

Therapeutic Intervention Scoring System-28 acuity tool in the Neuroscience Critical Care Unit

1 Background

The Neuroscience Critical Care Unit (NCCU) at Johns Hopkins Hospital treats patients with serious and life-threatening neurological conditions and diseases, including tumors of the brain and spinal cord, large strokes, hemorrhages, and traumatic brain injury. The acuity level of the patients varies; post-operative patients who are relatively stable routinely stay overnight for observation before transfer to a less acute neuroscience unit for recovery, while more unstable patients require more intensive monitoring and longer stays. Patients' acuity levels influence decisions made regarding staffing and resource allocation, admissions, and transfers. The unit is staffed using a 1:1 or 1:2 nurse-patient ratio, according to the amount of care required by each patient, determined by acuity level. In terms of admissions, if a low-acuity patient is transferred out, the unit may not have the manpower available to accept admission of a high-acuity patient. Finally, when transferring a patient to another unit, it is important to do so when the patient is stable enough to be transferred, to prevent readmission to the NCCU within 72 hours, known as bounce-back. While nurse managers have experience in determining acuity levels in order to make these decisions, a consistent and quantifiable way of scoring was sought out by a multidisciplinary NCCU team.

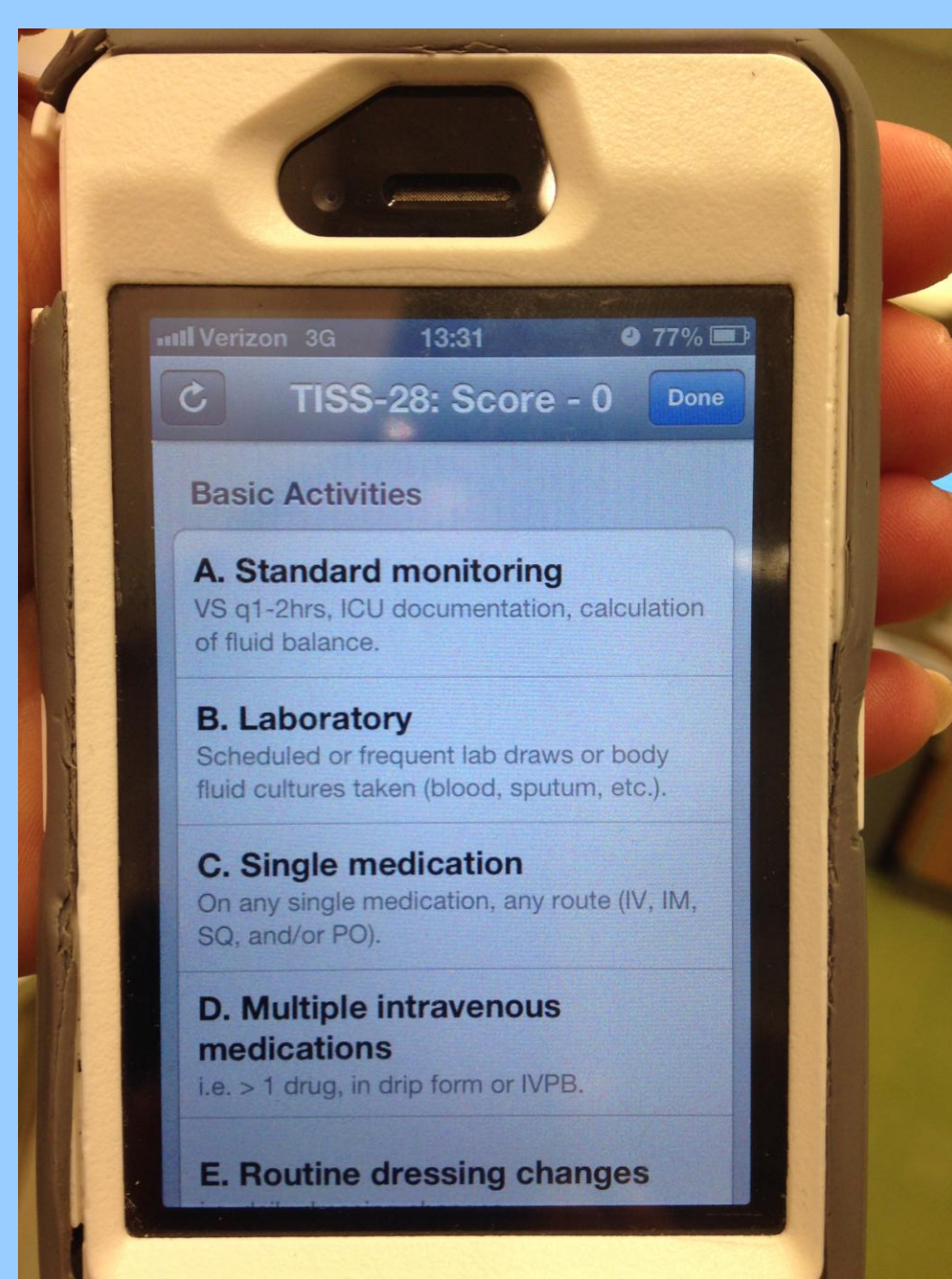
The Therapeutic Intervention Scoring System-28 (TISS-28) is a tool used to assign scores to patients according to severity of illness. The TISS-28 is based on the principle that the number of therapeutic interventions, and therefore amount of nursing time spent on a patient, is related to the severity of clinical conditions. It is therefore an indicator of nursing workload in ICU settings (Padilha et al., 2007). Muehler et al. (2010) found a correlation between TISS-28 score and severity of illness scores, and between high TISS-28 scores and worse outcomes in a surgical ICU. The TISS-28 had been introduced to the NCCU, but no data entry or analysis had been done prior to this project. The aim of this quality improvement project, therefore, was to describe a one month sample of TISS-28 data in the NCCU.

TISS-28 with language modified for use in NCCU

NCCU Patient Acuity Scoring Tool: Therapeutic Interventions Scoring System (TISS-28)	
Utilize the scoring tool below to calculate the total acuity score for your patient which must be reported to the charge RN during end of shift report.	
Basic Activities	
A. Standard monitoring: VS q2-2hrs, ICU documentation, calculation of fluid balance.	5
B. Scheduled or frequent lab draws or body fluid cultures taken (blood, sputum, etc).	2
C. On any single medication, any route (IV, IM, SQ, and/or PO).	2
D. On multiple IV meds (>1 drug, in drip form or IVPB).	3
E. Routine dressing changes (i.e. daily dressing changes).	3
F. Frequent dressing changes (i.e. >1 change per shift), and/or extensive wound care.	3
G. Care of any drains), except # tube.	3
Respiratory	
Mechanical ventilation, any form (i.e. APRV, AC, SIMV, CPAP).	5
Supplemental ventilator support without mechanical ventilation (NIPPV) and/or supplemental O2 by any method (DOPNBS, VM, NC, etc.).	2
Care of artificial airways (ETT, tracheostomy).	1
Treatment for improving lung function (S, acapella, chest PT, nebs, intratracheal suction).	3
Cardiovascular	
Any single vasoactive medication.	3
Multiple vasoactive medications.	4
IV replacement of large fluid losses, using any type of IV fluid.	4
Any A-line.	5
Left atrium monitoring (CVP) and/or floating a PA catheter with or without CO measurement.	8
Central venous access (e.g. central line, PICC).	2
CPR after arrest within the last 24 hours.	3
Renal	
Intermittent and/or continuous dialysis or any dialytic techniques (peritoneal, etc.).	3
Quantitative UOP measurement using Foley catheter (hourly).	2
Active diuresis with medications.	3
Neurology	
Measurement of intracranial pressure (ICP), any method.	4
Nutrition/Metabolic	
Treatment of complicated metabolic acidosis/alkalosis.	4
IV nutrition (CPN, PPN).	3
Enteral feeding via NGT, PEG, PEJ, or other GI route.	2
Interventions/Procedures	
A. Single specific intervention in the ICU.	3
B. INCLIDES: Intubation, intubation of pacemaker, cardioversion, endoscopies, emergency in the last 24hrs, gastric lavage.	5
C. NOT INCLUDED: Routine interventions without direct consequences to the patient, such as x-rays, echocardiography, electrocardiogram, dressings, or placement of CVC or A-lines.	0
Multiple interventions in the ICU. More than one, as described above.	5
Specific interventions outside of the ICU: surgery or diagnostic procedures.	5
Total TISS-28 score: _____	
Language modified from original document to be consistent with usual NCCU terminology, 2012	

2 Methods

The nurses in the NCCU calculate patients' TISS scores twice daily (once per shift) and report to the charge nurse using an iPhone application. Scores are sent to a Microsoft Outlook email account. In collaboration with a multidisciplinary team in the NCCU, a system was created for inputting patients' TISS scores into a spreadsheet from the email account. Data from September to December of 2012 was entered.



TISS-28 as shown on iPhone app

Data from November 2012 was analyzed according to a number of parameters. First, patient diagnoses were grouped into ten broad categories, and mean TISS scores were taken from each category. Then, TISS scores were analyzed to determine if a linear relationship existed between TISS scores and patient's length of stay. This was done by sorting the patients according to length of stay, then determining the average (mean) TISS score for each patient over time. A median was then calculated from average patient scores in each length of stay category. Lastly, one patient was found to have been readmitted within 72 hours of transfer in November. This individual's TISS scores and trends were analyzed to determine if a certain TISS score upon transfer predicts readmission.

3 Results

A total of 212 patients were admitted to the NCCU and had at least one TISS score recorded in November 2012.

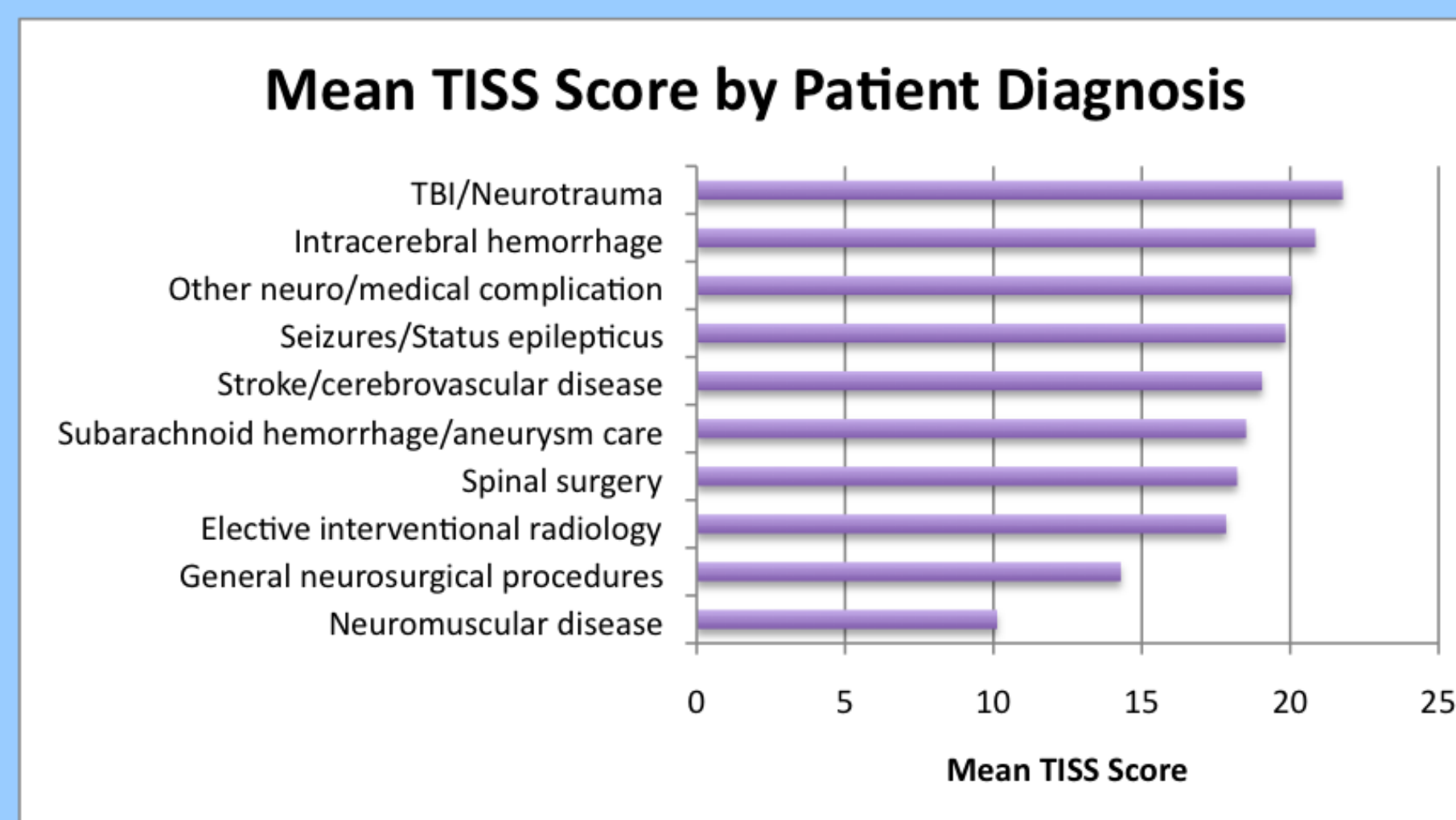


Figure 1 shows the mean TISS scores of 212 patients for ten diagnosis categories. The diagnosis category with the highest mean TISS score was traumatic brain injury (TBI)/neurotrauma, at 21.77. diagnosis category with the lowest mean TISS score was neuromuscular disease, at 10.13.

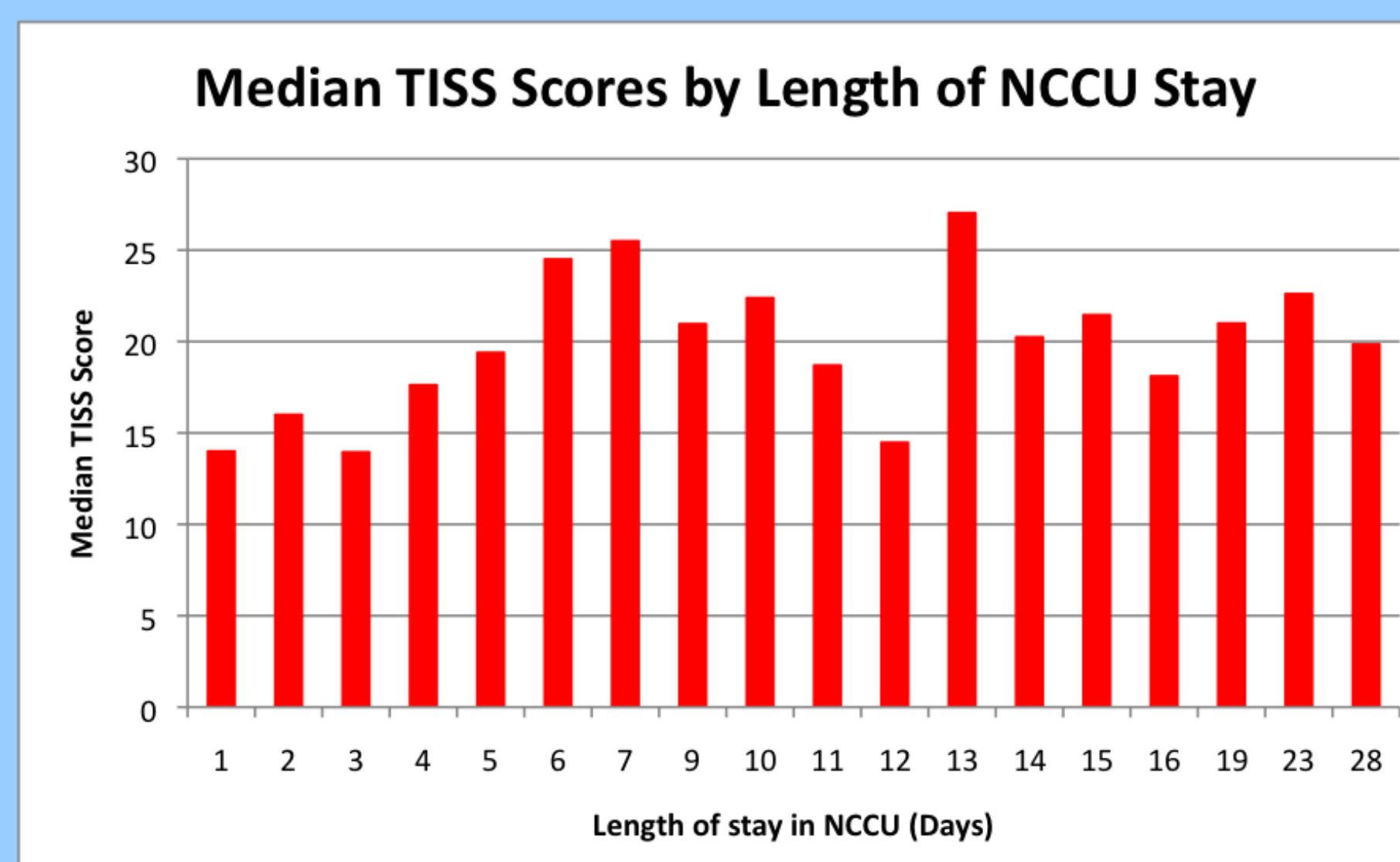


Figure 2 represents median TISS scores of 212 patients according to length of stay (LOS). LOS ranged from one to 28 days. Standard deviation of median TISS scores in this dataset was 3.81. A linear relationship was not found to exist between patients' average TISS scores and LOS.

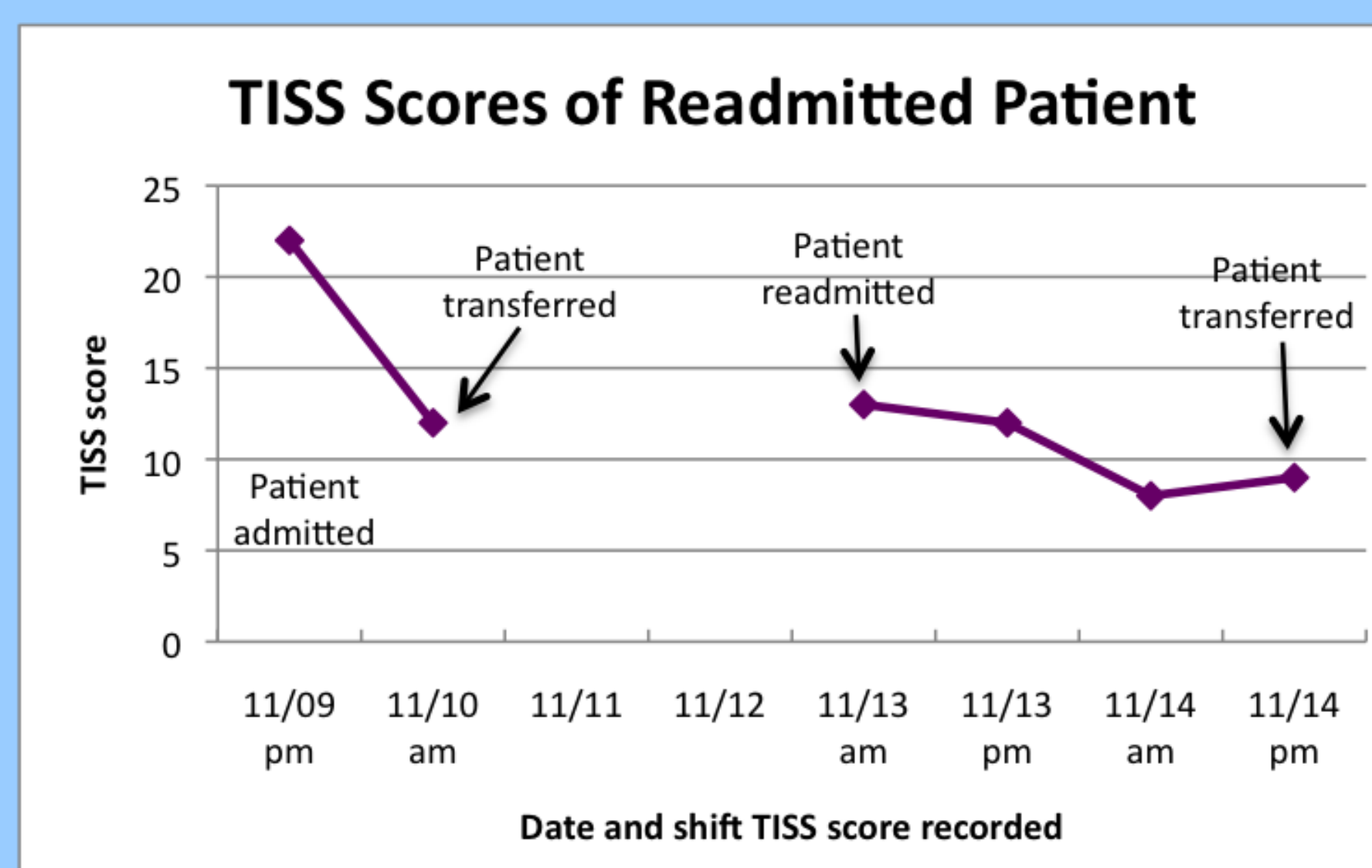


Figure 3 shows the TISS score trends of the patient who was readmitted less than 72 hours after transfer. The TISS score upon transfer was 12, and upon readmission it was 13. There were 49 total TISS scores of 12; therefore, this particular score was not predictive of readmission. After further investigation, it was revealed that the patient had been readmitted for a hyperglycemic event. Certain nursing activities, including an insulin infusion which requires hourly blood glucose checks to ensure proper titration, is time intensive yet is not included on the TISS-28.

4 Conclusions

The fact that a linear relationship was not found between TISS scores and patients' length of stay could be due to the fact that other factors influence patient acuity levels that are not reflected by the TISS-28. For example, in the NCCU, hourly neurological assessments are required by higher-acuity patients. Such frequent assessments are time consuming, yet assessments of any kind are not included on the TISS-28. Therefore, other factors need to be considered to estimate severity of illness and nursing workload, in order to make decisions regarding staffing and resource allocation in critical care hospital units. Padilha et al. (2007) determined that each TISS-28 point corresponds to 10.6 minutes of the work time of a nurse, meaning that within a six-hour shift, each nurse would be able to care for a patient with a maximum of 34 points. Nurses in the NCCU work 12-hour shifts. The goal in the NCCU is for each nurse to care for one or two patients whose total TISS-28 scores are less than or equal to 46. Those 46 points would account for approximately two-thirds of the nurse's time, leaving time for other activities not included on the TISS-28.

Limitations of this project include a small sample size, a short time period, and limited statistical analyses. Nevertheless, the availability of the TISS-28 as a tool that could contribute to staffing allocation decisions, and the four total months' of data that has been collected and entered, justify investment in future studies.

5 Future Directions

This project was the first of many phases in using the TISS data. Many more analyses could be done, including:

- Examining TISS trends within each diagnosis category
- Analyzing the four months of data that has been reported to increase the sample size and further explore possible trends or relationships
- Comparing TISS scores with other scores, such as the multiple organ dysfunction score, a descriptor of complex clinical outcomes
- Reviewing nurse-patient ratios to evaluate workload distribution according to TISS scores
- Comparing TISS scores of patients who died with those who survived

6 References

- Muehler, N., Oishi, J., Specht, M., Rissner, R., Reinhart, K., & Sakr, Y. (2010). Serial measurement of Therapeutic Intervention Scoring System-28 (TISS-28) in a surgical intensive care unit. *Journal of Critical Care* (25) 620-627.
- Padilha, K. G., Sousa, R. M., Kimura, M., Miyadahira, A. M., da Cruz, D.A., Vattimo, M. de F. ... Mayor, E. R. (2007). Nursing workload in intensive care units: A study using the Therapeutic Intervention Scoring System-28 (TISS-28). *Intensive and Critical Care Nursing*, 23(3), 162-169.

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