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Research article

The burden of not-weighted factors – Nursing workload in a medical Intensive Care Unit

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ABSTRACT

Objectives: Body weight and infection status affect nursing workload and are not accounted for in the Therapeutic Intervention Scoring System 28 (TISS-28) and Nine Equivalents of Nursing Manpower Use Score (NEMS). The objective of this study was to analyse the correlation between weight and infection status with TISS 28 and NEMS in a cohort of medical Intensive Care Unit patients.
Research methodology: A retrospective observational trial was conducted on the nursing records of 26 randomly selected patients over a 12-month period. TISS-28 and NEMS were calculated for each day of ICU stay. Infectious status was determined based on positive cultures to multi-resistant organisms while overweight and obesity were based on Body Mass Index.
Results: A total of 809 nursing shifts' activity records were analysed. There were 12 infected patients that required isolation, 14 overweight patients and 3 obese: 9 patients presented both conditions. Only the presence of both conditions was statistically associated with an increase in workload (TISS-28p-value = 0.041 and NEMS p-value = 0.011).
Conclusions: Although TISS-28 and NEMS do not specifically consider body weight and infection status, their integration into nursing workload scores may improve the accuracy as management tools, increasing the quality of the cares provided.

Implications for Clinical Practice

- High body weight and the presence of multidrug resistant pathogens correlate with a significantly higher nursing workload in the intensive care unit.
- Obesity and infection status should be considered in the estimation of the nursing workload, as they are not routinely included in TISS-28 and NEMS.
- It is there are other determinants that alone or in association can affect TISS-28 and NEMS scores and this nursing workload.

Introduction

Healthcare managers face the challenge of correctly allocating the precious resources available to a specific department in order to meet the stringent requests of budget cuts and guarantee the highest possible standard of care to patients. Nursing is a key process so being able to more accurately assess nursing workload burden is a key process to optimise resource utilisation and clinical outcomes.

The Intensive Care Unit (ICU) is the setting where the highest intensity of care is provided within the hospital, with multiple complex procedures being performed on critically ill patients, who are often completely dependent on registered nurses (RN) for their basic needs. These tasks require specialised training and full dedication by the healthcare provider: one of the most common strategies, often

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adopted by institutional regulations, is a 2:1 patient to RN ratio (Dimick et al., 2001; Amaravadi et al., 2000; Pronovost et al., 1999).

A more modern approach to resource allocation in healthcare, applicable also to ICU, is based on the Intensity of Care Model (Padilha et al., 2008) that aims to adjust resources on the needs of the single patient. ICUs offer intensive hospital assistance, which consequently generates the high costs per case: while hospital beds have decreased steadily, the evolution of patient population and life expectancy have determined an increase in ICU beds and related costs (Hawari et al., 2009). Questions have arisen on the long-term sustainability of ICUs (Zamperetti et al., 2006): optimising resources seems to be the most rational and effective approach to preserve the level of assistance while containing costs.

Evidence based medicine relies on the creation and adoption of specific protocols of proven effectiveness which call for adequate tools to evaluate outcome (Fanneran et al., 2015). Appropriateness is the key to successful resource allocation and can be applied to not only procedures or therapies but also the most important factor in the process of care of the patient – healthcare professionals (Daud-Gallotti et al., 2012).

Previous scientific reports point to a significant relationship between a decrease in the nursing staff workload and health benefits obtained during the patient's treatment (Kwiecień et al., 2012; Lankshear et al., 2005).

Some researchers claim that there are connections between the number of nurses and a decrease in the incidence of infections in the intensive care setting (Hugonnet et al., 2007). The increasing need for critical care beds, combined with decreasing budgets and nurse shortages may lead to situations whereby nurse staffing adequacy is suboptimal and patient safety may be compromised (Daud-Gallotti et al., 2012).

Nursing science has historically been more attentive to workload analysis than traditional medical science, so various scores have been developed to assess the number of professionals necessary to provide adequate assistance to a patient, especially in the most resource heavy contexts: ICUs.

The Therapeutic Intervention Scoring System 28 (TISS-28) (Padilha et al., 2007) and Nine Equivalents of Nursing Manpower Use Score (NEMS) (Carmona-Monge et al., 2013) take into account the various activities that are considered the most important determinants of nursing workload during a shift, correlated to the management and care of ICU patients.

However, there are factors that ICU professionals intuitively identify as determinants of everyday nursing workload: body weight and infection status, which are not accounted into TISS-28 and NEMS. The body weight likely affects the daily routine due to the high prevalence of overweight patients in the general population and consequently in ICU. Infection by multi-drug resistant pathogens is one the main challenges in Intensive Care and absorbs a considerable amount of resources, both in terms of treatments and assistance (Huttunen et al., 2013).

Methods

Objectives

The primary objective of this retrospective investigation was to analyse the correlation between weight and infection status with TISS-28 and NEMS in a cohort of medical ICU patients. TISS-28 is a scoring system that takes into account the various activities performed by a nurse during a shift in an ICU, such as monitoring vital parameters or managing or changing wound dressings. This score can be translated into an estimate of the time required to perform these activities. NEMS is a more immediate score that considers nine activities to define the nursing workload and patient intensity of care requirements.

The secondary objective was to correlate the nursing workload with clinical severity measured by Simplified Acute Physiology Score II (SAPSII) score, Sequential Organ Failure Assessment (SOFA) score. SOFA is a scoring system used to assess patients' conditions during ICU stay by measuring the functionality of several systems: respiratory, nervous, cardiovascular, renal, liver and coagulation. The outcome is a score that can vary between six (the best score) and 24 (the worst score). SAPS II takes into account two physiological variables and three disease-related variables to estimate severity and mortality in a population of patients and allow benchmarking between different healthcare facilities.

Setting

Data for this retrospective correlational study came from Policlinico Teaching Hospital (Modena, Italy) ICU patients' records archive covering one-year period.

Ethical approval

This study was approved by the local institutional Ethics Committee (Comitato Etico Provinciale di Modena) with the approval number 171.10.

Participants

A sample, amounting to 10% of the patients admitted to the ICU, was randomly selected from the archive using a computer-generated sequence of randomisation developed by one of the authors (MS Excel® 2010). The Modena ICU is a nine bed facility that treats mainly critically ill medical patients, characterised by an elderly population.

Data collection

Demographics variables (age, gender, height and body weight) were recorded for each patient. The maximum observation period was 30 consecutive days. The Braden scale was used to measure the risk of pressure sores, all lesions were noted and their evolution followed for the duration of ICU stay. Several measuring tools were used for the assessment of patients:

- Body weight: Body Mass Index (BMI). BMI was calculated on the basis of the reported weight and height, a BMI > 25 was considered overweight and obese when >30.
- Clinical severity: SOFA and SAPSII
- Nursing workload: TISS-28 and NEMS

Infectious status was determined on the basis of positive cultures to multi-resistant organisms, that required the adoption of prophylactic measures to contain the spread of the infection to other patients, that include donning protective garments, specific decontamination procedures, the creation of isolated, dedicated areas where specific supplies infected patients are stored. The list of microorganisms involved in the containment programme at our Institution were: *Acinetobacter baumannii*, *Klebsiella pneumoniae* resistant to carbapenems, *Escherichia coli* resistant to carbapenems, *Serratia marcescens*, *Pseudomonas aeruginosa*, *Clostridium difficile*, *Staphylococcus aureus* resistant to methicillin, *Aspergillus fumigatus*.

Data analysis

Normally distributed data were expressed as mean ± standard deviation (SD), non-parametric distributed continuous variables were expressed as median with interquartile range (IQR) and cat-

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