

## Assessing the adequacy of workload measurement tools using a quality-based methodology

*Adecuación de escalas para medir cargas de trabajo mediante metodología de calidad*  
*Adequação de escores para medir cargas horárias através de uma metodologia de qualidade*

Maria Fuensanta Hellín Gil<sup>I,II</sup>, Maria José López Montesinos<sup>I,III</sup>, Ana Myriam Seva Llor<sup>I,III</sup>,  
Maria Pilar Ferrer Bas<sup>II</sup>, Maria Loreto Maciá Soler<sup>IV</sup>

<sup>I</sup> Instituto Murciano de Investigación Biosanitaria Virgen de la Arrixaca. Murcia, España.

<sup>II</sup> Hospital Clínico Universitario Virgen de la Arrixaca, Quality Nursing Area. Murcia, España.

<sup>III</sup> Universidad de Murcia, Faculty of Nursing. Murcia, España.

<sup>IV</sup> Universidad de Alicante, Faculty of Health Sciences, Nursing. Alicante, España.

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### ABSTRACT

**Objective:** determine which tool (NEMS and NAS) is most suitable for use in intensive care units using a quality-based methodology. **Method:** after identifying the opportunity for improvement "Inadequacy of the NEMS for determining nursing workload in the intensive care unit (ICU)", we assessed the NEMS and the NAS, as a proposed improvement to the NEMS, using quality improvement cycles methodology based on the following criteria: measurement of daily nursing workload on a daily and shift basis; the tool encompasses all nursing activities undertaken in the ICU; and workload assessed per patient and unit. **Results:** there was no significant difference in level of compliance for the NEMS (67%). The comparison NEMS-NAS showed that there was a statistically significant improvement for all criteria except criterion 1. The NEMS only assesses criterion 1 (64.22%); while the NAS assessed all four criteria, obtaining a compliance rate of 64.74% for criteria 1, 2, and 4, and 100% for criterion 3. **Conclusion:** the NAS is more suitable for measuring nursing workload in UCIs. **Descriptors:** Quality Management; Intensive Care Units; Quality Control; Workload; Nursing.

### RESUMEN

**Objetivo:** Determinar cuál de las escalas evaluadas (NEMS y NAS), es más adecuada para Unidades de Cuidados Intensivos aplicando metodología de calidad. **Método:** Tras identificar como oportunidad de mejora la no adecuación de la escala NEMS para determinar cargas de trabajo de enfermería en UCI, se aplica metodología de los ciclos de mejora a dicha escala y a la NAS, como propuesta de mejora, evaluando los criterios: medición de cargas de trabajo al día y por turno, inclusión de todas las actividades enfermeras, y análisis por paciente y unidad. **Resultados:** Escala NEMS no muestra diferencias significativas en el cumplimiento (67%). Comparación NEMS-NAS, todos los criterios excepto el 1º, obtienen mejora significativa. NEMS sólo valora el criterio 1 (64,22%), y NAS todos con un cumplimiento para el 1º, 2º y 4º del 64,74%, y el 3º del 100%. **Conclusión:** La escala NAS es más adecuada para medir cargas de trabajo de enfermería en UCI. **Descriptor:** Gestión de la Calidad; Unidades de Cuidados Intensivos; Control de Calidad; Carga de Trabajo; Enfermería.

### RESUMO

**Objetivo:** determinar qual dos escores avaliados (NEMS e NAS), é o apropriado para as Unidades de Tratamento Intensivo aplicando a metodologia da qualidade. **Método:** após identificar como uma oportunidade de demonstrar a não adequação do escore NEMS para determinar as cargas de trabalho dos enfermeiros na UTI, aplicou-se a metodologia dos ciclos de melhoria para esse escore e para o NAS como propostas de melhorias, avaliando os critérios: medição da carga horária por dia e

por turnos, incluindo todas as atividades de enfermagem e análise por paciente-unidade. **Resultados:** o escore NEMS não demonstrou diferenças significativas na efetividade (67%). Comparando o NEMS-NAS, todos os critérios, exceto o 1º, obtiveram uma melhora significativa. O NEMS valoriza apenas o critério 1º (64,22%) e o NAS, todos, com efetividade de 64,74% para o 1º, 2º e 4º de e de 100% para o 3º. **Conclusão:** o escore NAS é o mais apropriado para medir a carga de trabalho de enfermagem na UTI.

**Descritores:** Gestão da Qualidade; Unidades de Terapia Intensiva; Controle de Qualidade; Carga Horária; Enfermagem.

CORRESPONDING AUTHOR

Maria Fuensanta Hellín Gil

E-mail: mfuensanta.hellin@carm.es

## INTRODUCTION

Over recent years, there has been a growing concern with quality in all areas, including the field of health. This concern is shared by patients/health service users, health managers, and practitioners<sup>(1)</sup>.

Within multidisciplinary health teams, nurses play a critical role in health promotion and disease prevention, patient care and recovery, and in assuring the quality of care, due to their closer relationship with patients and interaction with the subsystems of care facilities. Continuous quality improvement is an essential element of all care processes. Essential characteristics of this activity include efficacy, effectiveness, efficiency, access to healthcare for all those who need it, the constant pursuit of patient satisfaction, while ensuring that patient safety is maintained at all times and that health care is assessed based not only on quantity, but also on the quality of the activities undertaken in order to take further steps towards achieving excellence in health care delivery<sup>(1)</sup>.

Continuous quality improvement is negatively affected by increases in workload since work demands directly influence the amount of time health professionals are able to dedicate to care activities and spend with patients and thus impact their ability to provide quality care.

The accurate assessment of nursing staff requirements can therefore help to inform staffing levels and thus have a direct positive effect on the humanization of health care, efficiency, and health care costs<sup>(2)</sup>, thus influencing both health professionals and patients.

It is possible to determine the time required by nursing professionals to meet patient needs (number of hours of care) while sustaining generally accepted health care standards. Nursing shortages negatively affect the quality of care provided to patients, resulting in an increased risk of adverse events such as medication errors and health care-associated infections. Understaffing also has an impact on patient morbidity and mortality and length of hospital stay and thus has ethical, legal, and cost implications<sup>(2)</sup>. Furthermore, nursing shortages have direct consequences for health care professionals, since consistently heavy workloads can lead to exhaustion and a decrease in job satisfaction, which in turn results in an increase in rates of absenteeism, thus jeopardizing goals and institutional image.

Studies show<sup>(2-4)</sup> that there is an increasing body of evidence that confirms that nursing shortages jeopardize the quality of patient care. Indeed, it has been shown that inadequate nurse staffing levels is associated with an increase in the risk of infection among critically-ill patients<sup>(5)</sup>, while adequate staffing has

been shown to have a number of advantages, including reductions in in-hospital mortality and morbidity<sup>(6-9)</sup>, hospital stay and readmission<sup>(10)</sup>, the prevalence of burnout syndrome<sup>(11)</sup>, rates of absenteeism among nursing staff, and general and staff costs.

Accurate workload measurement is therefore essential to determine as precisely as possible nurse staffing requirements and inform staffing levels. This is particularly important in the case of highly-specialized services such as those provided in intensive care units (ICUs), given the type of resources and techniques used in these settings and the health status and high level of dependency of patients.

There are various workload measurement tools, some of which tailored to acute care settings. These measures classify patients according to care needs, thus favoring quality control and comparison with other similar facilities. Gaining a more in-depth understanding of workload and specific staffing requirements can provide important insights into how to optimize nursing human resources and help ensure that health costs are matched to real care needs<sup>(3)</sup>.

There is a wide variety of nursing workload measurement tools, each with their own particular characteristics. This study assessed the following tools: the Nine Equivalents of Nursing Manpower Use Score (NEMS)<sup>(12)</sup>, which has been used for a number of years in the ICU that is the object of this study; and the Nursing Activities Score (NAS)<sup>(13-14)</sup>, which is proposed as a best alternative to the NEMS because it is more up-to-date, encompasses all nursing activities undertaken in the ICU, is able to measure workload on a daily and shift basis, and because it is easy to determine staffing requirements and nurse-to-patient ratios based on its results.

## OBJECTIVE

The objective of this study is to use our own quality-based methodology that uses quality improvement cycles to assess the adequacy of two nursing workload measurement tools for use in the ICU of the *Hospital Clínico Universitario Virgen de la Arrixaca*: the NEMS, which has been in use at the ICU in question since 1997; and the NAS, which the relevant literature shows to be a more comprehensive and suitable method for measuring nursing workload.

## METHOD

### Ethical issues

The study complied with all relevant legal and ethical requirements and protected the confidentiality of the ICU. Only records relating care activities undertaken with patients

included in the workload measurement tools were used, together with patient admission and discharge/death records.

### Design, place of study, and period

Cross-sectional study using quantitative methods based on a quality improvement cycle undertaken as part of a quality management program<sup>(1)</sup> implemented to identify opportunities for improvement. The study was conducted between 2013 and 2014.

The NEMS has been used to measure workload in the ICU of the *Hospital Clínico Universitario Virgen de la Arrixaca* since 1997, but has achieved limited results in terms of planning of nurse staffing.

### Methodology

Quality improvement cycle methodology was used to evaluate the adequacy of the NEMS and NAS for assessing nursing workload and activities in the ICU. The NEMS<sup>(12)</sup> assesses nursing activities performed during the past 24 hours based on nine parameters and using a therapeutic intervention scoring system with scores ranging between three and 12 for each activity. The maximum 24-hour score is 63, while 46 points corresponds to the workload of one full-time nurse. The advantage of this tool is that it is simple to use and not time-consuming. However, drawbacks include the fact that it is not sensitive to minor changes in patients' clinical status.

In contrast, the NAS<sup>(13-14)</sup> was designed to assess nursing activities that better reflect workload in ICUs. Each activity is awarded a specific score based on the nursing time required to perform it. The tool consists of 23 items and 100 points corresponds to the workload of one full-time nurse during a 24-hour period. Each activity is scored according to the proportion of time taken up by the activity in relation to the total nursing time over the 24-hour period; thus the score awarded to each item should be understood as a percentage of the total time spent. Total patient time, calculated as the sum of all the recorded items, is used to determine staffing requirements.

### Population or sample. Data Sources

The sampling frame comprised ICU patients (each with a daily care plan). All ICU patients admitted during the study period were assessed.

For the two modalities – quality improvement cycle applied only to the NEMS and applied to both the NEMS and NAS – the study units or recipients of the service for all criteria were the ICU patients and the provider was the nursing staff, while patient stay in the unit, from admittance to discharge, was the process being addressed.

With respect to data sources, the cases or study units were identified using the ICU patients' medical records, together with the lists of admissions and discharges/deaths. Compliance with the criteria was assessed using information obtained from the patients' medical records and from each patient's daily care plan, taken from the electronic system in the case of the NEMS and from hand written plans completed on the previous day in the case of the NAS.

### Study protocol

The following criteria were used to measure the quality of the records produced by the two tools:

- Criterion 1: daily nursing workload is assessed for each patient admitted to the ICU.
- Criterion 2: in addition to daily nursing workload, workload per shift (morning, afternoon, and evening) is assessed for each patient admitted to the ICU.
- Criterion 3: the nursing workload measurement tool encompasses all nursing activities undertaken with ICU patients during each shift.
- Criterion 4: the workload records are examined individually, for each specific patient, and as a whole, considering all ICU patients, on a daily and shift basis, to determine adequate nurse staffing levels in the unit based on the results obtained from these records.

Based on the level of compliance with the above criteria, we measured the presence, absence or level of quality in order to determine what should be done, and how and where, to improve quality, meet needs, and solve quality-related problems, realizing perceived opportunities for improvement.

The dimension examined for each criterion was scientific and technical quality and professional competence: nursing workload records for ICU patients. For criteria 1 and 2, process-related data was used, given that these criteria are related to the process of measuring workload; while for criteria 3 and 4, structural data was utilized, since these criteria are related to the recording tool. Although the type of data differs according to each criterion, the amount remains the same since each patient had a daily care plan and each day the number of patients was equal to the number of care plans.

We first used the Ishikawa diagram, also called a cause and effect diagram and which is particularly useful for situations in which little quantitative data is available for analysis (Figure 1), to determine the potential causes and sub-causes of the detected quality-related problem.

In view of the need to replace the NEMS with another tool that is capable of solving the detected problem, a literature review was conducted and the NAS was proposed as an alternative. To determine which tool is most suitable for use in the ICU, we used our own a quality-based methodology that uses quality improvement cycles. Generally, corrective measures are applied between two evaluations; however, since the study was solely concerned with assessing the adequacy of the NAS as a proposed improvement to the NEMS, it was decided to use the quality improvement cycle methodology to assess the following:

- The NEMS: this tool was assessed to, in addition to the level of compliance with criteria, to identify its weaknesses and ability to meet the needs and expectations as to the measurement of workload in the unit. The performance of the tool against the quality criteria set out above was assessed during two seven-day periods – one in September and one in November 2013 – without using corrective measures, to verify whether the results had been influenced by the fact that both tools were

applied simultaneously in November.

- The NEMS - NAS: the results obtained for a four-day period in September 2013 during which the NEMS was applied as usual in the unit were compared with the results obtained for a four-day period in November 2013, during which the NAS was applied for the first time. The same criteria were assessed using the quality improvement cycle methodology, since the incorporation of the new tool (NAS) and the process this involves constituted the only corrective measure.

With respect to types of evaluation, the initiative to evaluate was external, the relationship between the temporal action and the evaluated action was retrospective, and the relationship between the people responsible for data extraction was crosswise.

**Results analysis**

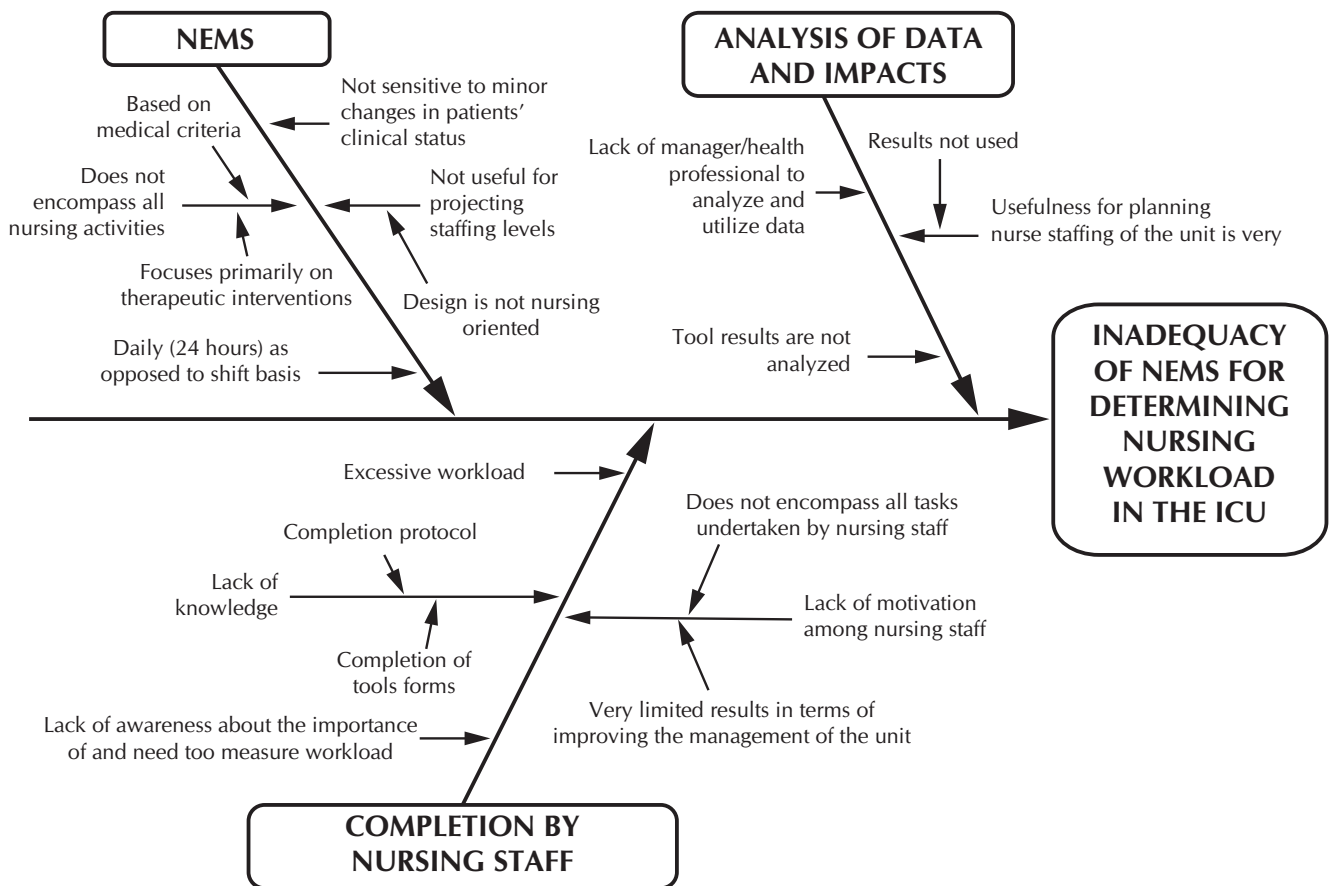
Since different samples were used for each assessment (NEMS and NEMS/NAS), sample homogenization was necessary to allow meaningful comparisons to be made and display the differences using Pareto charts. As mentioned above, the samples correspond to the number of patients/number of care

plans and we used our own methodology based on quality improvement cycles, which included a statistical analysis of the data to test the parameters (essentially the level of actual compliance with criteria), which were measured based on a graphical representation clearly highlighting the levels of compliance, or rather noncompliance, to prioritize the most important aspects of the intervention (Pareto charts).

**RESULTS**

The Ishikawa diagram (Figure 1) allowed us to identify the opportunity for improvement at the outset: *“Inadequacy of the NEMS for determining nursing workload in the ICU”*.

The NEMS only permits the assessment of nursing workload on a daily basis, as opposed to on a shift basis, and the items it assesses do not encompass all nursing activities performed in ICUs. Furthermore, the ICU does not have procedures or a member of staff responsible for analyzing the information recorded by the NEMS, which means its usefulness for planning nurse staffing is limited. It was therefore only possible to assess the first of the four criteria, which for the first evaluation carried out in September 2013 obtained a compliance score of 145, compared to zero for the remaining criteria.



Note: ICU = intensive care units

Figure 1 - Ishikawa Diagram

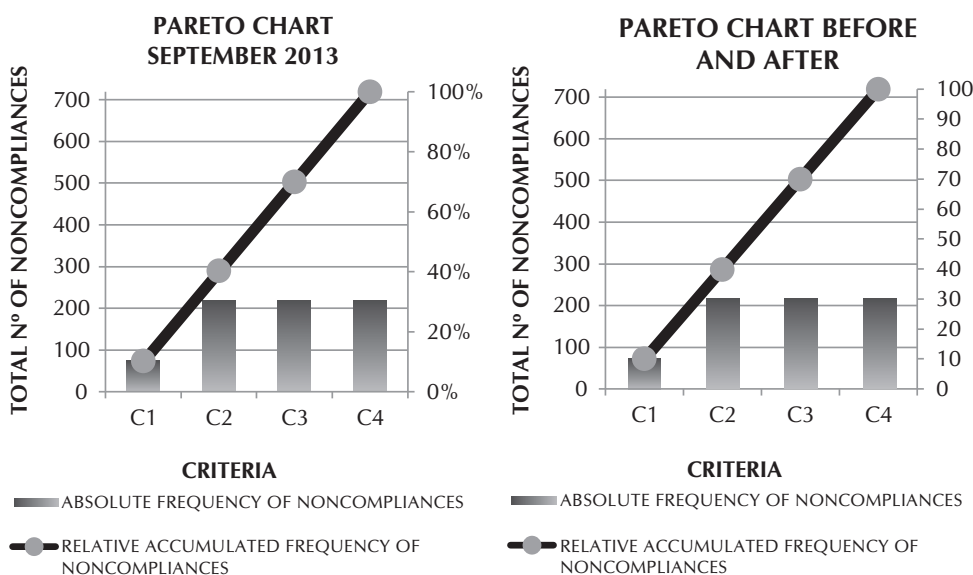


Figure 2 - Pareto charts before and after, NEMS

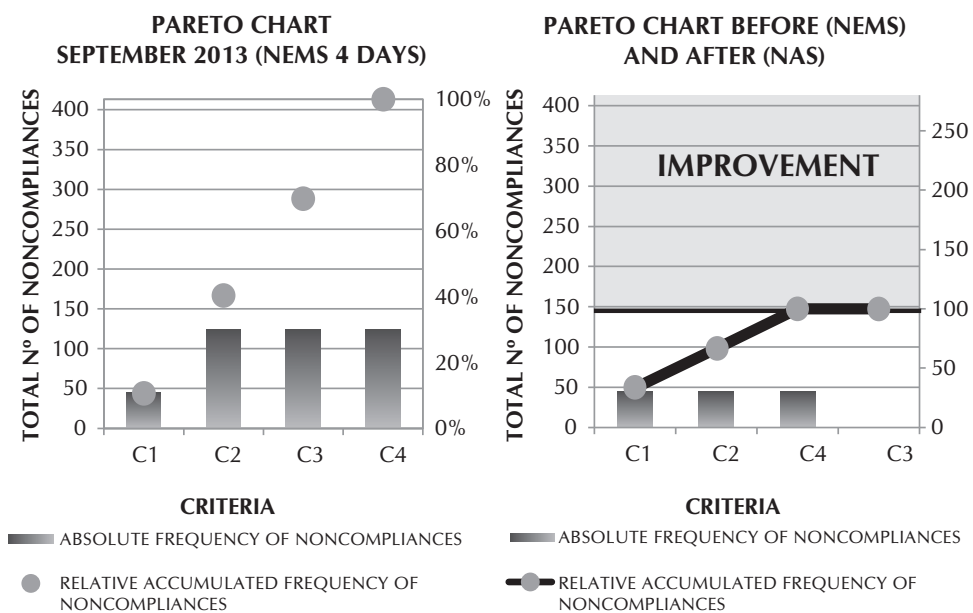


Figure 3 - Pareto charts before (NEMS) and after (NAS)

When the results of the first evaluation of the NEMS were compared with those of the second evaluation in November 2013, when the tool was used in association with the NAS for four of the seven days, there was no significant difference between the scores (in the second evaluation the first criteria obtained a compliance score of 145.32), while the Pareto chart remained practically the same (Figure 2).

With respect to the level of compliance of the NEMS during the seven-day period in November 2013, an average of 31 patients per day was obtained, together with an average of 20.85 for the care plans, which is equivalent to a compliance rate of 67.27%, and an average score of 30.55 points.

With regard to level of compliance in the second improvement cycle, where the first evaluation was conducted on the NEMS between 24 and 27 September and the second evaluation was conducted with the NAS in the period in which the tool was applied (between 19 and 22 November 2013), all four criteria were complied with by the NAS, obtaining a compliance rate of 64.74 % for criteria 1, 2, and 4, and 100% for criterion 3. A statistically significant improvement in level of compliance was observed for three of the criteria in comparison with the NEMS, since the latter only assessed criteria 1, obtaining a 64.22% compliance rate. This represents a major overall improvement, as shown by the Pareto charts that display the results of the two evaluations (Figure 3).

**DISCUSSION**

The NEMS only complied with the first quality criteria evaluated by this study, clearly revealing this tool's weaknesses; in contrast to the NAS, which, apart from complying with all four criteria and assessing nursing workload on a daily and shift basis, encompasses all nursing activities undertaken in the ICU, and is thus an effective method for measuring nursing workload and projecting staffing levels and requirements in line with the real care demands of this unit. These findings coincide with those of other studies<sup>(15-18)</sup> that showed that this tool was more effective than other alternatives.

The NEMS is only able to assess the first criterion, relating to the assessment of daily nursing workload per patient, showing that it is not suitable for meeting the workload measurement needs and objectives of this ICU.

As in other studies<sup>(19-20)</sup>, this situation motivated a search for an alternative workload measurement tool that serves as a perceived opportunity for improvement, including new alternatives

to tools that have already been validated. These studies also showed that the alternative workload measurement tools were more accurate than the NEMS and more comprehensive in terms of the care tasks undertaken in ICUs and confirmed the lack of adequacy and suitability of the NEMS for assessing nursing workload.

The NAS is able to assess workload per shift for all ICU patients admitted during any shift and thus assesses more patients than the NEMS and provides more realistic results in terms of patients and respective nursing activities than tools that only calculate overall workloads on a daily and shift basis.

The NAS also shows greater adequacy than the NEMS in relation to actual ICU patient workloads. Furthermore, studies highlight that it is difficult to project staffing requirements using the NEMS due to the fact that it does not have a nursing-oriented design<sup>(17-18)</sup>. Other studies<sup>(12,21)</sup> also observed that it is not able to assess certain care needs, since it focuses primarily on therapeutic interventions, reflecting the nurse/patient relationship from a workload perspective in a non-subjective manner.

In contrast, other studies<sup>(15-16)</sup> show that NAS adapts to the actual tasks undertaken by nurses in ICUs without requiring periodic updating because its design is tailored to acute care settings, regardless of the illness that justifies admission to the ICU. These studies also show that it is an effective tool for determining nursing requirements in conventional ICUs. Thus, we could say that our findings coincide with those of other studies<sup>(18)</sup> that have shown that the NAS has greater adequacy than the NEMS for measuring nursing workload in ICUs.

The NAS was able to assess all four quality criteria, showing a statistically significant improvement for all criteria except the first in comparison to the NEMS, which was only able to assess the first criteria, thus confirming the suitability of the NAS for improving workload measurement in the ICU.

Other studies<sup>(18,22)</sup> that compared these two tools showed that the NAS had greater adequacy than the NEMS, which usually receives more negative assessments with respect to its use for nursing in ICUs, confirming the findings of our study.

However, we were not able to find any studies that used quality improvement methodology to assess workload measurement tools, thus preventing the comparison of our study

with other similar studies. We believe that it is necessary to assess workload measurement tools and the process of measuring from a quality perspective, since this aspect is ever present in all nursing activities. Furthermore, although validation provides valuable information about a tool, it is also appropriate to use quality criteria, since they provide guidance on the roles and responsibilities of nursing in intensive care settings and serve to guide the process of improvement towards excellence, contributing toward the search for effective nursing workload measurement tools.

## CONCLUSION

NEMS only complied with the first of the four criteria, revealing this tool's weaknesses; in contrast to the NAS, which complied with all four criteria.

The NEMS is inadequate not only for use in the ICU, but also for use with patients and health professionals, since it does not meet the workload measurement needs and objectives relative to the ICU.

The NAS enables the assessment of workload per shift for all ICU patients admitted during any shift and produces more realistic results, both in terms of patients and respective nursing activities.

This study confirmed the suitability of the NAS for improving workload measurement in the ICU in question.

We can therefore conclude that, apart from meeting the proposed objective, the findings obtained using our quality-based methodology show that the level of compliance of the workload measurement method currently used in the ICU was insufficient and therefore the tool is inadequate not only for use in the ICU, but also for use with patients and health professionals. Furthermore, the tool does not provide sufficient information to inform and project nurse-to-patient ratios that are well-matched to the unit's care demands, especially among patients who are admitted to the unit on a more frequent basis. It is thus necessary to replace the current tool with an alternative tool such as the NAS, which meets unit's nurse workload measurement needs set out in the criteria adopted by this study to assess the tools.

## REFERENCIAS

1. Saturno PJ. Gestión de la calidad. Concepto y componentes de un Programa de Gestión de la Calidad. Manual del Máster en gestión de la calidad en los servicios de salud. Módulo 1: Conceptos básicos. Diseño e implantación de Programas de Gestión de la Calidad en los Servicios de Salud. Unidad temática 2. 2008, 2ª Edición. Universidad de Murcia. Murcia.
2. Myns D, De Bacquer D, Van Hecke A, Beeckman D, Verhaeghe S, Van Goubergen D. Validation of standard times and influencing factors during the development of the workload indicator for nursing. *J Adv Nurs* [Internet]. 2013[cited 2014 Jan 07];70(3):674-86. Available from: <http://onlinelibrary.wiley.com/doi/10.1111/jan.12232/abstract;jsessionid=76D94E97FE6554169A1B0DA6223306A0.f01t01>
3. Carmona Monge FJ, Uria Uranga I, García Gómez S, Quirós Herranz C, Bergaretxe Bengoetxea M, Etxabe Unanue G, et al. Análisis de la utilización de la escala Nursing Activities Score en dos UCIS Españolas. *Rev Esc Enferm USP* [Internet]. 2013[cited 2014 Jan 07];47(5):1108-16. Available from: <http://www.redalyc.org/pdf/3610/361033328014.pdf>
4. Munnich EL. The labour market effects of California's minimum nurse staffing law. *Health Econ* [Internet]. 2014[cited 2015 Jan 07];23(8):935-50. Available from:

- <http://onlinelibrary.wiley.com/doi/10.1002/hec.2966/abstract>
5. Hugonnet S, Chevrolet JC, Pittet D. The effect of workload on infection risk in critically ill patients. *Crit Care Med* [Internet]. 2007[cited 2014 Jul 17];35(1):76-81. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/17095946>
  6. Aiken LH, Clarke SP, Sloane DM, Sochalski J, Silber JH. Hospital nurse staffing and patient mortality, nurse burnout and job dissatisfaction. *J Am Med Assoc* [Internet]. 2002[cited 2013 Jul 10];288(16):1987-93. Available from: <http://www.nursing.upenn.edu/media/Californialegislation/Documents/Linda%20Aiken%20in%20the%20News%20PDFs/jama.pdf>
  7. Kalisch BJ, Friese CR, Choi SH, Rochman M. Hospital nurse staffing: choice of measure matters. *Medical Care* [Internet]. 2011[cited 2014 Jul 17];49(8):775-9. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3291170/>.
  8. Needleman J, Buerhaus P, Mattke S, Stewart M, Zelevinsky K. Nurse-staffing levels and the quality of care in hospitals. *N Engl J Med* [Internet]. 2002[cited 2014 Jan 07];346(22):1715-22. Available from: <http://www.nejm.org/doi/full/10.1056/NEJMsa012247#t=article>
  9. Neuraz A, Guérin C, Payet C, Polazzi S, Aubrun F, Dailler F, et al. Patient mortality is associated with staff resources and workload in the ICU: a multicenter observational study. *Crit Care Med* [Internet]. 2015[cited 2015 Jul 17];43(8):1587-94. Available from: <http://www.theintensivistcompany.com/pdf/Staff%20resources%20and%20workload.pdf>
  10. Mitka M. Greater nurse staffing may lower hospital readmissions. *JAMA* [Internet]. 2013[cited 2014 Jan 07];310(18):1911. Available from: <http://jama.jamanetwork.com/article.aspx?articleid=1769885>
  11. Rafferty AM, Clarke SP, Coles J, Ball J, James P, McKee M, et al. Outcomes of variation in hospital nurse staffing in English hospitals: cross-sectional analysis of survey data and discharge records. *Int J Nurs Stud* [Internet]. 2007[cited 2014 Jan 07];44(2):175-82. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2894580/>.
  12. Perren A, Previsdomini M, Perren I, Merlani P. High accuracy of the nine equivalents of nursing manpower use score assessed by critical care nurses. *Swiss Med Wkly* [Internet]. 2012[cited 2014 Jan 07];142:w13555. Available from: <http://www.smw.ch/content/smw-2012-13555/>.
  13. Arias Rivera S, Sánchez-Sánchez MM, Fraile-Gamo MP, Patiño-Freire S, Pinto-Rodríguez V, Conde-Alonso MP, et al. Adaptación transcultural al castellano del Nursing Activities Score. *Enferm Intensiva* [Internet]. 2012[cited 2014 Jul 17];24(1):12-22. Available from: <https://dialnet.unirioja.es/servlet/articulo?codigo=4207992>
  14. Sánchez-Sánchez MM, Arias-Rivera S, Fraile-Gamo MP, Thuissard-Vasallo IJ, Frutos-Vivar F. Validating the Spanish version of the Nursing Activities Score. *Enferm Intensiva* [Internet]. 2015[cited 2015 Sep 05];26(2):63-71. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25862002>
  15. Lucchini A, De Felippis C, Elli S, Schifano L, Rolla F, Pegoraro F, Fumagalli R. Nursing Activities Score (NAS): 5 Years of experience in the intensive care units of an Italian University hospital. *Intensive Crit Care Nurs* [Internet]. 2014[cited 2014 Aug 09];30(3):152-8. Available from: <http://www.sciencedirect.com/science/article/pii/S0964339713001134>
  16. Altafin JA, Grion CM, Tanita MT, Festti J, Cardoso LT, Veiga CF, et al. Nursing Activities Score and workload in the intensive care unit of a university hospital. *Rev Bras Ter Intensiva* [Internet]. 2014[cited 2014 Jul 17];26(3):292-8. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4188466/>.
  17. Bernat A, Abizanda R, Ybars M, Quintana J, Gascó C, Soriano M, et al. Cargas de trabajo asistencial en pacientes críticos: estudio comparativo NEMS frente a NAS. *Enferm Intensiva* [Internet]. 2006[cited 2014 Jan 07];17:67-77. Available from: <http://www.elsevier.es/es-revista-enfermeria-intensiva-142-articulo-cargas-trabajo-asistencial-pacientes-criticos-13089639>
  18. Carmona Monge FJ, Rollán Rodríguez GM, Quirós Herranz C, García Gómez S, Marín Morales D. Evaluation of the nursing workload through the Nine Equivalents for Nursing Manpower Use Scale and the Nursing Activities Score: a prospective correlation study. *Intensive Crit Care Nurs* [Internet]. 2013[cited 2014 Jul 17];29(4):228-33. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/23746441>
  19. Braña Marcos B, Del Campo Ugidos RM, Fernández Méndez E, De la Villa Santoveña M. Propuesta de una nueva escala de valoración de cargas de trabajo y tiempos de enfermería (VACTE®). *Enferm Intensiva* [Internet]. 2007[cited 2013 Jun 07];18(3):115-25. Available from: <http://www.elsevier.es/es-revista-enfermeria-intensiva-142-articulo-propuesta-una-nueva-escala-valoracion-13109366>
  20. Padrón Sánchez A, Gutiérrez Núñez CA, Enríquez Cortina P, Rivero González Y. Escala de evaluación de la carga de trabajo de enfermería (EVECTE): propuesta de una nueva escala. *Rev Cub Med Int Emerg* [Internet]. 2003[cited 2013 Sep 07];2(3):50-8. Available from: [http://bvs.sld.cu/revistas/mie/vol2\\_3\\_03/mie08303.pdf](http://bvs.sld.cu/revistas/mie/vol2_3_03/mie08303.pdf)
  21. Del Campo Pérez V, Rivas Vila A, García Mariño AL, González Morales I, Hermida Rodríguez MM, Pena Rodríguez A. Aplicación de la escala NEMS en la cuantificación del trabajo de enfermería en una UCI polivalente. *Enferm Global* [Internet]. 2008[cited 2014 Jul 17];7(2):13-14. Available from: <http://revistas.um.es/eglobal/article/view/14651>
  22. Roldán Gil C. Medición con tres escalas de las cargas de trabajo de enfermería al ingreso y al alta médica de la unidad de cuidados intensivos. En: XIX Premio de Enfermería 2013. Mutua Terrasa [Internet]. 2013[cited 2014 Jul 17]. Available from: [http://www.mutuaterassa.cat/pfw\\_files/cma/mutua\\_terrassa/noticias/6%20CARGAS%20TRABAJO%20enfermeria%20UCI.pdf](http://www.mutuaterassa.cat/pfw_files/cma/mutua_terrassa/noticias/6%20CARGAS%20TRABAJO%20enfermeria%20UCI.pdf)