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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 5

SUMMARY, DISCUSSION OF RESULTS, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This final chapter presents a summary of the study, discussion of results and conclusions of the study. This is followed by a discussion of the limitations of the study and recommendations for management, nursing education, clinical practice and for further research in this area.

5.2 SUMMARY 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.

The objectives of the study were to:

- describe the profile of patient admissions to the intensive care units
- investigate the impact of the patients' profile on the requirements for nursing workload
- validate the use of TISS-28 as a measure of quantifying nursing workload in this setting

Methodology

This study was done in two stages. Stage I entailed face and content validation of TISS-28 by a panel of ICU nurse experts to ensure applicability of the items for the South African context. This process followed the model proposed by Lynn (1986). Stage II involved collection of data by the researcher using the three instruments (TISS-28, TISS-76 and SAPS II) from the three ICUs (n=3) in a public sector hospital in Johannesburg so as to determine the profile of patient admissions to ICU, the impact of this profile on the requirements for nursing workload and to determine concurrent and construct validity as well as inter-rater reliability of TISS-28.

Prior to the commencement of the study, ethical clearance and permission to conduct the study was obtained from the relevant authorities and university committees. A pilot study was conducted prior to the beginning of the main data collection in order to refine the methodology and data collection instrument. A non-experimental, descriptive, prospective two-stage design was utilized in order to meet the objectives of the study. Following consultation with the biostatistician, it was decided that 105 participants would constitute an adequate sample size. Data collection took place during the month of June, July and August 2008. Following further consultation with the biostatistician, descriptive and inferential statistics were used to analyze the data.

5.3 MAIN FINDINGS AND DISCUSSION

Six ICU nurse experts took part in **stage I** of the study. The majority of the experts (50%) were between ages 50-59 years, 33.33% were between ages 30-39 whereas 16.67% were

between ages 40-49. Lynn (1986) suggests that persons selected in face and content validation should have an expertise in the content of the instrument. Most of the expert nurses were senior nurses with experience and skills in the specialty. This was of great advantage in the validation process since this meant that they were well conversant with activities done in the ICU and were in a good position to assess the TISS-28 contents.

The majority of the experts (66.66%) had obtained a diploma in intensive care nursing. (16.67%) had a diploma plus a Masters degree in intensive care nursing whereas (16.67%) had a Masters degree and a PhD. This reflects that the experts had obtained ICU training hence they had knowledge, skills and experience in the caring of ICU patients given their experience and knowledge obtained in the specialty.

The majority of the experts (50%) were clinical instructors, whereas 33.33% of them were ICU nurse/shift leaders, with only 16.67% of them being intensive care unit managers. Their years of ICU experience ranged from five to twenty five years with the mean years of experience being sixteen. This high level of experience was necessary during face and content validation of TISS-28 as it required experienced participants to achieve this task so as to ensure accuracy in face and content validity determination.

In total, 105 participants took part in **stage II** of the study. The mean age of these participants was 43 years with range of 18-88 years. The majority of the study participants were male being 62 (59.05%) whereas the minority were female only accounting to 43 (40.95%) of the study participants.

Out of the 105 participants, 2(1.90%) participants died after 24 hours and before 48 hours of ICU admission. In total, 20 (19.05%) participants died after 24 hours of ICU admission before they were discharged to the ward. The average length of ICU stay for the study participants was 6.58 days with length of stay ranging from 1.5 to 37 days.

The participants admitted to the ICU were as follows: Medical cases were 40 (38.10%) with the lowest TISS-28 mean score of 28.60, scheduled surgical patients were 38 (36.19%) with the TISS-28 mean score of 29.76 and unscheduled surgical patients were 27 (25.71%) with the highest TISS-28 mean score of 30.19. The highest TISS-28 mean score of 30.19 points found in this study closely corresponds to 31 points found by Telles and Castilho (2007) and 28.4 points found by Kwok et al. (2005). This means that patients admitted to ICU for unscheduled surgery require more therapeutic interventions, are critically ill and need much nursing workload as compared to those admitted for scheduled surgery and medical reasons. Padilha et al. (2007:163) points out that the more severe the state of the patient, the larger the number of therapeutic interventions necessary for treatment and consequently, the higher the TISS-28 score, the longer the nursing time spent on such care.

In addition, participants admitted to the ICU were categorized depending on their TISS-28 scores following a method used by Miranda et al. (1996). The TISS-28 score ranges of the participants in the ICU were as follows: 14.29% of the study participants had scores ranging from 36-60, 80.95% had scores from 21-35 and 4.76% had scores ranging from 0-20. A study conducted by Padilha et al. (2007) showed that 54.5% of their sample had the TISS-28 mean scores ranging from 22-26 points, this being the highest percentage. This is almost in agreement with this study as the majority of the patients were between 21-35

scores. This can be concluded that in most cases, majority of ICU patients fall between 21-35 categories of TISS-28 scores. These results indicate that most of the participants in this study scored higher TISS-28 points hence they need much more complex care.

This means that the patients were critically ill and needed much therapeutic interventions thus they required much nursing time to render the necessary care. Categorizing the patients in this manner is of much help in working out the nurse to patient ratio. Study conducted by Padilha et al. (2007) indicates that patients with more than 22 points require a nurse patient ratio of 1:1 and that 1:2 ratio would be possible in ICUs that present with lower TISS-28 scores. Supported from the literature, the researcher views this method of scoring patients as a guide for staff allocation to be useful rather than following the expensive, consensus based method of one patient to one nurse without actually considering the patients' specific needs and scores including the nurses' level of competency.

A study conducted by Scribante et al. (2004) indicates that there is a shortage of ICU trained nurses in South Africa. Due to this fact, the skill-mix in critical care environment needs to be balanced by delegating low level clinical tasks to "inexperienced" nurses and allowing highly skilled nurses to undertake more complex care as suggested by Ball and McElligot (2003). In order to achieve this, patients admitted to the ICU need to be scored using TISS-28 and thereafter, allocation should be done by matching the patients' needs and the nurses' competencies. The hospital management should also base its nurse to patient ratios on patients' needs rather than fiscal imperatives as suggested by Ball and McElligot (2003) so as to promote better patient outcome in the ICU.

A study conducted by Miranda et al. (1996) indicates that one TISS-28 point equals to 10.6 minutes of nursing time spent on patient care. The study by Miranda et al. (1996) found out that a typical nurse was capable of delivering work equal to 46.35 TISS-28 points per eight hour shift. Though not an objective of this study, the researcher felt it was necessary to point out that an average nurse in this study was able to deliver care equal to a maximum of 47 TISS-28 points equivalent to eight hours 30 minutes in a 12 hour shift. It is important to point out that the times include only TISS activities and other direct and indirect patient care activities, but not personal activities (Miranda, et al., 1996).

In addition, this study revealed that all ICU patients required laboratory investigations (100%), nearly all patients were on standard monitoring (99.05%), had a central venous line (97.14%), were on quantitative urine output measuring (93.33%), and on multiple intravenous medications (92.38%). It was also found out that basic activities are the priority need for ICU patients. The need for ventilatory support comes next followed by the need for cardiovascular support. The need for renal support comes after ventilatory support and this is followed by the need for specific interventions and metabolic support. These findings are summarized in **tables 4.7 and 4.8**. These findings correspond with the findings from the study done in Hong Kong by Kwok et al. (2005) as the patients admitted to the ICU in their study had similar needs as was found in this study. This depicts that the needs and the profile of patients admitted to ICUs in different countries can be similar. Shulman, Beyene and Frndova et al. (2008:249) indicate that the volume of documented clinical information per patient per day in this manner is a marker of patient-related workload.

Moreover, this study revealed that patients are admitted to ICU for different reasons with different needs. Literature indicates that these patients' needs can only be met and outcome optimized depending on the nurses' competency level, skills, knowledge and experience (Ball & McElligot, 2003). This is supported by the synergy model which states that when patients' characteristics and nurses' competencies match and synergise, outcomes for the patient are optimal (Alspach, 2006:4). In this case, nursing care assignments need to reflect the level of demands from the patients as supported by Numata et al. (2006).

Face and content validity of TISS-28 was assessed by a panel of ICU nurse experts. During their assessment, the ICU nurse experts indicated that some of the items in TISS-28 such as multiple dressing changes needed much higher scores than had been awarded. This issue needs to be considered in future studies. Despite of this, the TISS-28 items and the entire instrument was found to have good face and content validity with 83% agreement rate for 2 items and 100% agreement rate for the remaining 26 items. **A CVI of 0.93** was found for the entire instrument. This finding is in agreement with results suggested by Lynn (1986) and Polit and Beck (2006) who advocate for a CVI of more than 0.9.

Concurrent validity of TISS-28 was determined by looking at correlation between TISS-28 and SAPS II as well as TISS-28 and TISS-76. The correlation between TISS-28 scores 24 hours after ICU admission and SAPS II scores within the first 24 hours of ICU admission demonstrated a **significant weak positive** result ($r = 0.2098$, $p = 0.0317$), supporting the finding by Padilha et al. (2007) that the severity of patients' illness is significantly related to nursing workload and type and number of therapeutic interventions in ICU. A **significant very strong positive** correlation between TISS-28 scores both after 24 and 48 hours of ICU admission and TISS-76 scores both after 24 and 48 hours of ICU

admission (r = 0.7857, p = 0.0001; r = 0.7677, p = 0.0001) was found respectively. These were in agreement with study by Kwok et al. (2005) who found statistically significant relationship between TISS-28 and SAPS II as well as TISS-28 and TISS-76. The results showed that TISS-28 had good concurrent validity due to its high scores that match previous validated studies.

Construct validity of TISS-28 was determined by looking at the difference between mean TISS-28 of ICU patients and ward patients. A **significant difference** was found between the TISS-28 scores among ICU patients both during 24 and 48 hours after admission and ward patients. Patients in the ICU had higher scores as compared to the patients in the ward (t = 25.59, p = 0.0001; t = 21.48, p = 0.0001) respectively.

A study conducted by Kwok et al. (2005) found higher scores in ICU patients and lower scores in rehabilitation hospital patients. This is attributed to the critically ill nature of ICU patients who often require more attention to the therapeutic activities listed in TISS-28 than do patients in the wards. Generally, the results showed that TISS-28 had good construct validity as it claimed to have a specific list of therapeutic activities mainly for critically ill patients. According to Kwok et al. (2005), patients in the ward are not expected to demonstrate high TISS-28 scores as the instrument was specifically designed for use in the ICUs. The results in this study prove that TISS-28 is specifically meant for critically ill patients.

Inter-rater reliability of TISS-28 was determined by comparing the data collected by the researcher and assistant expert researcher from a sample of patients**.** A **statistically significant** correlation was found between the data collected by the researcher and the

expert assistant researcher both after 24 and 48 hours of ICU admission. An intra-class correlation coefficient of 0.99 and a p-value of 0.0001 were found. This proves that the instrument can always be relied upon due to its stability.

5.4 CONCLUSION

In conclusion, the purpose of this study was to introduce the TISS-28, TISS-76 and SAPS II in critically ill adult patients in order to describe the validity and reliability of TISS-28 as a suitable measure of quantifying nursing workload in the intensive care units of a public sector hospital in Johannesburg. The results indicated that TISS-28 has acceptable face, content, concurrent and construct validities as well as inter-rater reliability. This therefore, renders the instrument suitable for use as an objective measure of quantifying nursing workload in this setting.

It will also be good to conduct a similar study in the researcher's home country Kenya, after completing the programme so as to achieve the same goal. This supports Kwok et al. (2005) for he suggested that more validation of TISS-28 is needed to delineate specific ICU activities of different countries given that each country has different cultural circumstances, resource availability, variations in nurses' working patterns, job responsibilities and protocols.

5.5 LIMITATIONS OF THE STUDY

The following limitations were encountered:

- The study was done in a level III tertiary hospital in three adult ICUs within a short period on small sample size (n=105), thus study findings from this study can only be generalized to other ICUs in level III tertiary hospitals in South Africa. It may be necessary for validation of the instrument to be conducted in other levels of ICUs within the South African context using a larger sample size.
- It was unfortunate that some of the patients were very sick and died within a few days of their ICU stay. 20 out of 105 (19.05%) patients died during the study, therefore the researcher was not able to obtain neither these patients' information after 36 hours in ICU nor the data in the ward after discharge as was planned. However, data obtained from the rest of the patients were utilized to meet the study objectives.

5.6 RECOMMENDATIONS OF THE STUDY

With the increasing severity of illness and nature of complexity of ICU patients, rapid advancement in technology and increased nursing workload, ICU nurses and management need to possess a valid objective instrument for measuring nursing workload in order to render care based on the complex needs for better patient outcome. In order to meet these patients' complex needs, the following recommendations have been made for the benefit of the following four disciplines.

5.6.1 Recommendations for Clinical Nursing Practice

- There is a need for health institutions to put into use an objective instrument to measure the amount of nursing workload required to render to each patient admitted to the ICU as a person.
- A nurse need to know how much work he/she is required to render to the patient allocated to him/her as this enables one to utilize the time and plan on how to offer total nursing care to a specific patient based on his/her own needs.
- An objective, valid and reliable instrument for measuring nursing workload should be introduced in as many ICUs as possible as this acts as a guide on how much work to expect and what kind of a nurse is required to render nursing care to a certain patient in a given shift.

5.6.2 Recommendations for Nursing Management

As the ICU environment requires skilful, experienced and competent nursing staff in order to ensure optimum patient outcomes, the following recommendations are made for nursing management:

- The management should recruit, select and deploy the nursing staff based on the type of patients in the ICU i.e. some patients need complex care with high skills and competency hence the management should deploy experienced trained ICU nurses so as to ensure that a high quality care is maintained.
- The management should not base their nursing allocation on cost constraints for this can endanger patients' lives because of inadequate skills and experience of the staff which can lead to poor patient outcome and increased mortality in relation to complications that can arise from errors.

- There is a need for use of evidence based information in the quantification of nursing workload. This includes the use of an instrument that has been validated internationally and proven to be a good objective measure of nursing workload.

5.6.3 Recommendations for Nursing Education

The following recommendations are made for nursing education.

- Clinical instructors and nurse educators should use learning opportunities in ICU to ensure that nurses understand the meaning of and how to use and comply with the instrument for effective quantification of nursing workload.
- Nurses should be made aware of improved patient outcomes which can only result through planning on patients care based on his/her needs using an appropriate instrument to score.
- There is a need for continuous education especially for the unit manager and shift leaders about how to quantify nursing workload. This is mainly for the purpose of increasing their understanding on this issue and their decision making about who will care for which patient.

5.6.4 Recommendations for Further Research

Further research is recommended to investigate the following issues which arose from the study:

- This study could be extended to include other adult ICUs in more different hospitals in South Africa.

- TISS-28 could be used to quantify nursing workload now that its validity and reliability has been tested in South African setting.
- More detailed analysis of nursing workload at each ICU could be worked out.
- There is a need to explore nurses' views and attitudes towards introduction of the TISS-28 in the adult ICUs for the purpose of measuring nursing workload.
- Revision of the TISS-28 items may be necessary since some of the items were found to require much higher scores in South African setting than have been awarded.

To end this journey, this research report sought to determine validity and reliability of TISS-28 in ICUs of a public sector hospital in Johannesburg. This research study found out that TISS-28 is a valid and reliable scientific objective instrument. This instrument can be used to quantify nursing workload in the South African ICUs given the current shortage of critical care nurses and increasing complexity of patients' illness and needs.