

Sizing the nursing staff in an Intensive Care Unit for Adults**Dimensionamento de pessoal de enfermagem em Unidade de Terapia Intensiva para adultos**Dimensionamiento del personal de enfermería en una Unidad de Terapia Intensiva para adultos***Kelly Cristina Inoue¹, Laura Misue Matsuda²****ABSTRACT**

Objective: To analyze the staff sizing of the Intensive Care Unit for Adults (ICU-A) by means of the Nursing Activities Score (NAS) and the COFEN Resolution No. 293/2004. **Methods:** Is a descriptive and exploratory study performed in the UCI-A, in a teaching hospital in Paraná, between May/2008 and November/2007. The population consisted of 107 patients who stayed more than 24 hours in that unit. **Results:** According to the results, the average of the NAS (697.3 points) showed: a high workload of nursing; the nursing staff of this sector should have 40 professionals instead of the current 28; the proportion of 35.7% nurses does not correspond with the recommended, which is 52.5%. **Conclusion:** Despite some limitations of the NAS to measure the nursing workload in the UCI-A and also the limitations of the empirical Technical Safety Index recommended for the national level, it was concluded that both methods contribute to the sizing of the nursing staff to better serve that needs of that service.

Keywords: Health personnel management; Intensive care units; Personnel downsizing; Critical care; Occupational health

RESUMO

Objetivo: Analisar o dimensionamento do pessoal de enfermagem da Unidade de Terapia Intensiva de Adultos (UTI-A) através da aplicação do Nursing Activities Score (NAS) e da Resolução COFEN n.º 293/2004. **Métodos:** Pesquisa descritiva, exploratória realizada na UTI-A de um hospital-escola do Paraná, entre novembro/2007 e maio/2008. A população constituiu-se de 107 pacientes que permaneceram mais de 24 horas nessa unidade. **Resultados:** De acordo com os resultados, a média do NAS (697,3 pontos) aponta para alta carga de trabalho de enfermagem; a equipe de enfermagem do setor deve contar com 40 profissionais em ao invés de 28; a proporção de 35,7% de enfermeiros não corresponde com o recomendado que é de 52,5%. **Conclusão:** Apesar de algumas limitações do instrumento NAS para mensurar a carga de trabalho de enfermagem em UTI e do Índice de Segurança Técnica empírico, recomendado nacionalmente, concluiu-se que os dois métodos utilizados contribuem para um dimensionamento do pessoal de enfermagem mais adequado às necessidades desse serviço.

Descritores: Gestão de pessoal em saúde; Unidades de terapia intensiva; Downsizing organizacional; Cuidados críticos; Saúde dos trabalhadores

RESUMEN

Objetivo: Analizar el dimensionamiento del personal de enfermería de la Unidad de Terapia Intensiva para Adultos (UTI-A) por medio del *Nursing Activities Score* (NAS) y de la Resolución COFEN N° 293/2004. **Métodos:** Estudio descriptivo y exploratorio realizado en la UTI-A, de un hospital escuela de Paraná, entre Noviembre/2007 y Mayo/2008. La población estuvo constituida por 107 pacientes que permanecieron más de 24 horas en dicha unidad. **Resultados:** De acuerdo a los resultados, la media del NAS (697,3 puntos) apunta para: Una alta carga de trabajo de la enfermería; el equipo de enfermería del sector debe contar con 40 profesionales en lugar de los 28 actuales; la proporción de 35,7% enfermeros no corresponde con lo recomendado, que es de 52,5%. **Conclusión:** A pesar de algunas limitaciones del instrumento NAS para medir la carga de trabajo de enfermería en la UTI-A y del Índice de Seguridad Técnico empírico recomendado en el ámbito nacional, se concluyó que ambos métodos contribuyen para un dimensionamiento del personal de enfermería más adecuado a las necesidades de ese servicio.

Descripciones: Administración del personal en salud; Unidades de terapia intensiva; Reducción de personal; Cuidados críticos; Salud laboral

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INTRODUCTION

The nursing care process in Intensive Care Units (ICU) is characterized by complex care activities that demand a highly technical and scientific competence – after all, the immediate decisions to be made and the adoption of safe conducts are directly related to a person's life or death. In this context, it is extremely important to provide and maintain a qualified nursing staff that is appropriately dimensioned so as to develop safe nursing care with quality.

Staff dimensioning is understood as a systematic process that aims to foresee the quantity and quality of resources per category (nurse, nursing technician, nursing assistant) so that the clients' nursing care needs are directly or indirectly covered⁽¹⁾. In ICUs, the nursing staff dimensioning, besides meeting patients' care demands, also contributes to favorable working conditions, and consequently, to nursing professionals' health, who have to deal with stressful situations in a daily basis – such as suffering and death.

The nursing staff dimensioning, therefore, subsidizes quantitative and qualitative planning and assessment of staff so as to provide nursing care with quality, which is previously established, to a group of patients, according to the institution philosophy and structure, and to each service singularity⁽²⁾.

The nursing staff provided under the quantitative and qualitative focus, able to meet the patients' care needs, should be estimated by the nurse⁽³⁻⁴⁾ based on minimal technical norms established by COFEN Resolution No. 293/2004. Such Resolution determines that the quantitative dimensioning of nursing staff should be based on characteristics related to the institution/company, to the nursing care, and to the clients⁽⁵⁾.

Based on what was exposed, it is important to take into consideration that in general ICUs receive extremely debilitated patients who greatly depend on the care, more than in other hospital units, and for this reason, the nursing staff dimensioning should be estimated by means of more complex instruments which are easily applied, consider the several activities specifically developed in this sector, assist quantifying the real nursing workload, and determining the number of necessary workers to comprise the team.

The Nursing Activities Score (NAS)⁽⁶⁾ is the most complete instrument validated in Brazil⁽⁷⁾ in order to measure the ICU nursing workload, for besides taking into account the time procedures and therapeutic interventions take, it also contemplates administrative activities and patients' families' support time. Moreover, in order for the ICU dimensioning to be adequate, it is important to comply with the criteria from COFEN Resolution No. 293/2004⁽⁵⁾ which establishes the Technical

Safety Index (TSI) and the proportion of nurses, according to the complexity of care having to be provided to clients, over the total of nursing professionals.

The TSI refers to the additional number of nursing professionals necessary in case of unforeseen work absences, either due to benefits or absenteeism. The empiric coefficient of 15%, which estimates the necessity of 8.33% additional staff to cover for absences due to benefits and 6.67% to cover for absenteeism, is recommended when the institution TSI is not known⁽⁵⁾.

As to the proportion of nurses over the total number of nursing professionals, 52% to 56% of the total nursing staff should be nurses and the remaining should be nursing technicians (NR)⁽⁵⁾ in the case of ICUs.

Upon the fact that the Adult ICU (A-ICU) of a University Hospital in Paraná's Northwest has been going through rapid and progressive changes, using diversified technologies related to a deeper client care complexity, and that since it has been amplified in 2003, the nursing staff was not re-adjusted to meet the new composition criteria⁽⁵⁾, a question is raised: is the A-ICU nursing staff dimensioning appropriate to meet the care demands? In order to answer this question, aiming to implement health risk prevention or minimization strategies to protect the nursing staff and the clients assisted by them, the present study was proposed with the objective of analyzing the A-ICU nursing staff dimensioning through the NAS instrument and COFEN Resolution No. 293/2004 application.

METHODS

This is a quantitative research of the descriptive, and exploratory type, which took place between November 2007 and May 2008, at a Public University Hospital A-ICU in Paraná's Northwest.

With eight hospitalization beds, the A-ICU is classified as type II⁽⁸⁾ and complies with all the criteria established by Ordinance No. 3,432/1998⁽⁹⁾. In this sector, the nursing team is comprised of 28 professionals – 10 nurses, 17 NT and one nursing assistant (NA). Such contingent is divided in five teams with a weekly workload of 36 hours.

In order to dimension the nursing team, an instrument that was specifically developed for the present study was utilized, considering all patients who were hospitalized in the A-ICU and remained there for at least 24 hours. After excluding 11 individuals who did not meet the hospitalization time criteria, a population of 107 patients was taken into account for the study.

The data collection occurred through daily visits to the A-ICU. At that moment, information regarding the 24 previous hours were collected from the patients' files, the same patients who later comprised the study

population. When records were inconsistent, the nursing team was contacted to provide further clarifications.

The data collection instrument, comprised of three parts, was distributed according to the following: the first part referred to patients' demographic data (age, gender, marital status, and origin) and clinical data (date and time of hospitalization in and release from the A-ICU, hospitalization diagnosis, treatment time and release type); the second part referred to obtaining NAS related data, according to Queijo's⁽⁷⁾ translation and validation; and the third part, was related to data records regarding the nursing professionals proportion per patient.

It is worth highlighting that operational definitions for NAS activities and therapeutic interventions scoring from NAS Guide⁽¹⁰⁾ were utilized.

Data were compiled and treated through the programs *Microsoft Office Excel 2003* and *Statistica 8.0*.

The following variables received frequencies and percentages for the data treatment: gender, age, treatment type, number of diseases when hospitalized, length of ICU stay, previous chronic degenerative disease, and release condition. Age and NAS total score were added to the descriptive statistic analysis for the variables, and were taken into account: minimum and maximum variation; average, median, and Standard Deviation (SD) dispersion measurement.

As of the data obtained by the NAS application, the nursing staff workload was quantified on each day investigated and afterwards the number of nursing professionals necessary to perform the work was estimated. The reference established by Miranda et al.⁽⁶⁾ was utilized in this stage, and it proposes that each NAS activity scoring correspond to the percentage of time spent with care provided in a period of 24 hours. For a 100 scoring, one nurse is required per shift⁽⁶⁾, which is understood in this study as a nursing professional, regardless of his/her category.

When performing the scores sum through the NAS application, a simple arithmetic average is obtained, and the average number of professionals needed for the daily care is also determined. Thereafter, the daily workers quantitative estimated by the NAS was compared to the number of workers who were present in the sector.

Based on the workers average as estimated by the NAS, the number was adjusted to COFEN Resolution No. 293/2004⁽⁵⁾, with the empiric TSI addition and the nurses and NT proportion establishment.

Mathematically, the A-ICU nursing team dimensioning can be expressed by the following formula:

$$NP = (T \cdot (\bar{u} \text{ NAS}/100)) + 15\%$$

Where:

- NP = number of necessary nursing professionals.
- T = number of nursing teams.
- \bar{u} NAS = NAS score average.

After obtaining the number of professionals needed for each shift and estimating the staff quantitative for each working day through the NAS application, and adjusting the results to COFEN Resolution No. 293/2004, the estimated staff numbers and the actual number of workers in the A-ICU were compared.

It is necessary to take into consideration that the NAS scores do not depend on disease seriousness, type of patient, or ICU. This fact allows it to be used as a management tool that estimates the amount of care required by a patient during the next shift, measures the workload in a more efficient way or even optimizes financial resources in staff management⁽⁶⁾.

It is important to emphasize that all ethical demands established by Resolution No. 196/96 from the Conselho Nacional de Saúde/MS (National Health Council/MS)⁽¹¹⁾ were met and this research is registered under the Legal Opinion No. 412/2007, issued by the Permanent Committee of Ethics for Researches with Human Beings of Universidade Estadual de Maringá - PR.

RESULTS

Clients Characterization

The study population was comprised of 107 patients, among which 69 (64.5%) were males and 38 (35.5%) were females, whose ages ranged between 14 and 92 years, with an average of 53.2 years (SD ± 19.9) and a median of 57 years old. The number of patients that were 60 years old or more (41.1%), whose age bracket is defined as elderly⁽¹²⁾ is noteworthy.

Concerning clinical data, most of the patients received clinical treatment (60.7%), were carriers of several diseases when hospitalized at the A-ICU (74.8%) and remained less than 21 days in the sector (82.2%). It is worthy highlighting that more than half of the patients (53.3%) carried previous chronic degenerative diseases, such as: systemic hypertension, *mellitus* diabetes, stroke, chronic obstructive pulmonary disease, cardiopathies, chronic kidney failure, and neoplasias.

Regarding the releasing condition, most of the patients (55.1%) was released to the infirmary, but death also presented a high frequency (34.6%).

A-ICU Nursing staff dimensioning

As of the total daily score, that is, all A-ICU patients' NAS sum, it was possible to calculate the daily workload for the sector nursing team, which varied between 479.7 and 1007.2 score points, with an average of 697.3 score points (SD ± 83.5), and a median of 687.0 score points. Therefore, at least 4.8 workers and a maximum of 10.1 workers per shift were necessary to provide nursing care in the A-ICU. An average of approximately 7 nursing professionals per shift.

When verifying in a daily basis the number of workers providing care in the A-ICU and calculating the difference with the NAS numbers, the results were that only on 6 (3.2%) days the nursing professionals in the A-ICU were in a higher number than the number estimated by the NAS. On the remaining days (96.8%), up to 13.7 professionals were lacking in a period of 24 hours, with an average deficit of 4.2 professionals (SD \pm 2.5), and a median of 3.9 professionals below the number dimensioned by the NAS, in the corresponding 24 hours.

In numeric terms, by using the previously presented formula, the A-ICU nursing staff dimensioning according to the workload obtained from the NAS and adjusted to COFEN Resolution No. 293/2004, was calculated as follows:

$$\begin{aligned} NP &= (T \cdot (\mu \text{ NAS}/100)) + 15\% \\ NP &= (5 \cdot (697.3/100)) + 15\% \\ NP &= 40,09475 \end{aligned}$$

NP H \approx 40 nursing professionals

Therefore, it was possible to verify that eight nursing professionals are needed per shift in the A-ICU, which comes to a total of 40 nursing professionals to comprise the nursing teams. Furthermore, considering the proportion of 52% to 56% nurses on the total of nursing professionals⁽⁵⁾, the sector should have, at least, 21 nurses (52.5%).

In Table 1, data on the actual and estimated (dimensioned) numbers of nursing professionals by category are presented.

Through this table it is possible to verify that 28 nursing professionals work at the A-ICU, of which 10 (35.7%) are nurses, 17 (60.7%) are NT and one (3.6%) is a NA.

DISCUSSION

The elderly population uses health services more intensively than the other age bracket groups, which brings higher costs to care, either due to the treatment duration or a slower recovery⁽¹³⁾. In the A-ICU investigated, such fact was not different: among patients who stayed for a prolonged time, that is, hospitalization periods longer than 21 days, 11 (55%) were elderly.

According to the demographic and clinical data, it is possible to verify that the population receiving care in the A-ICU has similar characteristics to other Brazilian ICUs clients⁽¹³⁻¹⁴⁾, for patients almost always present a serious health state, with multiple comorbidities and chronic degenerative diseases that, when associated, complicate even more such individuals' health, and consequently influence in the length of stay and death frequency in the sector.

About the nursing workload, when adopting the standard established by other authors⁽¹⁵⁾, where the limit between high a low workload is 680 score points in the NAS, it is possible to observe that the A-ICU NAS average (697.3 score points) corresponds to a high existing workload.

When considering that the nursing workload is comprised of the time used by the team to perform the activities they are responsible for, which are directly or indirectly related to patients' care, and that such activities are impacted by the degree of dependence presented by the individual, the disease complexity, the institution characteristics, the work processes, the facilities characteristics and the team professionals' profile⁽¹⁶⁾, it is possible to conclude that in the A-ICU the nursing care quality and safety can be compromised because on most of the days studied (96.8%) the number of professionals was smaller than the number dimensioned by the NAS.

Although the staff dimensioning does not guarantee a quality care by itself, the quantitative and qualitative professional adequacy in the ICU assumes permanent care, with an early problem perception and quicker adoption of conducts upon the detected interurrences. Add to it the fact that the lack of nursing staff certainly results in workers' physical and mental stress, which favors the absenteeism due to disease reasons in the institution⁽¹⁷⁾.

The risks originated from the environment and the nursing work execution itself contribute to a higher number of work accidents and the development of labor-related diseases. These are also factors increasing the absenteeism rate, the turnover, demotivation to work, productivity loss, and mainly, decreasing the nurse professionals' quality of life⁽¹⁸⁾.

Table 1 – Number of nursing workers dimensioned versus number of existing nursing workers in the A-ICU, Maringá-PR, 2008.

Workers Shift	Nurses		NT		Nursing Workers	
	Dimensioned	Real	Dimensioned	Real	Dimensioned	Real
M	5	2	3	4	8	6
T	4	2	4	4	8	6
N ₁	4	2	4	3	8	5
N ₂	4	2	4	3	8	5
N ₃	4	2	4	4	8	6
Total	21	10	19	18⁽¹⁾	40	28

(1) From this total, one is a NA (Nursing Assistant); NT (Nursing Technician)

When adjusting the average number of nursing professionals ($n=7$) per shift, in 24 hours, according to the estimation from the NAS and the recommendations established by COFEN Resolution No. 293/2004, it is possible to verify that, in order to comprise the five A-ICU teams, 40 professionals are necessary. Data show that this unit presents a deficit of 12 employees (30%), which allows affirming that the professionals are overloaded with work.

Still considering the data presented in Table 1, it is possible to observe that there are only 10 nurses working in the A-ICU, which corresponds to a proportion way below that recommended by the legislation⁽⁵⁾. Moreover, the NA category remains working in the sector with no distinction from the NT category.

It is important to remember that, in order to minimize critical patients' risks, besides the quantitative staff adequacy, it is also necessary that ICU nursing professionals are qualified. In this context, the medium level professionals should not have duties in these areas, for it is known that patients with serious life threatening conditions should only receive direct care from nurses, as well as those requiring more technically complex care, demanding adequate scientific knowledge and the ability of making immediate decisions⁽⁴⁾.

More than 20 years after the Decree-Law providing for the Nursing Professional Practice⁽⁴⁾, it is still possible to observe ICU patients that should be treated by nurses receiving care from other categories professionals. This is probably the product of the country's unfavorable socioeconomic conditions and policies, which difficult the assistant nurse insertion in the ICU⁽¹⁷⁾.

Although there is only one NA, it is indispensable to qualify them or replace them by a NT, for the A-ICU receives critically ill patients that demand high complexity care. According to the legislation⁽⁴⁾, the NA should only perform elementary tasks with a repetitive nature. Such activities are not always present in an ICU environment, and when found, they represent only a small share that should not be considered in order to justify this professional's presence in the team.

Two considerations regarding the nursing staff dimensioning, obtained with the NAS application and adjusted to COFEN Resolution No. 293/2004, should be highlighted: the limitations of the instrument used (NAS) and the 15% empiric coefficient used as TSI.

With regard to the limitations of the instrument used, it is important to remember that there are processes and tasks in an ICU that interfere in the nursing care time, making it different from the time idealized by the NAS. Thus, there may be processes that are not adequately considered, discriminated, assessed or classified during its application⁽¹⁴⁾. When this occurs, the workload quantification as measured by the NAS is influenced in the estimation of necessary staff to provide nursing care.

It is noteworthy to say that the NAS was applied retrospectively, based on the care provided in the 24 hours before, which interferes in the phenomenon measurement, for the care provided was registered, according to the staff availability, not necessarily according to the patients' care demand⁽¹⁷⁾. A recently assessed proposal⁽¹⁹⁾ refers to the a prospective NAS application, aiming to project care to be provided, mainly when the objective is to distribute the necessary professionals in order to provide care with quality along a work shift.

In spite of its limitations, the NAS is the best instrument validated in Brazil to characterize ICU related nursing care. A prior study⁽²⁰⁾ developed in the same unit, concluded that the Patient Classification System⁽²¹⁾ countersigned – but not demanded by – COFEN Resolution No. 293/2004 is not broadly used in the ICU because it does not comprise several activities and procedures that are part of the sector routine.

As to the TSI limitation, the empiric coefficient recommended⁽⁵⁾ may not represent the real staff need in order to cover for workers absences by benefits or absenteeism in the A-ICU, once they have the right to have some benefits backed by the Estatuto dos Funcionários Públicos do Estado do Paraná (Statute of Public Employees of the State of Paraná)⁽²²⁾, which guarantees more days off work than the ones ruled by the Consolidação das Leis Trabalhistas (Consolidation of the Work Laws)⁽²³⁾. In addition, the sub-dimensioning verified in the present study generates a work overload that certainly favors the increase of absenteeism due to diseased nursing professionals.

The work conditions themselves in the ICU environment are very stressful, due to the fact the nursing worker frequently faces several factors (such as human suffering; unfavorable work conditions; productivity with quality expectations by managers; perception of being just a production factor whose potentialities and needs are neglected) that certainly result in emotional implications and physical tiredness⁽²⁴⁾. In an environment such as that, the high demands for services and high expectations probably help increase the absenteeism-disease rate⁽²⁰⁾, and when associated the nursing workers deficit, mainly regarding nurses, according to what was verified in this study, the situation might become even more critical, generating a vicious circle among insufficient workers, work overload and absenteeism.

CONCLUSION

Upon the above exposed, it is possible to conclude that the NAS application adjusted to the COFEN Resolution No. 293/2004 recommendations may contribute to an adequate dimensioning of nursing staff in the ICU and favor work conditions aiming to reach

nursing care with quality and safety, both for who provides care (nursing worker) and who receives it (patient) in the A-ICU. Studies that approached the specific characteristics of the institution, mainly with regard to the benefits conquered by workers and absenteeism for the real TSI calculation deserve to be discussed and trigger

actions that favor an even more accurate dimensioning.

It is important to idealize and implement strategies to prevent or minimize health risks both for the nursing staff in the A-ICU and the clients receiving their care, until it is possible to enable a better staff adequacy for the sector.

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