study revealed out of a sample of 82 (n = 82) patients, more than one-third (39.0%; n = 32) tested positive for delirium when CAM-ICU methods were used during their length of stay in ICU. Although the incidence appears high it is within the current acceptable rates in general and trauma ICUs. It should be noted that two-thirds (65%) of the sample of patients were surgical cases. For six patients who had delirium had a death outcome after 218 days in ICU, but these results showed no statistical significant (IR 2.61; CI 0.56-16.10; p = 0.916). Eight clinical factors in this study were statistically significantly ($p<0.001$) associated with patients having delirium or not. These included medication ($p = 0.030$), physical restraint ($p = 0.025$), acute onset of fluctuating course ($p<0.001$), inattention ($p<0.0001$), altered level of consciousness ($p<0.001$) and disorganised thinking ($p<0.001$), overall CAM-ICU ($p<0.001$) and severity of illness ($p<0.001$). Further, the characteristics of patients older than 60 years of age who tested positive for delirium were mostly male (83.3%), with tertiary education (50.0%), having experienced physical restraint (83.0%), and on midazolam (83.3%). These findings have implications for nursing care because they highlight the importance of regular screening of patients in for delirium and addressing modifiable factors that may contribute to delirium, such as the culture of physical restraints,

which appears to be the norm in mechanically ventilated patients and titrations of midazolam administration. Consequently, nurses caring for patients in adult ICUs appear to not be aware of best practice recommendations in the prevention of delirium in ICU. This could be related to the fact that nurses in South Africa are not formally required to register with SANC their participation in continuous professional development activities.

## 5.6 RECOMMENDATIONS OF THE STUDY

The recommendations for this study are based on the findings arising from this study. The incidence of delirium amongst patients in two adult intensive care units can be reduced by the need for best-practice strategies based on this study's findings. Thus emphasis is placed on those positive risk factors that can be modified through nursing interventions.

### 5.6.1 Recommendations for Nursing Practice

Recommendations for clinical nursing practice are as follows:

- There is a need to align South African nursing practices with best practice guidelines for the prevention of delirium in the intensive care setting. It can be achieved through standardising the implementation of delirium assessment using the CAM-ICU method on a regular basis. Consideration of the brain and its cognitive functions should be included as another vital organ that should be monitored by nurses in the ICU setting.
- There is a need for nurses to become aware of their practices that may hinder or help in the prevention of delirium in the ICU setting. There are modifiable risk factors for delirium that can be modified through astute fundamental nursing practices. This can

be achieved by monitoring environmental factors (noise level, lighting, making use of calendars, wall clocks and making use of their familiar items) and other modifiable factors such as the use and administration of sedatives (midazolam) and the use of physical restraints.

- Involving and teaching family members about the symptoms of delirium will also help them to understand the need for constant re-orientation, presence and becoming more involved in the care of their loved one, which forms the basis for patient-centered care.

- Application of evidence-based information on delirium nursing care at the bedside and engaging with clinical preceptors whereby nurses can learn in discussion about measures that can improve their nursing management.

- Discussion amongst ICU nurses and doctors, during rounds regarding the patient's delirium assessment score, review of the pharmacological treatment and patients' responses to the management.

### 5.6.2 Recommendations for the Nursing Education

Recommendations for nursing education are as follows:

- The assessment and implementation of delirium monitoring should be embedded in the curriculum for critical care nursing programs. International best practice guidelines exist, and these should be used to educate nurses in the formal education program,

- Educators should establish collaborative partnerships with clinicians to ensure that the methods taught to students in the formal education program are relevant and within the current and recommended practices.

- Because South African nurses are not yet required to maintain registration of practice through continuous education programs, they are not formally required to up-date their practices through continuous education programs there is also a vital need for short-term continuous education programs so that they can understand the importance of using bedside tools in the prevention of delirium.

### 5.6.3 Recommendations for the Policy (Institution or Management)

Recommendations for policy and institutional management are as follows:

- The CAM-ICU method of assessment should be embedded within the Gauteng Province ICU charts, followed by all the nine South African provinces so that it becomes another vital sign for nurses to monitor and assess in intensive care units. Early detection and prevention of complications related to the treatment of delirium can be prevented through early intervention and will reduce the costs of hospital expenditure.

### 5.6.4 Recommendations for Further Research

Recommendations for further research are as follows:

- The study should be repeated using the same design and methods, however the data collection point should be extended to a period of at least one year to ensure a good reflection of the incidence of delirium in ICUs.

- Nurses' experiences of caring for delirious patients in ICU could be explored through a qualitative study to understand their perspectives and opinions when physical restraint is used as an intervention on delirious patients.

- There is a need to consider an intervention study to reduce the incidence of delirium in ICU. This could be achieved through the development of a comprehensive best-practice educational program that can be administered at the bedside or in the formal education sector as a continuing education program for nurses working in ICUs. The effect of this intervention can be measured through a pre- and post-test quasi-experimental study.

This chapter concludes this research report. This study was conducted with the purpose of exploring and describing the incidence of delirium in adult ICUs of one public hospital in Johannesburg. The findings of this study provide evidence that support the theory practice gap in the ICUs that call for nursing interventions through the current best-practice guidelines and recommendations for prevention of delirium amongst patients in ICU.

## LIST OF REFERENCES


Agency for Health Care and Research (AHCR). 2016. National Quality Measures Clearing House. Accessed at: https://www.qualitymeasures.ahrq.gov/help-and-about/summaries/varieties-of-measures-in-nqmc. 2017/02/24.

Arif, M., Grap, M.J. 2009. Comfort and sedation. An introduction to critical care nursing. 5th ed. St. Louis, MO: Saunders Elsevier.

Ali, S., Patel, M., Jabeen, S., Bailey, R., Patel, T., Shahid, M. & Arain, A. 2011. Insight into delirium. *Innovations in Clinical Neuroscience*, 8(10): 25-34.

Allen, J. & Alexander, E. 2012. Prevention, recognition and management of delirium in the intensive care unit. *Advanced Critical Care*, 23(1): 5-11.

American Psychiatric Association (APA). 2013. *Diagnostic and statistical manual of mental disorders DSM-V*. 5th ed. Washington, DC: American Psychiatric Association.

Baird, S. M. Manual of Critical Care Nursing: Nursing Interventions and Collaborative Management. 7th ed. 2016. Elsevier

Balas, C., Happ, M, Yong, W, Chelluri, L, Richmond, T. 2009. Outcomes associated with delirium in older patients in surgical ICUs. *Chest*, 135(1): 18-25.

Balas, C., Vasileskis, E., Burke, J., Boehm, L., Pun, T., Olsen, M., Peitz, J., Ely, W. 2012. Critical Care Nurses' Role in Implementing the 'ABCDE Bundle' into Practice. *Critical Care Nurse*, 32(2): 35-37.

Barr, J., Fraser, G., Puntillo, K., Ely, W., Gelinas, C., Dasta, J., Davidson, J., Devlin, J., Kress, J., Joffe, A., Coursin, D., Herr, D., Tung, A., Robinson, B., Fontaine, D., Ramsay, M., Riker, R., Sessler, C., Pun, B., Skrobik, Y. & Jaeschke, R. 2013. Clinical practice guidelines for the management of pain, agitation, and delirium in adult patients in the intensive care unit. *Critical Care Medicine*, 41(1): 263-306.

Bergeron, N., Dubois, M., Dumont, M., Dial, S. & Skrobik, Y. 2001. Intensive care delirium screening checklist: evaluation of a new instrument. *Intensive Care Medicine*, 27: 859-864.

Boehm, M. Vasilevskis, E. & Mion, C. 2016. Interprofessional Perspectives on ABCDE bundle Implementation. *Dimensions of Critical Care Nursing*, 35(6): 339-347.

Botma, Y., Greeff, M., Mulaudzi, F.M.M., Wright, S.C.D. 2010. *Research in Health Sciences*. Cape Town: Pearson Education South Africa.

Bourne, R. S. 2008. Delirium and use of sedation agents in intensive care. *Nursing in Critical Care*, 13(4): 195-202.



Bourne, R. S. 2008. Delirium and use of sedation agents in intensive care. *Nursing in Critical Care*, 13(4): 195-202.

Boot, R. 2012. Delirium: A review of the nurses in the intensive care unit. *Intensive and Critical Care Nursing,* 28: 185-189.

Bray, K., Hill, K., Robin, W., Leaver, G., Walker, N., O'Leavy, M., Delaney, T. Walsh, D., Gager, M. & Waterhouse, C. 2004. British Association of Critical Care Nurses position statement on the use of restraint in adult critical care units. British Association of Critical Care Nurses. *Nursing in Critical Care,* 9(5): 199-211.

Brink, H., Van Der Walt, C., Van Rensburg, G. 2012. *Fundamentals of Research Methodology for Healthcare Professonals,* 3rd ed. Cape Town: Juta and Company.

Brummel, E. & Girard. D. 2013. Preventing Delirium in the Intensive Care Unit. Critical Care Clinics, 29: 51-65.

Brummel, E., Vasilevskis, E., Han, J., Boehm, L., Pun, T. & Ely, W. 2013. Implementing Delirium Screening in the Intensive Care Unit: Secrets to Success. *Critical Care Medicine*, 41(9): 2196-2208.

Brummel, E., Jackson, J., Pandharipande, P., Thompson, J., Shintani, A., Dittus, R., Gill, T., Bernard, G., Ely, W. & Girard, T. 2014. Delirium in the ICU and Subsequent Long-term Disability Among Survivors of Mechanical Ventilation Critical Care Medicine. *Critical Care Medicine*, 42(2): 369-377.

Bruno, J.& Warren, M. 2010. Intensive Care Unit Delirium. *Critical Care Nursing Clinics of North America*, 22: 161-178.

Burns, N. & Groves, S. 2011. Understanding Nursing Research 5th ed. Philadelphia: Saunders.

Chlan, L. 2003. Description of anxiety levels by individual differences and clinical factors in patients receiving mechanical ventilator support. *Heart & Lung*, 32(4): 275-282.

Collinsworth, W., Priest, L., Campbell, R., Eduard, E. & Masica, L. 2016. A Review of Multifaceted Approaches for the Prevention and Mitigation of Delirium in Intensive Care Units. *Journal of Intensive Care Medicine*, 31(2): 127-141.

De Castro, S., Unlu, C., Tuynman, J., Honig, A., Van Wagensveld, B., Steller, P. & Vrouenraets, B. 2014. Incidence and risk factors of delirium in the elderly general surgical patient. *American Journal of Surgery*, 208: 26-32.

DiLibero, J., O'Donoghue, S., DeSanto-Madeya, S. & Ninobla, A. 2016. An Innovativative Approach to Improving the Accuracy of Delirium Assessments Using the Confusion Assessment Method for the Intensive Care Unit. *Dimensions of Critical Care Nursing*, 35(2): 74-80.

Devlin, W., Fong, J., Howard, P., Skrobik, Y., McCoy, N., Yasuda, C. & Marshall, J. 2008. Assessment of Delirium in the Intensive Care Unit: Nursing Practices and Perceptions. *American Journal of Critical Care*, 17(6): 555-565.

Devlin, J., Nava, S., Fong, J.J., Bahhay, I., Hill, N.S. 2007. Survey of sedation practices during noninvasive positive-pressure ventilation to treat acute respiratory failure. *Critical Care Medicine*, 35(10): 2298-E4.

Devlin, J., Fong, J., Fraser, G. & Riker, R. 2007. Delirium assessment in the critically ill patient. *Intensive Care Medicine*, 33(6): 929-940.

Devlin, W., Brummel, E. & Fellow, N. 2012. Optimising the recognition of delirium in the intensive care unit. *Best Practice & Research Clinical Anaesthesiology*, 26(3): 385-393.

Devlin, W. & Pohlman, S. 2014. Everybody, Every Day, "Awakening and Breathing Coordination, Delirium Monitoring/Management and Early Exercise/Mobility" Cultuure is Feasibility in Your ICU. *Critical Care Medicine*, 42(5): 1280-1281.

De Vos, A., Strydom, H., Fouche, C. & Delport, C. 2011. *Research at grass roots: for the social sciences and human service professions*. 4th ed. Pretoria, Van Schaik Publishers.

Eastwoods, M., Peak, L., Bellomo, R., Baldwin, I. & Reade, C. 2012. A questionnaire survey of critical care nurse's attitudes to delirium assessment before and after introduction of the CAM- ICU. *Australian Critical Care*, 25(3): 162-169.

Ely, W., Shintani, A., Truman, B., Speroff, T., Gordon, S., Harrell Jr., F., Inouye, S., Bernard, G. & Dittus, R. 2004. Delirium as a predictor of mortality in mechanically ventilated patients in the intensive care unit. *JAMA*, 291(14): 1753–1762.

Ely, W., Margolin, R., Francis, J., May, L., Truman, B., Dittus, R., Speroff, T., Gautam, S., Bernard, G. & Inouye, S. 2001. Evaluation of delirium in critically ill patients: validation of the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU). *Critical Care Medicine*, 29(7): 1370-1379.

Ely, W. 2014. *The Confusion Assessment Method (CAM-ICU) of ICU: The complete training manual*. VanderBilt University Medical Centre.

Ely, W. 2017. The ABCDE bundle: Science and Philosophy of How ICU Liberation Serves Patients and Family. *Critical Care Medicine*, 45(2): 321-330.

Fitzgerald, J., O'Regan, N., Adamas, D., Timmons, S., Dunne, C., Trezepacz, P. & Meagher, D. 2016. Concordance between delirium motor subtype scale (DMSS) and the abbreviated version (DMSS-4) over longitudinal assessment in elderly medical inpatients. *International Psychogeriatrics*, 28(5): 845-861.

Fraught, D. 2014. Delirium: The nurses' role in the prevention, diagnosis and treatment. Medsurg Nursing

Girard, T., Pandharipande, P. & Ely, W. 2008. Delirium in the intensive care unit. *Critical Care*, 12(S3): 1-9.

Grover, S. Lahariya, S., Bagga, S. & Sharma, A. 2014. Incidence, prevalence and risk factors for delirium in elderly admitted to coronary care unit. *Journal of Geriatric Mental Health*, 1(1): 45-53.

Glantz, S. 2012. *Primer of biostatistics*. 7th ed. Singapore: McGraw Hill Education.

Gunther, M., Morandi, A., & Ely, E. 2008. Pathophysiology of delirium in the intensive care unit. *Critical Care Clinics*, vol 24, no.1, pp. 45-65.

Gusmao-Flores, D., Sullah, J., Chalhub, R. & Quarantini, L. 2012. The Confusion for the intensive care unit (ICAM-ICU) and intensive care delirium assessment method screening checklist (ICDSC) for the diagnosis of delirium: a systematic review and meta- analysis of clinical studies. *Critical Care,* 16(4): R115: 1-10.

Hall, J., Meagher, J., MacLullich, J. 2012. Delirium detection and monitoring outside the ICU. *Best Practice & Research Clinical Anaesthesiology*, 26: 367-383.

Happ, M. 2000. Preventing treatment interference: the nurses' role in maintaining technologic devices. *Heart & Lung*, 29(1): 60-69.

Hardin-Pierce, M.G. 2010. Sensory motor complications of acute illness. High-acuity nursing.5th ed. Upper Saddle River, NJ: Pearson Education.

Hayhurst, C., Pandharipande, P. & Hughes, C. 2016. Intensive Care Unit Delirium: A review of Diagnosis, Prevention and Treatment. *The American Society of Anaesthesiologist*, 125(6): 1229-1241.

Hine, K. 2007. The use of physical restraint in critical care. British Association of Critical Care Nurses. *Nursing in Critical Care*, 12(1): 6-11.

Hofso, K. & Coyer, M. 2007. Part 2 chemical and physical restraints in the management of mechanically ventilated patients in the: A patient perspective. *Intensive and Critical Care Nursing*, 23: 249-255.

Hughes, G., Brummel, E., Vasilevskis, E., Girard, D. & Pandharipande, P. 2012. Future directions of delirium research and management. *Best Practice & Clinical Anaesthesiology*, 26(3): 395-405.

Inouye, S., Foreman, M., Mion, L., Katz, K. & Cooney, L. 2001. Nurses' recognition of delirium and its symptoms: comparison of nurse and researcher ratings. *Archives Internal Medicine*, 161(20): 2467-2473.

Inouye, S., Marcantonio, R. & Metzger, D. 2014. Doing Damage in Delirium: The hazards of Antipsychotic Treatment in Elderly Patients. *Lancet Psychiatry,* 1(14): 312-315.

Jaber, S., Chanques, G., Altairac, C. Sebbane, M., Vergne, C., Perrigault, P. Eledjam, J. 2006. A prospective study of agitation in a medical surgical ICU: incidence, risk factors and outcomes. *CHEST*, 128(4): 2749-2757.

Jones, R., Yang, F. & Zhang, Y. 2006. Does educational attainment contribute to risk for delirium? A potential role for cognitive reserve. *Journal of Gerontology,* 61(12): 1307-1311.

Kallenbanch, T. & Amado, L. 2017. Assessment of delirium in the intensive care unit. *Southern African Journal and Analgesia*, 23(3): 57-63.

Kanova, M., Sklienka, P., Kula, R., Burda, R. & Janoutova, J. 2017. Incidence and risk facors for delirium in ICU patients – a prospective observational study. *Biomed Pap Med Fac Univ Palacky Olomounc,* 16(2): 187-196.

Kiekkas, P., Panteli, A., Baltopoulos, G. & Filos, K. 2013. Unplanned extubation in critically ill patients: clinical review. *Nursing in Critical Care*, 18(3): 123-134.

Kram, S., DiBarotolo, M., Hinderer, K. & Jones, R. 2015. Implementation of the ABCDE bundle to Improve Patient outcomes in a rural community Hospital. *Dimensions of Critical Care Nursing*, 34(5): 250-258.

Kress, J., Gehlbach, B., Lacy, M., Pliskin, N., Pohlman, A. & Hall, J. 2003. The long-term psychological effects of sedative daily interruption on critically ill patients. *American Journal of Respiratory & Critical Care Medicine*, 168(12): 1457-1461.

Kwizera, A., Nakibuuka, J., Ssemogerere, L., Sendikadiwa, C., Obua, D., Kizito, S., Tumukunde, J., Wabule, A., NakasujJa, N., 2015. Incidence and Risk factors for Delirium among mechanically ventilated patients in an African Intensive Care setting: An observational Multicenter Study. *Critical Care Research and Practice*, 2015(16): 1D491780

LeBlanc, A. Bourbonnais, F., Harrison, D. & Tousignant, K. 2018. The experience of intensive care nurses caring for patients with delirium: A phenomenological study. *Intensive and Critical Care Nursing*, 44: 92-98.

Marchington, K., Carrier, L. & Lawlor, P. 2012. Delirium masquerading as depression. *Palliative & Supportive Care*, 10(1): 59-62.

McDonnell, S. & Timmins, F. 2016. A quantitative exploration of the subjective burden experienced by nurses when caring for patients with delirium. *Journal of Clinical Nursing*, 21: 2488-2498.

Mehta, S., Meade, M., Hynes, P., Filate, W., Burry, L., Hallett, D., McDonald, E. & Cook, D. 2007. A multicentre survey of Ontario intensive care unit nurses regarding the use of sedatives and analgesics for adults receiving mechanical ventilation. *Journal of Critical Care*, 22(3): 191-196.

Micek, S., Anand, N., Labible, B., Shannon, W. & Kollef, M. 2005. Delirium as detected by the CAM-ICU predicts restraint use among mechanically ventilated patients. *Critical Care Medicine*, 33(6): 1260-1265.

Miller, R. & Ely, W. 2006. Delirium and cognitive dysfunction in the intensive care unit. *Seminars in Respiratory and Critical Care Medicine*, 27: 210-220.

Mistraletti, G., Pelosi, P., Mantovani, E., Berardino, M. & Gregoretti, C. 2012. Delirium: Clinical approach and prevention. *Best Practice & Research Clinical Anaesthesiology*, 26(3): 311-326.

Mistarz, R., Elliott, S., Whitefield, A. & Ernest, D. 2011. Bedside nurse-patient interaction do not reliably detect delirium: An observational study. *Australian Critical Care*, 24: 126-132.

Morandi, A., Pandharipande, P., Jackson, J. Bellelli, G. & Ely, W. 2012. Understanding terminology of delirium and long-term cognitive impairment in critically ill patients. *Best Practice & Research Clinical Anaesthesiology*, 26(3): 267-276.

Morton, G. & Fontaine, K. 2013. Critical Care Nursing: A holistic Approach. 10th ed. Philadelphia: Lippincott Williams & Wilkins.

McPherson J., Wagner C., Boehm L., Hall J., Johnson D., Miller L., Burns K., Thompson J., Shintani A., Ely W. & Pandharipande, P. 2013. Delirium in the cardiovascular Intensive Care Unit: Exploring modifiable risk factors. *Critical Care Medicine,* 41(2): 405-413.

Olson, T. 2012. Delirium in the intensive care unit: role of a critical care nurse in early detection and treatment. *Dynamics*, 23(4): 32-36.

Özsaban, A. & Acaroglu, R. 2015. Delirium assessment in intensive care units: practices and perceptions of Turkish nurses. *Nursing in Critical Care*, 21(5): 271-278.

Pan, Y., Jiang, Z., Changrong, Y., Wang, L., Zhang, J., Zhou, J., Tao, M., Quan, M. & Wu, Q. 2018. Influence of physical restraint on delirium of adult patients in ICU: a nested case-control study. *Journal of Clinical Nursing,* in press.

Panthmanath, N., McClure, J. 2015. Sedation and delirium in the intensive care unit. *Anaesthesia and Intensive Care Medicine*, 17(1): 17-23.

Pandharipande, P., Cotton, B., Shintani, A., Thompson, J., Costabile, S., Pun, T., Dittus, R. & Ely, W. 2007. Motoric subtypes of delirium in mechanically ventilated patients surgical and trauma intensive care unit patients. *Intensive Care Medicine*, 3(10): 1726-1731.

Patel, R., Gambrelli, M., Speroff, T., Scott, T., Pun, B., Okahashi, J., Burgess, H., Dittus, R., Bernard, G. & Ely, W. 2013. Deliirum and sedation in the intensive care unit (ICU): survey of behaviours and attitudes of 1,384 healthcare professionals. *Critical Care Medicine*, 37(3): 825-832.

Peterson, J., Pun, B., Dittus, R., Thomason, J., Jackson, J., Shintani, A. & Ely, W. 2006. Delirium and its motoric subtypes: a study of 614 critically ill patients. *Journal of American Geriatric Society*, 54(3): 479-484.

Pianto, F. & Biancofiore, G. 2016. The ABCDE Bundle. A survey of Nurses Knowledge and Attitudes in the Intensive Care Units of a National Teaching Hospital in Italy. *Dimensions of Critical Care Nursing*, 35(6): 309-314.

Pisani, M., Kong, S., Kasl, S., Murphy, T., Araujo, K. & Van Ness, P. 2009. Days of delirium are associated with 1-year mortality in an older intensive care population. A*merican Respiratory & Critical Care Medicine*, 180(11): 1092-1097.

Polit, D. & Beck, C. 2010. *Essentials of Nursing Research: Appraising Evidence for Nursing Practice*. 7th ed. Philadelphia: Wolters kluver Health/Lippincott Williams & Wilkins.

Polit, D. & Beck, C. 2014. *Nursing research generating and assessing evidence for nursing practice.* 9th ed. Philadelphia: Wolters Kluver Health/Lippincott Williams & Wilkins.

Pun, B. Gordon, S. Peterson, J. Shintani, A. Jackson, J. Foss, J., Ely, E.W. 2005. Large-scale implementation of sedation and delirium monitoring in the Intensive care unit: A report from two medical centers. *Critical Care Medicine*, 33(6): 1199 – 1205.

Pun, T. & Ely, W. 2007. The importance of Diagnosing and Managing ICU Delirium. *Recent Advances in Chest Medicine*, 132: 624-636.

Roberts, B. 2004. Screening for delirium in an adult intensive care unit. *Intensive Care and Critical Care Nursing*, 20(4): 206-213.

Roberts, B., Rickard, C., Rajbhandari, D., Turner, G., Clarke, J., Hill, D., Tauschke, C., Chaboyer, W. & Parsons, R. 2005. Multicentre study of delirium in ICU patients using a simple screening tool. *Australian Critical Care*, 18(1): 6-16.

Rose, L., Dale, C., Smith, O., Burry, L., Enright, G., Fergusion, D., Sinha, Wiense, L., Sinuff, T., Mehta, S. 2016. A mixed-methods systematic review protocol to examine the use of physical restraint with critically ill adults and strategies for minimizing their use. *Systematic Reviews*, 5: 1-8.

Rundshagen, I., Schhnabel, K., Wegner, C. & am Esh, S. 2002. Incidence of recall, nightmares, and hallucinations, during analgosedation in intensive care. *Intensive Care Medicine*, 28(1): 38-43.

Ryan, D., O'Regan, N., O'Caoimh, R., Clare, J., O'Connor, M., Leonard, M., McFarland, J., Tighe, S., O'Sullivan, K., Trzepacz, P., Meagher, D. & Timmons, S. 2012. Delirium in an adult acute hospital population: predictors, prevalence and detection. *British Medical Journal,* 3:e001772. doi:10.1136/bmjopen-2012-001772.

Salluh, J., Soares, M., Teles, J., Ceraso, D Raimondi, N., Nava, V., Blasquez, P., Ugarte S., Ibanez-Guzman, C., Centeno, J., Laca, M., Grecco, G., Jimenez, E., Arias-Rivera, S., Duenas, C. & Rocha, M. 2010. Delirium epidemiology in critical care (DECCA): An international study. *Critical Care,* 14R210. Available at: http://ccforum.com/content/14/6/R210. Accessed on 29th February 2018.

Samuelson, K., Lundberg, D. & Fridlund, B. 2007. Stressful experiences in relation to depth of sedation in mechanically ventilated patients. *Nursing in Critical Care*, 12(2): 93-104.

Schmollgruber, S. 2015. Development of clinical competencies for intensive care nurses. (*Unpublished thesis*): University of the Witwatersrand.

Scott, P., Mcllveney, F. & Mallice, M. 2013. Implementation of a validated delirium assessment tool in critically ill adults. *Intensive and Critical Care Nursing*, 29(2): 96-102.

Sessler, C., Gosnell, M., Grap, M., Brophy, G., O'Neal, P. & Keane, K. 2002. The Richmond Agitation Sedation Scale: validity and reliability in adult intensive care patients. *American Journal of Respiratory Critical Care Medicine*, 166(10): 1338-1344.

Sharma, A., Malhotra, S. Grover, S. & Jindal, S. 2012. Incidence, prevalence, risk factor and outcome of delirium in intensive care unit: a study from India. *Psychiatry*, 34(6): 639-646.

Skrobik, T. 2003. An overview of delirium in the critical care setting. Geriatrics. *Geriatric Aging*, 6(10): 30-35.

Sosnowski, L., Lin, F., Mitchell, L. & White, H. 2015. Early rehabilitation in the intensive care unit. *Australian Critical Care*. 28(4): 216-225.

South African Nursing Council, 2005, Nursing Act, Act No.33 of 2005, Pretoria.

Spronk, P., Riekerk, B., Hofhuis, J. & Rommes, J. 2009. Occurrence of delirium is severely underestimated in the ICU during daily care. *Intensive care Medicine*, 35(7): 1276-1280.

Svenningsen, H., Egerod, I., Videbech, P., Christensen, D., Frydenberg, M. & Tønnesen, E. 2013. Fluctuations in sedation levels may contribute to delirium in ICU patients. *Acta Anaesthesiologica Scandinavica*, 57: 288-293.

Shim, J. & Leung, J. 2012. An Update on delirium in the postoperative setting: Prevention, diagnosis and management. *Best Practice & Research Clinical Anaesthesiology*, 26(3): 327-343.

Tate, J., Devito Dabbs, A., Hoffman, L., Milbrandt, E. & Happ, M. 2012. Anxiety and agitation in mechanically ventilated patients. *Qualitative Health Research*, 22(2): 157-173.

Thomason, J., Shintani, A., Peterson, J., Pun, B., Jackson, J. & Ely, W. 2005. Intensive care delirium is an independent predictor of longer hospital stay: a prospective analysis of 261 ventilated patients. *Critical Care*, 9(4): R375-R381.

Traynor, V., Cordato, N. Burns, P., Xu, Y., Britten, N., Duncan, K., DeVries, L. & McKinnon, C. 2015. Is delirium being detected in emergency? *Australsian Journal on Ageing*, 35(1): 54-57.

Trorlic, Z., Ista, E., Ponssen, H., Schoonderbeek, F., Schreiner, F., Verbrugger, Dijkstra, A., Bakker, J. & van der jagt, M. 2016. Attitudes, knowledge and practices concerning delirium: a survey among intensive care professionals. *Nursing in Critical Care*, 22(3): 133-140.

Truman, B. & Ely, W. 2003. Monitoring delirium in critically ill patients. Using the confusion assessment method for the intensive care unit. *Critical Care Nurse*, 23(2): 25-36.

Van den Boogaard, M., Schoonhoven, L., van Achterberg, T., van der Hoeven, G. & Pikkers, P. 2013. Haloperidol prophylaxis in critically ill patients with a high risk of delirium. *Critical Care*, 17: 1-11.

Van Rompaey, B., Schuurmans, M., Shortridge-Baggett, L., Truijen, S. & Bossaert, L. 2008. Risk factors for intensive care delirium: A systematic review. *Intensive and Critical Care Nursing*, 24: 98-107.

Vasilevskis, E. & Ely, W. 2013. Updates in Delirium. *The Neurohospitalist*, 4(2): 58-60.

Volland, J., Fisher, A. & Drexler, D. 2015. Delirium and Dementia in the Intensive Care Unit: Increasing Awareness for Decreasing Risk, Improving Outcomes, and Family Engagement. *Dimensions of Critical Care Nursing*, 34(5): 259-264.

Wells, G. 2012. Why don't intensive care nurses perform routine delirium assessment? A discussion of the literature. *Australian Critical Care*, 25(3): 157-161.

Watson, I., Celiana, P. & Fanfulla, F. 2012. Delirium, Is sleep important? *Best Practice of Clinical Anaesthesiology*, 26(3): 355-366.

Witlox, J. Eurelings, L. de Jonghe, J. Kalisvaart, K. Eikelenboom, P. & Van Gool, W. 2010. Delirium in elderly patients and the risk of postdischarge mortality, institutionalition and dementia: a meta-analysis. *JAMA*, 304 (4): 443 -451.

Wolters, E., deLange, W., Slooter, A., Veldhuijezen, S. 2016. Long Term Mental Health Problems After delirium in the ICU. *Critical Care Medicine*, 44(10): 1808-1813.

Zamoscik, K., Godbold, R. & Freeman, P. 2017. Intensive care nurses experiences and perception of delirium and delirium care. *Intensive and Critical Care Nursing*, 40: 94-100.

**APPENDIX A**

**DELIRIUM IN CRITICALLY ILL PATIENTS IN THE ADULT INTENSIVE CARE UNITS OF A PUBLIC HOSPITAL IN JOHANNESBURG**

**DATA COLLECTION TOOL**

**1.0 PATIENT DATA**

| | | | | | |
|---|---|---|---|---|---|
| 1.1 | RESEARCH CODE | | | | |
| 1.2 | GENDER | male | female | | |
| 1.3 | AGE | | | | |
| 1.4 | Education level | basic | high school | college | university |
| 1.5 | DATE OF ADMISSION | | | | |
| 1.6 | ADMISSION DIAGNOSIS | | | | |
| 1.7 | REASON FOR ICU ADMISSION | | | | |
| | medical | scheduled surgery | unscheduled surgery | | |
| 1.8 | MECHANICAL VENTILATION | Yes | No | | |
| 1.9 | SEVERITY OF ILLNESS<br>SAPS II Score on Admission | | | | |
| 1.1 | SEDATION SCORE<br>Richmond Agitation Anxiety Scale | | | | |
| 1.11 | DATE OF DISCHARGE FROM ICU | | | | |
| 1.12 | LENGTH OF STAY IN ICU | | | | |
| 1.13 | DATE OF DISCHARGE FROM HOSPITAL | | | | |

| 2.0 | SEVERITY OF ILLNESS ON ADMISSION TO INTENSIVE CARE UNIT | | | |
|---|---|---|---|---|
| | | | | |
| Variable / Scoring Guidelines | | Findings | Points | Score |
| 2.1 | **Age in Years** | < 40 | 0 | |
| | *age in years at time of last birthday* | 40 - 59 | 7 | |
| | | 60 - 69 | 12 | |
| | | 70 - 74 | 15 | |
| | | 75 - 79 | 16 | |
| | | > = 80 | 18 | |
| 2.2 | **Heart Rate in beats per minute** | < 40 | 11 | |
| | *use the highest or lowest heart rate in* | 40 - 69 | 2 | |
| | *past 24 hours whichever gives the* | 70 - 119 | 0 | |
| | *higher number of points* | 120 - 159 | 4 | |
| | | > = 160 | 7 | |
| 2.3 | **Systolic Blood Pressure in mmHg** | < 70 | 13 | |
| | *use the highest or lowest blood* | 70 - 99 | 5 | |
| | *pressure in past 24 hours whichever* | 100 - 199 | 0 | |
| | *gives the highest number of points* | > = 200 | 2 | |
| 2.4 | **Body temperature** | < 39 C | 0 | |
| | *use highest temperature* | > = 39 C | 3 | |
| 2.5 | **If on ventilation or CPAP PaO2 / FiO2** | < 100 | 11 | |
| | *use only if on ventilation or CPAP* | 100 - 199 | 9 | |
| | *using the lowest ratio* | > = 200 | 6 | |
| 2.6 | **Urinary Output in L per 24 hours** | < 0.500 | 11 | |
| | *if time period less than 24 hours adjust* | 0.500 - 0.999 | 4 | |
| | *urine output for period to 24 hours* | > = 1.000 | 0 | |
| 2.7 | **Serum Urea mmol/L** | < 10 | 0 | |
| | *use the highest value* | 10 - 29.9 | 6 | |
| | | > 30 | 10 | |
| 2.8 | **WBC count in 1000 per uL** | < 1.0 | 12 | |
| | *use the highest or lowest WBC in past* | 1.0 - 19.9 | 0 | |
| | *24 hours whichever gives the higher* | > = 20 | 3 | |
| | *number of points* | | | |
| 2.9 | **Serum Potassium in mmol/L** | < 3.0 | 3 | |
| | *use the highest or lowest potassium in* | 3.0 - 4.9 | 0 | |
| | *past 24 hours whichever gives the* | > = 5.0 | 3 | |
| | *higher number of points* | | | |
| 2.10 | **Serum Sodium in mmol/L** | < 125 | 5 | |
| | *use the highest or lowest sodium in* | 125 - 144 | 0 | |
| | *past 24 hours whichever gives the* | > = 145 | 1 | |
| | *higher number of points* | | | |
| 2.11 | **Serum Bicarbonate in mmol/L** | < 15 | 6 | |
| | *use the lowest value* | 15 - 19 | 3 | |
| | | > 20 | 0 | |
| 2.12 | **Serum Bilirubin in umol/L** | < 4.0 | 0 | |
| | *use the highest value* | 4.0 - 5.9 | 4 | |
| | | > = 6.0 | 9 | |
| 2.13 | **Glasgow Coma Scale** | < 6 | 26 | |
| | *use the lowest value if patient sedated* | 6 - 8 | 13 | |
| | *use the score before sedated* | 9 - 10 | 7 | |
| | | 11 - 13 | 5 | |
| | | 14 - 15 | 0 | |

| | | | | |
|---|---|---|---|---|
| **2.14** | **Chronic Diseases** | **none** | **0** | |
| | *HIV positive with AIDS defining* | **metastic carcinoma** | **9** | |
| | *opportunistic infection or tumor;* | **hematologic malig** | **10** | |
| | *malignant lymphoma Hodgkins disease* | **AIDS** | **17** | |
| | *leukemia or multiple myeloma;* | | | |
| | *metastases demonstrated at surgery,* | | | |
| | *radiographically or other suitable method* | | | |
| **2.15** | **Type of admission** | **scheduled surgery** | **0** | |
| | *scheduled surgery if scheduled at least 24h* | **medical** | **6** | |
| | *prior to operation; unscheduled if operated* | **unscheduled surge** | **8** | |
| | *on with less than 24h notice; medical if no* | | | |
| | *surgery within 1 week of admission to ICU* | | | |
| | | | | |
| | | | **SAPS II** | |
| | | | **Score** | |

| 3.0 | DAILY DATA CAPTURING WORKSHEET | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| ITEMS | VARIABLES | DAY 1 | | DAY 2 | | DAY 3 | | DAY 4 | | DAY 5 | | DAY 6 | | DAY 7 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 08h00 | 20h00 | 08h00 | 20h00 | 08h00 | 20h00 | 08h00 | 20h00 | 08h00 | 20h00 | 08h00 | 20h00 | 08h00 | 20h00 |
| **3.1** | **MECHANICAL VENTILATION** | | | | | | | | | | | | | | |
| **3.1.1** | yes | | | | | | | | | | | | | | |
| **3.1.2** | no | | | | | | | | | | | | | | |
| **3.2** | **MEDICATION** | | | | | | | | | | | | | | |
| 3.2.1 | morphine | | | | | | | | | | | | | | |
| 3.2.2 | midazolam | | | | | | | | | | | | | | |
| 3.2.3 | propofol | | | | | | | | | | | | | | |
| 3.2.4 | halloperidol | | | | | | | | | | | | | | |
| 3.2.5 | other antipsychotics | | | | | | | | | | | | | | |
| **3.3** | **PHYSICAL RESTRAINT** | | | | | | | | | | | | | | |
| 3.3.1 | Yes | | | | | | | | | | | | | | |
| 3.3.2 | No | | | | | | | | | | | | | | |
| **3.4** | **ASSESSING LEVEL OF CONSCIOUSNESS (RASS)** | | | | | | | | | | | | | | |
| 3.4.1 | Combative - score +4 | | | | | | | | | | | | | | |
| 3.4.2 | Very agitated - score +3 | | | | | | | | | | | | | | |
| 3.4.3 | Agitated -score +2 | | | | | | | | | | | | | | |
| 3.4.4 | Restless - score +1 | | | | | | | | | | | | | | |
| 3.4.5 | Drowsy - score -1 | | | | | | | | | | | | | | |
| 3.4.6 | *Awake and alert - score 0** | | | | | | | | | | | | | | |
| 3.4.7 | Light sedation - score -2 | | | | | | | | | | | | | | |
| 3.4.8 | Moderate sedation - score -3 | | | | | | | | | | | | | | |
| 3.4.9 | *Deep sedation - score -4*** | | | | | | | | | | | | | | |
| 3.4.10 | *Unarousable - score -5 ** | | | | | | | | | | | | | | |
| **3.5** | **CONTENT OF CONSCIOUSNESS (CAM-ICU)** | | | | | | | | | | | | | | |
| 3.5.1 | **Acute onset or fluctuating course** | | | | | | | | | | | | | | |
| 3.5.1.1 | present | | | | | | | | | | | | | | |
| 3.5.1.2 | absent | | | | | | | | | | | | | | |
| 3.5.2 | **Inattention** | | | | | | | | | | | | | | |
| 3.5.2.1 | present | | | | | | | | | | | | | | |
| 3.5.2.2 | absent | | | | | | | | | | | | | | |
| 3.5.3 | **Altered level of consciousness** | | | | | | | | | | | | | | |
| 3.5.3.1 | present | | | | | | | | | | | | | | |
| 3.5.3.2 | absent | | | | | | | | | | | | | | |
| 3.5.4 | **Disorganised thinking** | | | | | | | | | | | | | | |
| 3.5.4.1 | present | | | | | | | | | | | | | | |
| 3.5.4.2 | absent | | | | | | | | | | | | | | |
| **3.6** | **OVERALL CAM-ICU** | | | | | | | | | | | | | | |
| 3.6.1 | CAM-ICU positive | | | | | | | | | | | | | | |
| 3.6.2 | CAM-ICU negative | | | | | | | | | | | | | | |
| 3.6.3 | CAM-ICU unsure | | | | | | | | | | | | | | |

| 3.0 | DAILY DATA CAPTURING WORKSHEET | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| ITEMS | VARIABLES | DAY 8 | | DAY 9 | | DAY 10 | | DAY 11 | | DAY 12 | | DAY 13 | | DAY 14 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 08h00 | 20h00 | 08h00 | 20h00 | 08h00 | 20h00 | 08h00 | 20h00 | 08h00 | 20h00 | 08h00 | 20h00 | 08h00 | 20h00 |
| **3.1** | **MECHANICAL VENTILATION** | | | | | | | | | | | | | | |
| **3.1.1** | yes | | | | | | | | | | | | | | |
| **3.1.2** | no | | | | | | | | | | | | | | |
| **3.2** | **MEDICATION** | | | | | | | | | | | | | | |
| 3.2.1 | morphine | | | | | | | | | | | | | | |
| 3.2.2 | midazolam | | | | | | | | | | | | | | |
| 3.2.3 | propofol | | | | | | | | | | | | | | |
| 3.2.4 | halloperidol | | | | | | | | | | | | | | |
| 3.2.5 | other antipsychotics | | | | | | | | | | | | | | |
| **3.3** | **PHYSICAL RESTRAINT** | | | | | | | | | | | | | | |
| 3.3.1 | Yes | | | | | | | | | | | | | | |
| 3.3.2 | No | | | | | | | | | | | | | | |
| **3.4** | **ASSESSING LEVEL OF CONSCIOUSNESS (RASS)** | | | | | | | | | | | | | | |
| 3.4.1 | Combative - score +4 | | | | | | | | | | | | | | |
| 3.4.2 | Very agitated - score +3 | | | | | | | | | | | | | | |
| 3.4.3 | Agitated -score +2 | | | | | | | | | | | | | | |
| 3.4.4 | Restless - score +1 | | | | | | | | | | | | | | |
| 3.4.5 | Drowsy - score -1 | | | | | | | | | | | | | | |
| 3.4.6 | *Awake and alert - score 0** | | | | | | | | | | | | | | |
| 3.4.7 | Light sedation - score -2 | | | | | | | | | | | | | | |
| 3.4.8 | Moderate sedation - score -3 | | | | | | | | | | | | | | |
| 3.4.9 | *Deep sedation - score -4*** | | | | | | | | | | | | | | |
| 3.4.10 | *Unarousable - score -5 ** | | | | | | | | | | | | | | |
| **3.5** | **CONTENT OF CONSCIOUSNESS (CAM-ICU)** | | | | | | | | | | | | | | |
| 3.5.1 | **Acute onset or fluctuating course** | | | | | | | | | | | | | | |
| 3.5.1.1 | present | | | | | | | | | | | | | | |
| 3.5.1.2 | absent | | | | | | | | | | | | | | |
| 3.5.2 | **Inattention** | | | | | | | | | | | | | | |
| 3.5.2.1 | present | | | | | | | | | | | | | | |
| 3.5.2.2 | absent | | | | | | | | | | | | | | |
| 3.5.3 | **Altered level of consciousness** | | | | | | | | | | | | | | |
| 3.5.3.1 | present | | | | | | | | | | | | | | |
| 3.5.3.2 | absent | | | | | | | | | | | | | | |
| 3.5.4 | **Disorganised thinking** | | | | | | | | | | | | | | |
| 3.5.4.1 | present | | | | | | | | | | | | | | |
| 3.5.4.2 | absent | | | | | | | | | | | | | | |
| **3.6** | **OVERALL CAM-ICU** | | | | | | | | | | | | | | |
| 3.6.1 | CAM-ICU positive | | | | | | | | | | | | | | |
| 3.6.2 | CAM-ICU negative | | | | | | | | | | | | | | |
| 3.6.3 | CAM-ICU unsure | | | | | | | | | | | | | | |

**APPENDIX B**

**DELIRIUM IN CRITICALLY ILL PATIENTS AND ITS ASSOCIATION WITH PATIENT FACTORS AND OUTCOMES IN ADULT INTENSIVE CARE UNITS**

## INFORMATION LETTER

Dear _____ (name of patient / family member)

My name is Azania Lekalakala and I am postgraduate student undertaking a Master's degree (Intensive Care Nursing) at the University of the Witwatersrand in the Department of Nursing Education. I am conducting a research project and would like your consent to be part of my study. The purpose of this study is to determine the frequency/rate of the sudden change in condition (delirium) to a mental state of confusion in adult intensive care units, and to look at the relationship between this condition and the patient clinical factors and outcomes. This study will include patients who are admitted to the adult intensive care units.

Should you wish to participate in the study, I will ask you to sign a consent form so that I can gain access to your hospital records. It will also allow me to ask you to respond to a couple of questions known in the literature as the confusion assessment method of the intensive care unit. I will visit you twice a day (in the morning and the evening) for every day while you are in the intensive care unit and ask you the same questions. This should not take more than 5 to 10 minutes of your time.

Participation in this project is voluntary and you are free to withdraw at any time and there will be no penalty for doing so. If you choose to take part in the project, on behalf of your relative who is admitted in ICU you will be asked to give consent since your family member/relative is not in a condition to give it for self. Even though you have signed the consent form I will visit your relative in the general ward once they are discharged from ICU, and ask for them for the final consent so that the data that I have collected can be used in my study.

While you may not derive any benefit from participation in this study, it is hoped that it will help clarify patient needs in the intensive care units with regard to how best to improve nursing care to assist patients with this condition. The appropriate people and research committees of the University of the Witwatersrand and the hospital have approved this study. Should you require further information regarding this research project, you may contact Professor Cleaton Jones, the Chair or Mrs Zanele Ndlovu, the secretary of the University of the Witwatersrand Human Research Ethics Committee (HERC) at XXXXXXXXXX

Should you wish to contact me, or require further information, please do not hesitate to contact me in the Department of Nursing Education or on the following cell number XXXXX. Thank you for taking the time to read this information letter.

Yours sincerely,
Azania Lekalakala
MSc Nursing Postgraduate Student

**APPENDIX C**

**DELIRIUM IN CRITICALLY ILL PATIENTS AND ITS ASSOCIATION WITH PATIENT FACTORS AND OUTCOMES IN ADULT INTENSIVE CARE UNITS**

**FAMILY MEMBER / RELATIVE CONSENT FORM**

I _____ (name ) the _____ (relationship)

of the patient give permission to be included in the study.

I have read with understanding the content of the information sheet and I have been given the opportunity to ask questions I might have regarding the procedure and my consent to my being included in the study.

_____ _____

Date Signature

**APPENDIX D**

**DELIRIUM IN CRITICALLY ILL PATIENTS AND ITS ASSOCIATION WITH PATIENT FACTORS AND OUTCOMES IN ADULT INTENSIVE CARE UNITS**

**RETROSPECTIVE PATIENT CONSENT FORM**

I, _____(name of the patient) understand that my relative, _____ (name of relative), has given consent to my being included in the study and hereby give consent for the information obtained to be used in the study.

I have read with understanding the content of the information sheet and I have been given the opportunity to ask questions I might have regarding the procedure and my consent to my being included in the study.

_____ _____

Date Signature

**APPENDIX E**

**Ethical Clearance Certificate**

R14/49 Miss Azania Lekalakala

## HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

## CLEARANCE CERTIFICATE NO. M170543

| | |
|---|---|
| **NAME: (Principal Investigator)** | Miss Azania Lekalakala |
| **DEPARTMENT:** | Nursing Education<br>Charlotte Maxeke Johannesburg Academic Hospital |
| **PROJECT TITLE:** | Delirium in Critially Ill Patients and its Association with Patient Factors and Outcomes in Adult ICUs |
| **DATE CONSIDERED:** | 26/05/2017 |
| **DECISION:** | Approved unconditionally |
| **CONDITIONS:** | |
| **SUPERVISOR:** | Dr Shelley Schmollgruber |
| **APPROVED BY:** | Professor P. Cleaton-Jones Chairperson, HREC (Medical) |
| **DATE OF APPROVAL:** | 21/08/2017 |

**This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.**

**DECLARATION OF INVESTIGATORS**

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary in Room 10004,10th floor, Senate House/3rd floor, Phillip Tobias Building, Parktown, University of the Witwatersrand. I/We fully understand the conditions under which I am/we are authorised to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit to the Committee. **I agree to submit a yearly progress report**. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. in this case, the study was initially review May and will therefore be due in the month of May each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature Date

**PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES**

**APPENDIX F**

## Hospital Permission to Conduct Research

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

[redacted]

31 August 2017

**Ms. Azania Lekalakala**
**University of the Witwatersrand**
**Department of Nursing Education**
**Faculty of the Health Sciences**

Dear. Ms. Azania Lekalakala

**RE: "Delirium in critically ill patients and its associations with patients factors and outcomes in adult intensive care units"**

Permission is granted for you to conduct the above recruitment activities as described in your request provided:

1. [redacted] hospital will not in anyway incur or inherit costs as a result of the said study.
2. Your study shall not disrupt services at the study sites.
3. Strict confidentiality shall be observed at all times.
4. Informed consent shall be solicited from patients participating in your study.
5.

Please liaise with the Head of Department and Unit Manager or Sister in Charge to agree on the dates and time that would suit all parties.

Kindly forward this office with the results of your study on completion of the research.

Supported / ~~not supported~~

[redacted]

Approved / not approved

[redacted]

**APPENDIX G**

## Postgraduate Approval of Study

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Private Bag 3 Wits, 2050
Fax: 027117172119
Tel: 02711 7172076

Reference: Mrs Sandra Benn
E-mail: sandra.benn@wits.ac.za

10 January 2018
Person No: 1445670
PAG

Ms AM Lekalakala
465 Ormonde, Gladiator Street, Ormonde View, 2091
Ormonde
2091
South Africa

Dear Ms Lekalakala

**Master of Science in Nursing: Approval of Title**

We have pleasure in advising that your proposal entitled *Delirium in critically ill patients and its association with patient factors and outcomes in adult intensive care units* has been approved. Please note that any amendments to this title have to be endorsed by the Faculty's higher degrees committee and formally approved.

Yours sincerely

Mrs Sandra Benn
Faculty Registrar
Faculty of Health Sciences

**APPENDIX H**

**Permission to use instrument**

**From:** Ely, Wes [mailto:wes.ely@vanderbilt.edu]
**Sent:** 28 July 2016 11:49 PM
**To:** Shelley Schmollgruber
**Subject:** RE: request for permission to use CAM_ICU in research study

I think I already answered you; absolutely you have our permission. Good luck and do well.

Wes

_____

E. Wesley Ely, MD, MPH
Pulmonary and Critical Care and Health Services Research
Vanderbilt University and VA-GRECC
www.icudelirium.org

**From:** Shelley Schmollgruber [mailto:Shelley.Schmollgruber@wits.ac.za]
**Sent:** Monday, July 25, 2016 12:03 AM
**To:** Ely, Wes
**Subject:** request for permission to use CAM_ICU in research study

Dear Dr Ely,

My name is Shelley Schmollgruber, I am the Research Coordinator for MSc and PhD students in the Department of Nursing Education, Faculty of Health Sciences at the University of the Witwatersrand.

I am also the principal investigator on a study looking at improving psychological outcomes for patients in the intensive care units. This study is funded by a South African National Research grant and will involve an extensive education and training arm to change practice for critical care nurses working in our intensive care facilities in the last phase of the study.

I am currently supervising an MSc student in a parallel area linked to the main study that will be looking at the level of delirium in critically ill patients in two university-affiliated hospitals in Johannesburg. We would like to use the CAM-ICU for the data collection phase of this study. We hereby request your permission to use the CAM-ICU as part of our data collection tools.

We anticipate that the student will be completed with this phase of the study early in 2017. We are also willing to send you a copy of this proposal once it has been approved by our University Postgraduate office if you so wish.

I look forward to your response.

Kind regards

