

CUIDADO É FUNDAMENTAL

UNIVERSIDADE FEDERAL DO ESTADO DO RIO DE JANEIRO • ESCOLA DE ENFERMAGEM ALFREDO PINTO

RESEARCH

DOI: 10.9789/2175-5361.rpcfo.v13.10364

DIMENSIONING OF NURSING TEAM AT NEONATAL INTENSIVE CARE UNIT: REAL VERSUS IDEAL

Dimensionamento de enfermagem em unidade de terapia intensiva neonatal: real versus ideal

Dimensionamiento del equipo de enfermería en unidad de atención intensiva neonatal: real versus ideal

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How to cite this article:

Franco APV, Hamasaki BPA, Puiz LR, Dorigan GH, Dini AP, Carmona EV. Dimensioning of nursing team at neonatal intensive care unit: real versus ideal. 2021 jan/dez; 13:1536-1541. DOI: <http://dx.doi.org/10.9789/2175-5361.rpcfo.v13.10364>.

ABSTRACT

Objective: to compare the workload at a neonatal unit, according to Nursing Activities Score, and the dimensioning of nursing staff. **Method:** cross-sectional study at a teaching unit with 30 beds. Data collection took place from October 6 to December 6, 2017, and data were analyzed according to descriptive statistics. **Results:** the sample of 115 neonates, totaling 1944 measurements. The average workload score was 73%. The unit has 107 nursing professionals, while should has 137. The proportion of registered nurses was lower than recommended (34%), whereas the proportion of nursing technicians was higher than recommended (66%). **Conclusion:** there was an imbalance between workload and number of professionals in nursing staff. Tools as Nursing Activities Score should be applied for supporting the staff dimensioning, since workload can impact the health outcomes and patient safety.

Descriptors: Newborn; Neonatal nursing; Workload; Nursing staff; Neonatal intensive care units.

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RESUMO

Objetivo: confrontar a carga de trabalho em uma unidade neonatal, aplicando o *Nursing Activities Score*, com o dimensionamento de pessoal de enfermagem. **Métodos:** estudo transversal em unidade de ensino, com 30 leitos. A coleta de dados ocorreu de 06 de outubro a 06 de dezembro de 2017, sendo analisados segundo estatística descritiva. **Resultados:** amostra de 115 neonatos, totalizando 1944 medidas. A pontuação média da carga de trabalho foi 73%. A unidade conta com 107 profissionais de enfermagem, mas deveria ter 137. A proporção de enfermeiros foi inferior ao preconizado (34%), já a de técnicos de enfermagem foi superior ao recomendado (66%). **Conclusão:** constatou-se desequilíbrio entre a carga de trabalho e o quantitativo de pessoal de enfermagem. Instrumentos como *Nursing Activities Score* devem ser utilizados para fundamentar o dimensionamento, uma vez que a carga de trabalho tem impacto relevante nos resultados em saúde e segurança do paciente.

Descritores: Recém-nascido; Enfermagem neonatal; Carga de trabalho; Recursos humanos de enfermagem; Unidades de terapia intensiva neonatal.

RESUMÉN

Objetivo: confrontar carga de trabajo en una unidad neonatal, aplicando el *Nursing Activities Score*, y dimensionamiento del personal de enfermería. **Método:** estudio transversal en unidad docente con 30 camas. La recopilación de datos se realizó del 6 de octubre al 6 de diciembre de 2017 y se analizó de acuerdo con estadísticas descriptivas. **Resultados:** muestra de 115 recién nacidos, con total de 1944 mediciones. El puntaje promedio de carga de trabajo fue del 73%. La unidad cuenta con 107 profesionales de enfermería, pero debería tener 137. La proporción de enfermeras fue inferior a la recomendada (34%), mientras que la de los técnicos de enfermería fue superior (66%). **Conclusión:** hubo desequilibrio entre carga de trabajo y cantidad de personal de enfermería. Se deben utilizar instrumentos como *Nursing Activities Score* para apoyar el dimensionamiento, ya que la carga de trabajo tiene impacto relevante en resultados en la salud y seguridad del paciente.

Descritores: Recién nacido; Enfermería neonatal; Carga de trabajo; Personal de enfermería; Unidades de Cuidado Intensivo Neonatal.

INTRODUCTION

The balance between the care demand and the nursing staff dimensioning has an intimate influence in the health results obtained by the patients, as well as in the absenteeism rate and in the professionals' satisfaction with the work.¹⁻² Thus, a challenge for the nursing managers is to establish nursing dimensioning that is adequate to the occupation rate, level of complexity of care of the patients, fluctuations in the care demand and number of professionals per shift, according to the demand.¹

Given the increasing complexity of patients and its influence on the workload of professionals, managers and nurses have prioritized activities of direct care to them. In this context, despite such prioritization, some tasks may not be finalized due to the imbalance between the number of professionals and demands, which may cause undesirable risks to patients.³

As much for the nature of the work, as for its numerical contingent, the nursing team is a constant target of discussions about dimensioning of personnel. This subject is pressing, since the inadequacy of the contingent or of the distribution

of professionals can interfere in the quality of the service.⁴⁻⁵ While an oversized team brings high cost, the reduced team decreases the safety of the patient, interfering negatively in the results for his health, especially when it is considered an essential work like nursing.⁶⁻⁸

The amount of time devoted to the patient (directly and indirectly) and professional development are understood as nursing workload.⁹ When the workload becomes excessive, there is an increased incidence of adverse healthcare-related events such as hospital infection, pressure injuries, and errors,¹⁰ leading to prolonged hospitalization, increased institutional and public costs, and increased morbidity and mortality rates.^{8,11}

Given the relevance of the workload in the assistance, instruments were developed that quantify it. The Nursing Activities Score (NAS) was proposed through a multicenter study in 2003,¹² and validated for the Portuguese language in Brazil in 2009.¹³ This instrument is composed of 23 items, distributed in seven categories, to which values ranging from 1.2 to 32 points are attributed. The sum of the NAS score represents the amount of nursing work time that the patient demanded in 24 hours, which is expressed in percentage. The maximum score is 176.8%: when the score is over 100%, it means that more than one professional was needed to perform the care per patient. The NAS was created for application in Intensive Care Unit (ICU) with adult patients, but has presented satisfactory results to evaluate the nursing workload in other assistential scenarios.¹⁴⁻¹⁵

The adequacy of the number of professionals in the team may imply substantial financial expenditure. On the other hand, it is associated with the reduction of unnecessary costs to correct, or even mitigate, the occurrence of negative results that can come from the insufficient number of professionals,¹⁶ increasing the patient's safety and reducing the hospitalization time.¹⁷ Considering that the evaluation of the workload is a relevant managerial strategy and that there are few publications on the subject in the neonatal context, this study aimed to confront the workload in a neonatal hospitalization unit, evaluated by the Nursing Activities Score, and the dimensioning of nursing staff.

METHODS

It is a descriptive-exploratory, transversal study, developed in a neonatal unit of a public teaching hospital, in the interior of the State of São Paulo, Brazil. The studied unit has 30 beds, being 15 for semi-intensive care and 15 for intensive care, being a reference for 42 municipalities in its region, with an average occupation rate of 32.8 beds and an average occupation rate of 108%.

The sample was non-probabilistic. Newborns were included in the unit for at least 24 hours from October 6 to December 6, 2017. Three instruments were used for data collection. The first one had the objective of registering data of characterization of the patients of the sample, containing number of the hospital register of the patient, sex, days of life, days of hospitalization, weight at birth, gestational age, classification as to gestational age, classification as to

intrauterine growth, Apgar, reason for hospitalization, origin (obstetric center, joint housing and prompt care) and outcome of hospitalization on the day of collection (discharge, transfer, death, still hospitalized). The second instrument had the purpose of registering the number of nursing professionals scaled and of these, how many were effectively present for each day of the data collection period. These two instruments were developed by the researchers for the present study. The third instrument applied was the NAS,¹³ with the objective of evaluating the nursing workload, considering the last 24 hours of the day before the collection.

Two authors of the present study performed the data collection. For this, they participated in a training of four hours offered by the first author, with orientations on the filling of the NAS and the other instruments. Before starting the data collection, they carried out for three consecutive days, together, a test of the instruments applying them to the same patient. This was intended to promote greater familiarity with the instrument, as well as to identify doubts. The data collected in the test are not part of the sample. An updated NAS manual was used to ensure the quality of the data collection, guiding its application on the NAS and standardizing the understanding of each of its items.¹⁸

To calculate the personnel sizing, it was followed the methodological recommendation of data collection in a minimum period of 30 days, in order to obtain a sample that reflects the profile of the attended patients.¹⁹ The ideal Personnel Quantitative (PQ) was calculated according to the Federal Council of Nursing (Conselho Federal de Enfermagem - COFEN) Resolution n° 543/2017, through the formula: $QP = THN \times KM$.²⁰ The Total Hours of Nursing (THN) is the sum of the average daily workloads needed to assist patients, which was obtained through the NAS average hours. Considering that each NAS point corresponds to 14.4 minutes or 0.24 hour, for the transformation in hours, the NAS average was multiplied by 14.4 and the result was divided by 60.

The Marine Constant (KM) was calculated considering a weekly journey of 30 hours and Technical Safety Index (TSI) of 15%. Thus, for these variables, the standardized KM value is 0.2683: this is a coefficient deducted as a function of the worker's available time to cover absences.

The data were analyzed by means of descriptive statistics and tables of absolute (n) and relative (%) frequency were elaborated to describe the sample profile, as well as the NAS results. The survey was approved by the Research Ethics Committee, with CAAE: 73058317800005404, under the Opinion 2.238.328/2017.

RESULTS

The sample was composed by 115 neonates. Gestational age ranged from 24 to 41 weeks (median 35 ± 3.88), birth weight from 455 to 4340 g (median $2060 \text{ g} \pm 897.15$) and length of stay from one to 59 days (median 1.0 ± 10.54). Most neonates were male (60; 52.2%), classified as premature (83; 72.2%), suitable for gestational age (79; 68.7%), with fifth minute Apgar greater than or equal to 7 (104; 90.4%) and coming from the institution's obstetric center (104; 90.4%).

Throughout the data collection period, 61 (53%) patients were discharged, 32 (27.8%) remained hospitalized, 19 (16.6%) were transferred to other services and three (2.6%) evolved to death.

As for the application of NAS, a total of 1944 measures were obtained. The average score was 2126 points, with variation in the period from 1680 to 2835 points. Regarding the total NAS average in the unit, the lowest value was 58% and the highest value, 98%. The overall unit average was 73%. It was verified that the patients of the sample needed an average of 17.5 hours of nursing assistance, which varied from, at least, 14 and at most, 23.5 hours in 24 hours. In the unit of semi-intensive care, the workload obtained an average of 64%, while in the unit of intensive care the average was 74%.

In the studied period, the nursing team was composed by 107 professionals, being a nursing director, three supervisors, 32 nurses and 71 nursing technicians: that is, 103 professionals that act in the direct assistance. According to the workload, measured in the unit by the average value of NAS, the team should count with 137 nursing professionals.

The daily schedule of professionals in this neonatal unit was 17 professionals per shift. The Chart 1 presents the quantitative of nursing professionals per on duty, considering the THN calculated in the unit, according to the different values of productivity.

Chart 1 - Daily scheduling of nursing professionals per shift, according to the NAS identified for different productivity levels. Campinas, SP, Brazil, 2017

Team calculated through NAS			
Productivity	80%	85%	100%
Number of professionals	27	25	21

DISCUSSION

The profile of the clientele attended corroborates with data presented in other studies developed in neonatal admission units,^{14,19,21} being the majority of low weight and premature neonates. As it is a specialized reference center, with prenatal follow-up of pregnant women at risk, it was observed a higher frequency of admissions of patients born in the hospital itself, which can interfere positively in the prognosis of this clientele, which presents a high level of complexity.

According to the data resulting from the application of NAS, the workload of nursing in the studied unit was superior to the dimensioning for the assistential activities, as much in relation to the total number of professionals of the team, as in relation to the daily escalation of these professionals.

An organizational impact occurs when the workload is superior to the number of nursing professionals. What limits the possibility of nurses to participate of activities of continued education to extend their knowledge and competences for the care,²² as well as for, from them, the improvement of the performance of the team as a whole. In addition, it may compromise the quality of care provided due to physical and mental overload of the team.

It was verified the need of adequacy of the quantitative of professionals in the studied unit, due to the deficit of 30

professionals to attend with security the assistential profile identified by the NAS application. In addition, through the analysis of the daily schedule of professionals, considering that currently the unit is organized with 17 professionals per shift, a deficit of four workers was observed when the calculations were made with 100% productivity, which is unreal. Even so, the current number of professionals per shift does not correspond to the 21 professionals needed for this. This deficit was eight professionals for a productivity of 85% and 10 workers for a professional productivity of 80%. Considering the workload in the studied unit, it is unfeasible that the nursing team has safe opportunities, for example, to make use of different update strategies during the duty, since this can put the patient at risk.²²

The effective and ideal work time of the neonatal unit professionals would be 80% of their daily load.²³ When the rates rise above 80%, the costs increase and the quality of the care is reduced, occurring greater time of hospitalization, as well as greater rates of absenteeism, Burnout syndrome and greater chances of abandonment of the nursing service. These difficulties cause feelings of disillusionment, frustration, and devaluation in the team.²²⁻²³

The disproportion of the number of nurses in relation to the average level professionals was also evidenced in this study, when comparing the data with what is recommended by the COFEN Resolution n° 543/2017.²⁰ The studied unit has 34% of nurses in the team composition, while this Resolution recommends that, for intensive care, 52% of the team is composed by nurses, and this percentage is 42% for semi-intensive care in relation to technicians or auxiliaries.²³ However, the Resolution mentioned does not contemplate the specificities of neonatal units. Such results are in line with those of a study conducted in 2010,⁴ in an Adult ICU.

In a more recent study,²⁴ the authors based themselves on the recommendations of the Ordinance n° 930/2012 of the Ministry of Health, Brazil.²⁵ According to that Ordinance, in a Neonatal ICU type III, the proportion should be one on duty nurse per shift, exclusive in the unit, for every five beds and one nursing technician for every two beds. In neonatal intermediate care units, the proportion of five patients for each nursing technician and 15 patients for each nurse.

In the present study, it was observed a deficit of the number of professionals of superior level in all the analyzed days, while the professionals of medium level presented borderline distribution, close to the inferior limit. A lower proportion than the recommendation was observed in 42% of the days of the collection period in the beds destined to semi-intensive care, and in 65% of the days in the beds destined to neonates in intensive care, with an average of general inadequacy of 32%.

According to COFEN Resolution n° 543/ 2017, the nursing hours considered for assistance to patients under semi-intensive care, in the 24 hours, is 10 nursing hours per patient; while for intensive care, 18 nursing hours per patient.²⁰ An average of 17.5 nursing hours per patient under intensive care was identified in the studied unit. On the other hand, the average of nursing hours for patients in non-intensive care was 15 hours: each patient demanded in average 5 more

hours from professionals, in 24 hours, than the workload considered by COFEN Resolution n° 543/ 2017.²⁰ It is worth mentioning that, in the studied unit, the number of patients under intensive care is higher than the number of available beds for this category. This context justifies the result observed, in which of the 1122 measures obtained in the semi-intensive care beds, 21% were considered intensive care patients.

The high workload is a reality in different institutions, which can cause compromise in the quality of life of the team's professionals, and cause symptoms such as stress, fatigue, gastritis, and headache.²⁶ The literature points out that women are more susceptible to stress than men, which is significant in this context, since most nursing professionals are female. On the other hand, the literature points out that the professionals affirm that they like the labor activity that they exercise, being that the support offered by supervisors and work colleagues is more important for professional satisfaction than the financial return.²⁷ Therefore, it is essential to have the implementation of institutional and managerial strategies in neonatal units for the prevention of aggravation to the nursing worker's health.

Adverse events are closely associated with the increase in workload, which compromises safety in care.³ Therefore, it is urgent to promote discussions about the dimensioning of nursing staff, in order to raise the updating and adequacy of current recommendations.^{2,20} Furthermore, a management model that values the empowerment of nurses and generates possibilities for evidence-based practice can result in professional growth for the team, as well as improvements in safety and quality of care.² The workload is a factor that interferes in this process and should be investigated in different contexts.

Thinking of NAS as a relevant tool to measure workload, a study conducted in ICU in Spain identified that it was sensitive to specificities when applied to three different groups of patients, making it possible to identify the needs of each group for planning and proper sizing of work.²⁸

Considering that the workload is a complex, non-linear variable and that it can be influenced both by organizational characteristics and by the profile of nursing professionals and the clientele attended, its measurement is recommended in a routine way. This has the purpose of knowing the assistential complexity of the patients and to analyze aspects related to the dimensioning of nursing personnel that will interfere in the work process.

The results suggest that the neonatal unit workload may be underestimated by the current legislation that determines the minimum parameters for this specialty. Thus, a gap is verified that demands more studies that substantiate the dimensioning of nursing personnel in these units. It is also expected to instigate other neonatal units to measure their workload and elaborate strategies that contemplate the particularities of the scenarios of performance of the nursing team.

It is suggested that future studies be outlined with the purpose of developing and testing management tools that question parameters that have shown to disregard the specifics for the dimensioning of personnel in neonatal units, considering the care to newborns and families.

CONCLUSION

The workload of the nursing team, measured through the NAS, resulted in an average score of 73% in the neonatal hospitalization unit studied, which would demand a higher number of professionals. Thus, a deficit of 34 professionals was identified in the general picture. Considering the complexity of the care provided to neonates, and based on the recommended productivity estimate of 80% of the professionals, there was a daily deficit of 10 professionals in the unit's work scale.

Among the limitations of this research, it is worth mentioning the fact that it was carried out in only one neonatal unit. Therefore, it is recommended that other studies be carried out on the subject, involving more institutions. It is important to emphasize that in teaching hospitals the presence of students from several areas is a characteristic that can represent a higher workload, due to the need for constant monitoring and guidance to people in formation. Due to the lack of a specific instrument for classifying neonatal patients, the parameters of proportion of professionals presented in the current legislation were used for the comparisons.

The workload presents relevant implications for both professionals and patients. In this sense, the adequacy of the team in quantitative and qualitative level can bring favorable results to both, as well as mitigate the occurrence of risks related to health care.

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Received in: 30/07/2020

Required revisions: Did not have

Approved in: 21/12/2020

Published in: 01/10/2021

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