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Validation of the simplified therapeutic intervention scoring system in the intensive care units of a public sector hospital in Johannesburg

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CHAPTER 1

OVERVIEW OF THE STUDY

1.0 INTRODUCTION

This chapter will provide an overview of the planned study. The background to the study is described followed by the problem statement, purpose of the study, research questions, and objectives. Significance of the study including researcher's paradigmatic perspectives and relevant definitions will also be described. An overview of the methodology used will follow including the design, population and sampling procedures, data collection methods and data analysis procedures. Measures to ensure validity and reliability are described including ethical considerations.

1.1 BACKGROUND TO THE STUDY

Currently within South Africa, it is estimated that only 25.6% of all nurses working in the Intensive Care Units (ICU) are intensive care trained, and 21.4% are drawn from the ranks of sub professional nurses (Scribante, Schmollgruber & Nel, 2004:113). One of the consequences of such practices is that it carries the risk of dilution of highly specialised practices, which could threaten the safety of care provided by ICU nurses (Binnekade, Vroom & de Mol, et al., 2003:191). Moreover, as there is no nationally prescribed ratio for the requirements of nursing staff in the intensive care units (Scribante, et al., 2004), a consensus based method of one nurse to one patient is no guarantee that quality care is provided and thus is not cost effective.

An acute shortage of trained and experienced ICU nurses coupled with cost constraints has favoured the placement of generalist, newly qualified, agency nurses as well as an increasing number of sub-professional nurses in the intensive care units in order to secure the continuity of patient care. Ball and McElligott (2003) suggest that where activity and patient dependency were high and nurses' knowledge, experience and exposure was low, this could produce task orientated care, where patient progression was hindered, as nurses failed to appreciate and act on vital cues.

In addition, the risk of a reduced number of professional nurses caring for critically ill patients is well documented in the literature, for example, nosocomial infection rates (Robert, Fridkin & Blumberg, 2000; Needleman, Buershaus & Mattke, et al., 2002), an increased risk of central line infection rates, pressure sore incidence, falls and use of physical restraints (Whitman, Yookyung & Davidson, et al., 2002). These facts thus raise no doubt that benefit can be derived from the presence of a trained intensive care nurse in direct patient care (Amaravadi, Dimick & Pronovost, et al., 2000; Dimick, Swobada & Pronovost, et al., 2001; Pronovost, Dang & Dorman, et al., 2001; Dang, Johantgen & Pronovost, et al., 2002).

While the reality remains, we do not have enough ICU trained and experienced nurses in South Africa as highlighted by Scribante et al. (2004). Yet, within the public sector hospital, highly trained and experienced ICU nurses generally complain that they are no longer 'really' involved in patient care because they are required to supervise basic practices of, often disinterested and reluctant 'untrained' nurses. This suggests perhaps the type of activities that ICU nurses engage in may not always be commensurate with their training and skills level as highlighted by Williams, Schmollgruber and Alberto (2006).

Traditionally, within intensive care the requirement for nursing has always been associated with critically ill patients' severity of illness. As a result, the earliest attempt to quantify severity of illness was by Cullen et al. in 1974, who devised the Therapeutic Intervention Scoring System (TISS) (Bersten, Soni & Oh, 2003). The use of TISS as an indicator of severity of illness was limited due to the appearance of more sophisticated scoring systems for measuring severity of illness, such as the Acute Physiological and Chronic Health Evaluation (APACHE) (Knaus, Zimmerman & Wagner, 1981). Since then TISS has more commonly been used as a measure of nursing workload in ICU (Miranda, Rijk & Schaufeli, 1996).

Over the years, TISS has been updated (Keene & Cullen, 1983) from the initial 57 to 76 therapeutic activities, which are more representative of commonly performed activities in the ICUs. TISS remains the most widely used scoring system worldwide and is evident in numerous studies (Miranda, et al., 1996; Miranda, 1997; Amanda & Heidi, 2006 and others), which rely on therapeutic, diagnostic and nursing activities. TISS is currently used to determine nurse to patient ratios and assess current bed utilization and need (Adomat & Hewison, 2004:305).

However, the application of TISS is not without its critique. Miranda et al. (1996:65) cites four major criticisms of the updated (Keene & Cullen, 1983) version of TISS as: time consuming, cumbersome, exclusively scoring direct patient care, and that the listed items do not always reflect patient care activities of nurses. As a result of these criticisms, many other scoring systems were developed to capture nursing dependency, such as the Oula patient classification system (Lundgren-Laine & Suominen, 2007), comprehensive nursing intervention scoring system (Yamase, 2003) and project research on nursing (Guiccione,

Morena & Pezzi, et al., 2004). These instruments were also criticized as being too complicated, cumbersome and inappropriate by being focused on general nursing activities hence this led to development of Simplified Therapeutic Intervention Scoring System (TISS-28).

The TISS-28 based on advanced statistical methods was published by Miranda et al. (1996). Its items were reduced from 76 to 28 therapeutic items following four steps; item selection, item clustering, item reduction and cross validation (Miranda, et al., 1996). Literature shows that one TISS-28 point corresponds to 10.6 minutes of nursing time spent on direct patient care, thus permitting a more accurate estimation of nursing workload in an ICU (Miranda, et al., 1996:72). This is an added advantage over and above the previous versions. TISS-28 has been widely tested in numerous multi-centre and single centre studies on independent populations in first world countries. Recently, the instrument was tested in two third world studies in Hong Kong (Kwok, Chau & Low, et al., 2005) and Brazil (Padilha, Sousa & Kimura, et al., 2007). Although this is the case, South African condition cannot be compared to these first and third world countries especially after the apartheid which led to problems in provision of tertiary care in South Africa as highlighted in the Modernization of Tertiary Services (MTS) project which aims at modernization and reconfiguration of health care services (http://www.doh.gov.za/mts/index.html, 2004). To date, there is no evidence that TISS-28 has been validated and used in the South African context; however there is a need to objectively determine nursing requirements given the shortage of highly skilled and experienced nurses.

In summary, the simplified TISS-28 expands the scope of TISS beyond micro-level clinical management, severity of illness and nursing workload to inform meso level of

hospital management of cost accounting and allocation of resources in decision making in healthcare. This study therefore, proposed to evaluate the use of the TISS-28 in order to determine the validity and reliability of the instrument as a measure of the quantification of nursing workload and staffing requirements in the intensive care units of a public sector hospital in Johannesburg.

1.2 PROBLEM STATEMENT

The problem in this study is that there is a shortage of intensive care trained nurses in South Africa. Due to this, highly skilled and experienced intensive care nurses no longer feel that they are involved in patient care because they are increasingly required to supervise 'untrained' nurses. While this does raise a concern that intensive care nurses may engage in activities that are not commensurate of their level of training and skills, this also carries a risk of dilution of highly specialist nursing care as a result of increasing placement of generalist nurses and sub-professional nurses which will ultimately impact on patient outcomes.

Studies conducted overseas suggest that the use of a scoring system based on patient illness severity, such as the TISS-score provides an objective measurement of the requirements for nursing care and use of resources (Telles & Castilho, 2007:1006). To date no studies have been found that objectively quantify nursing workload in the intensive care setting in South Africa. However, there appears to be a consensus, in part as a result of cost constraints, that any nurse including sub-professional nurses may be capable of providing a substitute for the skills of an intensive care trained nurse. As this is clearly not the case, this study therefore proposed to investigate the use of an objective measurement to

determine the requirements for nursing care in the intensive care setting. It is however, anticipated that the findings of this study could be used to inform further future studies in the ICUs.

The researcher sought to answer the following questions:

- What is the profile of patient admissions to the adult intensive care units?
- What is the impact of the patients' profile in terms of the requirements for nursing workload?
- Can TISS-28 be considered a valid and reliable measure of quantifying nursing workload in this setting?

1.3 PURPOSE OF THE STUDY

The purpose of this study was to introduce the simplified therapeutic intervention scoring system (TISS-28), the original therapeutic intervention scoring system (TISS-76) and simplified acute physiological score (SAPS) version II in critically ill adult patients, in order to describe the validity and reliability of the simplified therapeutic intervention scoring system (TISS-28) as a suitable measure of quantifying nursing workload in the intensive care units of a public sector hospital in Johannesburg.

1.4 RESEARCH OBJECTIVES

The objectives of this study were as follows:

- To describe the profile of patient admissions to the intensive care units.
- To investigate the impact of the patients' profile on the requirements for nursing workload.

- To validate the use of TISS-28 as a measure of quantifying nursing workload in this setting.

1.5 IMPORTANCE OF THE STUDY

The importance of this study is that the findings will contribute to current baseline knowledge of hospital management, ICU nurse managers and ICU nurses in relation to availability of an objective valid and reliable scoring instrument for quantifying nursing workload and staffing requirements in the ICUs. TISS-28 is cost effective and can be used by hospital management for cost accounting and allocation of resources in decision making in healthcare.

With the shortage of ICU nurses in the South African setting, TISS-28 can be used as a guide in deploying and allocating the available skilled and experienced nursing staff appropriately without compromising patients' outcomes. TISS-28 measures the amount of nursing workload in a given ICU and allows distribution of staff to match the patients' needs and nature of complexity of their illness. ICU nurses on the other hand, will be able to score the patients admitted to the unit and from this they will be informed of how severely ill each patient is and the amount of time they need to render the care to a specific patient during the shift. Future ICU patients will benefit from quantification of nursing workload because care will be provided based on their individualized needs.

1.6 PARADIGMATIC PERSPECTIVE

A paradigm is a world view, a general perspective on the complexities of the real world (Polit & Beck, 2004:13). The researcher therefore based this study on the following assumptions:

1.6.1 Meta-theoretical Assumptions

According to (Botes, 1993:11), Meta theoretical assumptions are non-testable beliefs that are accepted to be true by the researcher. These Meta theoretical assumptions reflect the researchers' view of a person, environment, nursing and health/illness. The researchers' Meta theoretical assumptions regarding these concepts therefore, were as follows:

The person

The person in this case include the patient, the patients' significant others, the ICU nurse and the doctor or other team members. The critical care patient is a person in critical situation of life instability 'with precarious physical and psychological balance' subject to continuous care (Pitacco, Silvestro & Drigo, 2001:27). The critically ill patient in the ICU is vulnerable and needs skilled and experienced personnel in order to have their health care needs met. The ICU patients' significant others are always under stress due to the critical illness of the patient and they constantly need support for strength during this time. The nurse is central in the context of this study. The nurse is present at the patients' bed side twenty four hours a day, and is therefore key to provision of quality nursing care to each individual patient according to their unique and specific needs. In order to provide this quality care, adequate knowledge and skills are essential.

The environment

The environment is the total context of the persons' surrounding that has influence on his or her physical, psychological, emotional and behavioural well being. The environment can be external or internal, negative or positive in terms of all the conditions and circumstances that influence the surrounding and behaviour of the person. Any environmental changes may require greater energy to adjust to the situation. In this study, the environment is the ICU setting. The ICU environment is subject to complex technological advances. This new, unfamiliar and complex setting can be a source of stress to the ill patient as well as to the family.

Nursing

Caring for the unstable ICU patient in life-threatening situation requires a nurse who can provide competent and holistic care through the integration of advanced-level knowledge and skills. For better patient outcomes, the patients' needs should match the nurses' competencies as outlined in synergy model (Alspach, 2006:4). Nursing generally comprises the promotion and restoration of health, prevention of disease and caring for the sick, disabled and dying persons.

Health/Illness

Western society in Pitacco et al. (2001:27) has developed a concept of health, which despite numerous critical and re-defining interventions basically tends to consider it as 'an absence of illness, handicap or physical-psychological limitations'. The person in a critical or unstable life condition is a seriously ill person for whom initial care is not even aimed at restoring partial health, but towards the stabilisation of the condition so that it becomes a 'manageable illness' (Pitacco, et al., 2001:27). This process which begins from illness and

moves towards health is inescapable due to the fact that the results of intensive or resuscitation intervention cannot always be predicted and without these interventions, there would be no progress to health.

1.6.2 Theoretical Assumptions

The following theoretical statements derived from Miranda et al. (1996) in relation to patients' severity of illness, therapeutic interventions, nursing workload and time spent on direct patient care are applicable to this study:

- By taking instantaneous samples of the relevant work related activities of patients, the time spent on each activity can be estimated
- The number of therapeutic interventions is related to the severity of the clinical conditions
- The larger the number of therapeutic interventions necessary for treatment the more severe the state of the patient
- The larger the number of therapeutic interventions the more time is required to render care to that patient
- The more time spent on a patient the more the nursing workload

The central theoretical statement is that the number of therapeutic interventions reflects the patients' severity of illness and the amount of time and nursing workload required for care. This thus influences the number and type of nurses required to render care to the critically ill patients. In order to meet the patients' different needs, critical care nurses should be competent, possess adequate skills, knowledge and experience in this speciality. Shortage of ICU trained nurses with increased use of ICU untrained nurses challenge nurses' ability

to provide adequate care as traditionally defined for patients resulting in poor patient outcome.

1.6.2.1 Definition of terms for the purpose of this research

Intensive care unit (ICU) – Is a specifically designated unit, with specialized equipment and skilled personnel for the care of critically ill patients requiring immediate and continuous attention (Bersten, et al., 2003). For the purpose of this study, three intensive care units were utilized. These included: trauma, cardiothoracic and multidisciplinary units.

Critically ill patient – Is characterized 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 (Pitacco, et al., 2001). For the purpose of this study these critically ill patient health problems encompassed medical and surgical elective and emergency, diagnostic categories.

Illness severity Scoring System – Is an assessment of patient's illness severity or dependency on intensive care nursing staff, determined by the most marked abnormalities of fifteen clinical variables, using the Simplified Acute Physiology Score II (SAPS II). Illness severity scoring performs well as a predictor of hospital mortality rate (Bersten, et al., 2003) thus one can use this to predict the outcome of a patient on admission to ICU.

Therapeutic Intervention Scoring System – Is the quantification of nursing workload as determined by either the simplified Therapeutic Intervention Scoring System (TISS-28), or the Therapeutic Intervention Scoring system (TISS-76), which assigns points (ranging from 0 to 8 or 0 to 4, respectively) to therapeutic activities and items associated with nursing requirements for care in the intensive care units. One TISS-28 point equals 10.6 minutes of nursing time spent on direct patient care Miranda et al. (1996) hence one can estimate total amount of time required to care for a patient in a shift.

Validity - Validity is the degree to which an instrument measures what it is supposed to measure (Polit & Beck, 2004). For the purpose of this study, three measurements of validity were tested; content, concurrent and construct.

Reliability - Reliability is the consistency with which the instrument measures the target attribute (Polit & Beck, 2004). For the purpose of this study, two measurements of reliability were tested, namely inter-rater reliability and internal consistency.

Intensive Care Nurse – Is a person who provides competent and holistic care for the critically ill patient through the integration of advanced-level knowledge, skills and humanist values (Williams, et al. 2006:399).

Nursing workload - It is the amount of work that is performed by a nurse to a specific ICU patient in a given shift. It is determined by looking at the total scores on either TISS-28 or TISS-76 whereby, the higher the score the higher the nursing workload and vice versa.

1.6.3 Methodological Assumptions

Methodological assumptions are statements that are taken for granted or are considered true even though they have not been scientifically tested (Burns & Grove, 2003). The researcher believes in a holistic approach to patient care and a functional approach in nursing research. The expected outcome of nursing research is the use of findings to improve clinical practice. Because nursing is a practice profession, research is essential to develop and refine knowledge that can be used to improve clinical practice. When nursing follows a functional approach, nursing science becomes a practice with its purpose being to provide current knowledge to be used to generate guidelines for actions in order to make practice more effective. These actions can only be rendered in a specific context, i.e. in this case the ICU where patients' needs are taken into consideration. The researcher undertook this study with the aim of generating knowledge that is useful and applicable so as to improve nursing practice.

1.7 OVERVIEW OF RESEARCH METHODOLOGY

A non-experimental, comparative descriptive, correlational and prospective two-staged design was utilized to meet the study objectives. Prior to the commencement of the study, ethical clearance and permission to conduct the study were obtained from relevant university committees and the hospital. Participation in the study was voluntary and participants were free to withdraw from the study at any time.

Stage I of the study involved face and content validation of the TISS-28 by a panel of ICU nurse experts. Stage II involved determination of the construct and concurrent validity

including inter-rater reliability of TISS-28 as an objective instrument in measuring nursing workload in the intensive care units.

The population from which the ICU nurse experts were selected consisted of nurses who were currently working in the ICUs and had extensive experience on daily nursing activities performed in the ICUs and specialists in nursing education. The target population in stage II comprised of all critically ill patients admitted to the trauma, cardiothoracic, and multi-disciplinary ICUs at the public sector hospital in Johannesburg. A non probability purposive sampling method was used to select ICU nursing experts (n=6) to assess face and content validity of TISS-28. A simple random sampling method was used to select the sample of patients (n=105). In order to ensure that each patient had an equal opportunity of being selected, the ICU register was used as the sampling frame.

In stage I of the study, a 4-point Likert scale was used to rate the items on TISS-28 so as to assess its content validity. Following permission from the hospital and management, consents were obtained from the patients who agreed to participate in the study. Patients' information was then obtained from the ICU charts and entered into the three instruments: the TISS-28, TISS-76 and SAPS II. The scores obtained were thus used to meet the purpose and objectives of the study. Descriptive and inferential statistics were used to summarize, present and analyze the data to meet the purpose of the study.

Reliability was maintained through the following ways: the researcher was the sole data collector and compliance to the data collection instruments was highly maintained, the researcher collected data together with an experienced assistant researcher on randomly selected (n=15) participants so as to assess the instruments' consistency and finally, data

was verified by the statistician to ensure accuracy of results. Validity was maintained by assessment of the instrument by a panel of ICU nurse experts and using a random sampling method to prevent selection bias.

1.8 PLAN OF RESEARCH ACTION

This study is presented as follows:

Chapter 1: Overview of the research study

Chapter 2: Literature review

Chapter 3: Research design and research methods

Chapter 4: Data analysis and results

Chapter 5: Summary, discussion of results, conclusions, and recommendations

1.9 SUMMARY

This chapter of the research report introduced the reader to the study. The problem statement, the research questions, the purpose and objectives of the study were stated. Paradigmatic perspectives including relevant definitions were also described. In addition, overview of the research methodology, validity and reliability including plan of research action were provided.

The following chapters will include a review of the literature related to the topic under study, research design and research methods, data analysis and results and finally summary, discussion of results, conclusions, and recommendations will be given.