ORIGINAL ARTICLE / ОРИГИНАЛНИ РАД

Cardiac surgery intensive care unit nursing workload assessment using Nursing Activities Score

Nataša Stojaković[1,2], Bojan B. Mihajlović[1,2], Jelena Niković[1,3], Jovan Rajić[2], Jelena Vučković[1,2], Miodrag Golubović[1,2], Lazar Velicki[1,2]

[1]University of Novi Sad, Faculty of Medicine, Novi Sad, Serbia;
[2]Institute of Cardiovascular Diseases of Vojvodina, Sremska Kamenica, Serbia;
[3]University Clinical Center of Vojvodina, Novi Sad, Serbia

SUMMARY
Introduction/Objective Nursing Activities Score (NAS) is one of the most accepted and widely used scores for assessing the workload of the nursing staff in regards of qualitative and quantitative adequacy. The aim of this study was to evaluate and analyze nursing workload in the cardiac surgery intensive care unit (CSICU) using the NAS in a contemporary set of patients undergoing heart surgery.
Methods The study included 809 consecutive patients who had a major cardiac surgery in 2019 admitted to adult CSICU. Demographic data were collected from medical records [sex, age, type of treatment, length of stay (LOS), and discharge], EuroSCORE II, and NAS value.
Results The majority of patients underwent a coronary (43.1%), valvular (32.6%), and combined (24.2%) cardiac surgery procedure. The average patient LOS in CSICU was 2.5 ± 3.4 days. The average NAS value in our sample was 100.8% ± 63.1%. NAS value during the first operative day was a poor marker of the outcome in terms of mortality (C-index 0.520, 95% CI – 0.422–0.617, p = 0.676). Significant difference was observed in terms of average NAS value between the patients submitted to coronary surgery and combined surgery (p = 0.001). NAS has been shown to be useful for assessing activity in a CSICU, confirming the optimal workload of nurses, while higher NAS values in our hospital indicate increased workload compared to similar institutions.
Conclusion NAS provided viable information regarding the care and hospitalization of patients in a CSICU. In accordance with NAS, the optimal level of nursing workload was established in our hospital settings.
Keywords: intensive care unit; nursing workload; cardiac surgery; length of stay

INTRODUCTION

The complexity of modern cardiac surgery procedures is constantly increasing as well as technological influence in the field. Typical patient profile went through a dramatic change over the last decade [1]. Admitted patients showed a substantial increase in the average age and severity of illness. Concurrently, it became clear that, more than ever, intensive postoperative care has a vital role on the outcome of the treatment. A modern cardiac surgery intensive care unit (CSICU) requires personnel with a sophisticated level of education and training in order to comply with ever-increasing demands and increased patient expectations [2]. A significant bourdon of related activities has been put up on nursing personnel, creating challenges.

Nursing workload is significantly affected by nurse staffing ratio, so the number of nursing personnel in the CSICU has to be customized most importantly to satisfy patients' nursing assistance needs and patient outcomes, and the economic aspect of hospital care should also be taken into consideration [3, 4]. Higher nursing workload and lower nurse staffing are associated with higher patient safety risk, particularly with in-hospital mortality [5, 6].

Data recording, collection and analysis are crucial elements in assessing and improving the quality of the provided service and proper surgical ruling in modern cardiac surgery practice [7]. Assessment of the nursing workload is an effective tool for evaluating the time put into patient care, the optimal nurse-to-patient ratio, as well as the required nurses' educational qualifications levels [8, 9].

One of the most accepted and widely used scores is the Nursing Activities Score (NAS), published in 2003 [10]. The NAS increments measure the nursing care activities time required by patients admitted to the ICU. NAS represents a computed percentage of nursing staff's time (over 24-hour period) spent on the execution of activities included in the instrument. NAS score comprises seven categories or domains (basic nursing activities, ventilator support, cardiovascular support, kidney support, neurological support, metabolic support, and specific interventions), which are split into subdomains and further into their items, in a total of 23 [10, 11]. Many intensive care units (ICUs) use NAS daily to determine and monitor the nursing workload [12, 13, 14].

The primary objective of this study was to evaluate and analyze the nursing workload in

Correspondence to:
Nataša STOJAKOVIĆ
University of Novi Sad
Faculty of Medicine
Institute of Cardiovascular Diseases of Vojvodina
Put dr Goldmana 4
21204 Sremska Kamenica
Serbia
natasa.stojakovic@mf.uns.ac.rs

CSICU using NAS in a present-day set of patients who underwent heart surgery.

METHODS

This study was carried out as a prospective study using medical records of the Institute for Cardiovascular Diseases of Vojvodina, Serbia, between January 1, 2019 and October 30, 2019. The included patients exclusively underwent

- isolated coronary surgery (coronary artery bypass grafting and off-pump coronary artery bypass),
- isolated valvular surgery (mitral, aortic, and tricuspid surgery, with prosthetic replacements or repairs, through traditional or minimally invasive techniques),
- combined coronary and valvular surgery,

with the length of stay (LOS) in the CSICU ≥ 8 hours. No matter the priority level, all data were included (elective, urgent, emergency, salvage). The study was approved by the Institutional Review Board of the Institute for Cardiovascular Diseases of Vojvodina.

All data were collected from medical records, i.e., from the hospital information system (BIS), which is updated on a daily basis (sex, age, type of surgery, LOS, EuroSCORE II and discharge, mortality, NAS values, etc.). The data is used for statistical and research purposes. Euroscore II value was calculated a day prior to surgery according to general recommendations [15].

All data were collected only by the nursing staff who had experience with using NAS. During their stay in CSICU, the patients were scored daily with the NAS system. As proposed by Miranda et al. [10], 24-hour NAS was used in the description of nursing workload of a patient in any shift. The NAS was compiled at 6 a.m., reporting the previous 24 hours. The sum of the 23 items ranges 0–177% and according to Miranda et al. [10], an ideal score that a nurse can accomplish per shift in a 24-hour period is the NAS score of 100%. As an example: two patients who have the score of 50% each spent the work of one full-time equivalent per shift around the clock. Analogously, in an ICU, if a total of 350 points has been scored in one day, this unit used the work of 3.5 nursing fulltime equivalents per shift on that day.

The distribution of the quantitative data was estimated using the Kolmogorov–Smirnov test. Categorical variables (expressed as frequencies) were compared between the two groups using the Pearson χ^2 test or the Fisher exact test. Continuous variables (expressed as mean ± standard deviation) were compared between the groups using the Student's t-test if their distribution was normal, or using the Wilcoxon rank-sum test if their distribution was non-normal. Univariate and multivariate logistic regression, including the odds ratio (OR), were utilized in order to estimate the effects of the independent variables on the dependent one. As for the p-value of the performed tests, the value of 0.05 was used as the threshold for statistical significance.

Statistical analysis was performed using IBM SPSS Statistics for Windows, Version 19.0 (IBM Corp., Armonk, NY, USA) and MedCalc for Windows, Version 12.2.1 (MedCalc Software, Mariakerke, Belgium).

The study was approved by the Ethics Committee of the Institute for Cardiovascular Diseases of Vojvodina in Sremska Kamenica (decision no. 3055/1-8).

RESULTS

This study was performed on the total of 809 patients. The patients' mean age was 65.6 ± 8.5 years. Two-thirds of patients were male. Most of the patients underwent coronary (43.1%), valvular (32.6%), and combined (24.2%) cardiac surgery. The average patient LOS in CSICU was 2.5 ± 3.4 days. The distributions of the demographic data and principal operative-related factors of the study population are shown in Tables 1 and 2.

Table 1. Demographic data, preoperative patient profile, and surgery outcomes

Demographic data	Frequency, n	%
Sex		
female	270	33.4%
male	539	66.6%
Type of surgery		
coronary	349	43.1%
valvular	264	32.6%
combined	196	24.2%
PAOD	18	2.2%
Congestive heart failure	148	18.3%
COPD	97	12%
Previous MI < 6 weeks	50	6.2%
Smoking	372	46%
Diabetes mellitus	251	31%
Previous cardiac surgery	21	2.6%
Chronic renal failure	39	4.8%
Postoperative complications	35	4.3%
Hospital mortality	40	4.9%

PAOD – peripheral arterial occlusive disease; COPD – chronic obstructive pulmonary disease; MI – myocardial infarction

Table 2. Patient profile and scoring systems

Parameter	Mean	SD
Age (years)	65.6	8.5
Body mass index (kg/m²)	28.1	2.7
EF (%)	53.9	7.2
Ventilator time (hours)	14.2	6.8
Time in CSICU (days)	2.5	3.4
EuroSCORE II (%)	2.3	2.6
NAS (%)	100.8	63.1

EF – ejection fraction; CSICU – cardiac surgery intensive care unit; NAS – Nursing Activities Score

The general in-hospital mortality was 4.9%. Refractory cardiovascular failure was determined to be the principal cause of death among our study patients (42.5%). Other fatal causes were multiple systems organ failure (27.5%), sepsis (12.5%), acute cardiac arrest (7.5%), pulmonary

failure (7.5%), and chronic renal insufficiency (2.5%). Additionally, the average CSICU LOS for the patients who expired was 11 days with the average NAS of 160%. The average EuroSCORE II value for the patients with in-hospital mortality was 5.92%. The relation between the LOS in the CSICU and the value of nursing engagement assessed through NAS is shown in Figure 1.

Binary logistic regression analysis was used and only EuroSCORE II value and CSICU LOS emerged as autonomous predictors of in-hospital mortality [OR 1.461, 95% confidence interval (CI) – 1.311–1.627, p < 0.001 and OR 1.357, 95% CI – 1.269-1.441, p < 0.001, respectively]. NAS was not designated as a predictor of an in-hospital mortality. We also wanted to investigate whether it was possible to predict the outcome of the treatment based on the value of NAS during the first postoperative day. C-index statistics showed that the value of NAS during the first operative day was a poor marker of the outcome in terms of mortality (C-index 0.520, 95% CI – 0.422–0.617, p = 0.676).

Substantial difference was observed in terms of average NAS value between the patients submitted to coronary surgery and combined surgery (ANOVA F-ratio 7.038, p = 0.001), Figure 2. No such difference was observed between various age groups (ANOVA F-ratio 0.938, p = 0.455), Figure 3.

In regard to the structure of the nursing staff of our nine-bed CSICU, the workforce consisted of 19 registered nurses. Every one of them (100%) had a bachelor's degree and three (15.8%) had a master's degree. No significant fluctuations in nursing workload were observed during the period, suggesting effective resource allocation and planning.

DISCUSSION

Planning and organization of the nursing staff and their work processes in order to ensure high quality care has been influenced by constant transformations and improvements in the routine of healthcare practices, especially in hospital settings. Evaluation of the nursing workload is the most essential for ensuring enough staff in the critical care units [9, 16].

A study by Ferreira et al. [17] summarized 18 studies examining the effect of NAS in predicting nursing workload in various ICU conditions. The majority of analyzed hospitals were Brazilian hospitals. The study showed that the average NAS was in range from 50.4% in a Spanish hospital to 104% in a Brazilian hospital. About 60% of the studies examined in the study had an average NAS of 60–70% (the overall average of 65.5%). In only a few studies NAS has been used for measuring nursing workload in CSICUs.

Researchers in Belgium conducted a study to assess nurse workload, in 16 Belgian hospitals, where the mean NAS was 68.6% [18]. In addition, they confirmed the reliability of the NAS application in their hospitals and found that the NAS is a valid instrument that allows reliable assessment of nursing workload. A study done by Velozo et al. [8] showed that the NAS instrument was the
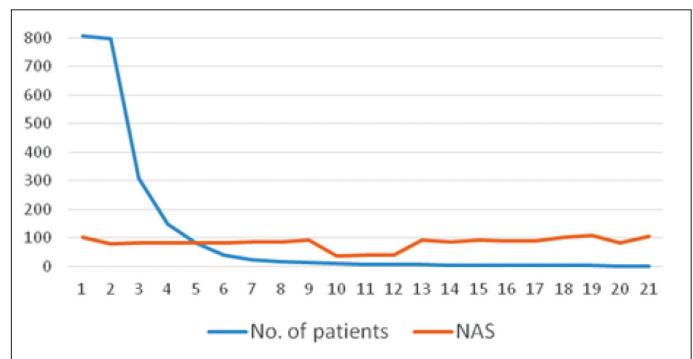
Figure 1. Correlation between the length of stay in a cardiac surgery intensive care unit (CSICU) and the level of nurse engagement assessed through Nursing Activities Score (NAS); there is a slight increase of NAS for the patients with prolonged CSICU stay
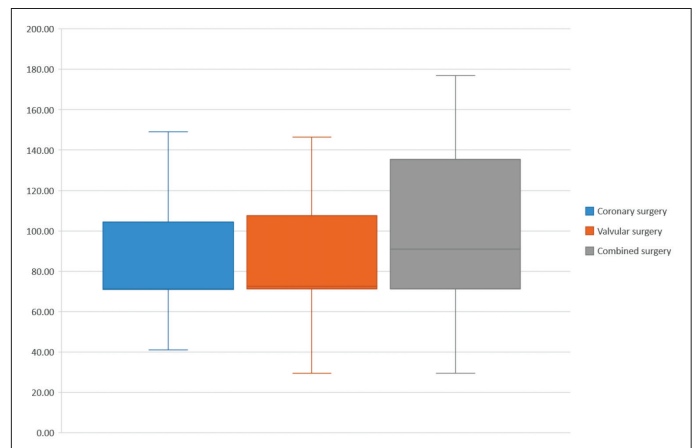
Figure 2. Box plot of Nursing Activities Score values according to the type of surgery; significant difference was found between coronary surgery and combined surgery (p = 0.001)
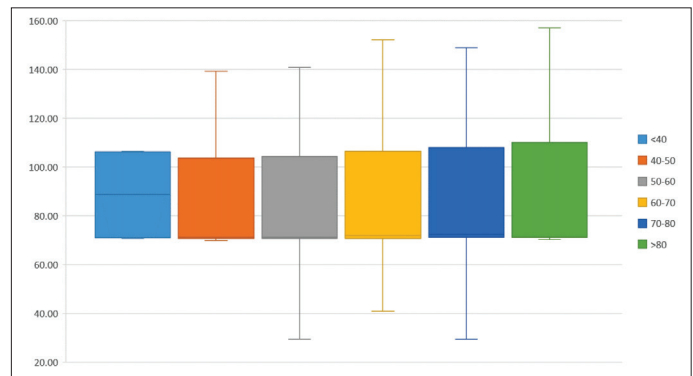
Figure 3. Box plot of Nursing Activities Score values according to different age groups; no significant difference was observed (p = 0.455)

best instrument for workload evaluation, estimating the total average working time closer to the recommended for care. Mean NAS values were measured for a total of 4617 observations, which was 56.7 ± 12.5; median 55 (25.3–142.9), also analysed NAS values in 490 patients at admission whose mean value was 62.6 ± 17.3, median 60.1 (33.6–142.9), while the maximum mean value during hospitalization was 67.7 ± 19.7, median 65.6 (33.6–142.9).

A systematic review published by Iranian authors (comprising 23 articles originated from Brazil, Belgium, Greece, Italy, Norway and Spain) reported the following findings:

minimal NAS was 36.1% calculated in the study conducted on 106 patients in Greece, while the highest established NAS was 109.3% in the study involving 285 Iranian patients [13]; in a Norwegian study, the average NAS value was 96.24% ± 22.35. The average NAS value in our sample was 100.8% ± 63.1%, which is higher in comparison with the values in the above-mentioned countries, except those in Iran and Norway [13].

The results of a Brazilian study exploring the workload in the postoperative period of heart surgery in a CSICU of a university hospital showed a higher mean daily NAS (74.62%) and 96.79% in the first postoperative day [19]. In a Portuguese retrospective observational study, the average workload of nurses per patient admitted to intensive care was 67.52 ± 10.91 NAS points, while on the first day of stay it was on average higher by 19.36 ± 2.61, i.e., 80.52 ± 10.89 [20]. In an integrating review conducted by Nobre et al. [12], it was reported that in three CSICUs the minimum NAS score was 58.1 and maximum is 66.36.

Comparing different ICU units, the results of the study by Ko and Park [9] revealed that the nursing workload was the highest in the surgical unit, followed by internal medicine and comprehensive nursing units. Riklikiene et al. [16] in their research came to the conclusion that when planning the operative program and the optimal number of nurses in the postoperative period in intensive care after cardiothoracic surgery, it is necessary to take into account the type of surgery as a factor that affects the workload of nurses. An important finding coming from our study is that the average NAS value for the patients submitted to combined surgery (coronary + valvular) is compellingly higher compared to the value of the patients submitted to coronary surgery (105% *vs.* 88%, p = 0.001). This finding can be explained by the fact that combined surgery patients are usually associated with more comorbid conditions demanding increased postoperative care.

An extensive retrospective Italian study analyzed the application of the NAS in three different ICUs (CICU: Cardiothoracic Intensive Care Unit; GICU: General Intensive Care Unit; and Neuro ICU: Neurosurgical Intensive Care Unit) during a six-year period [11]. The study results were as follows: the mean NAS for all the patients was 65.97% ± 2.53, GICU 72.55% ± 16.28, Neuro ICU 59.33% ± 6.54, CICU 63.51% ± 14.69. The average LOS was 4.82 ± 8.68 days.

Our mean NAS is also close to Norwegian NAS score published in a multicentric study conducted in seven countries in which variations in NAS mean values in range from 44.5 in Spain to 101.8 % in Norway were identified. In the total sample of the studies analyzed by Padilha et al. [14], the mean NAS was 72.8%, the mean age was 63.5 years, the mean LOS was 4.4 days, and the mortality rate was 8.2%.

In a Brazilian study conducted in three organizational units in an ICU over a period of four months, the average NAS was 71.7% ± 10.4 (min 48.2%; max 109.1%), LOS 9.2 ± 13.3 days, and average age 56.8 ± 18.5 years [21]. NAS presented a negative correlation with LOS (-0.23). There was no significant correlation between age and nurse workload p = 0.070.

In our study, the average patient LOS in CSICU was 2.5 ± 3.4 days. There is a slight increase of NAS for the patients with prolonged stay in CSICU. The patients' mean age was 65.6 ± 8.5 years with two-thirds of patients being of male sex. There is no significant difference in NAS values (p = 0.455) related to age groups. Similarly, in the study done by Ferretti et al. [22], it was reported that even though the care of older patients was associated with an increase in nursing workload, the ageing itself was not a sufficient predictor of NAS (p = 0.005).

Ricci de Araújo et al. [23] wanted to estimate the intensive care costs of a Brazilian hospital and one of the parameters used for this purpose was the actual hours of nursing care estimated based on the results of the nursing activities of the NAS, median 88 (54–107). They came to the conclusion that costs were underestimated in patients who needed a higher intensity of care (NAS > 100). In his study Bruyneel et al. [24] showed a strong correlation between the NAS and costs in the ICU. Another study by the same author conducted in Belgium showed that the optimal number of nurses should be twice the number provided for in the legislation [18]. The results of a number of studies also show that the number of nurses per patient calculated by the NAS system is (often) higher than foreseen in the relevant legislation [9]. Our results showed that the nurse-to-patient ratio was slightly above 1 (mean NAS 100.8), indicating an almost ideal engagement of the nursing staff and/or proper competency in nursing activities, showing sufficient and adequate nursing workforce.

Greek authors in their study carried out on 313 consecutive CSICU patients identified the risks affecting elevated in-hospital mortality in patients who underwent cardiac surgery [25]. The study showed that the risk of in-hospital mortality was nearly 3.3 times higher (OR 3.3, 95% CI 1.4–8) in patients who had high value of NAS on the first postoperative day. Similarly, research carried out by Padilha et al. [26] showed that patients who died while hospitalized in an ICU had 2.65 times higher NAS then other ICU patients. In a systematic review that included six studies with a total of 175,755 intensive care and/or cardiac/cardiothoracic units' patients it was found that every increase in one nurse decreases the probability of dying in hospital by 14% [27].

In our study, the general in-hospital mortality was 4.9%. NAS was not designated as a predictor of in-hospital mortality and only EuroSCORE II value and CSICU LOS emerged as autonomous in-hospital mortality predictors. We also wanted to investigate if it were possible to predict the outcome of the treatment based on the value of NAS during the first postoperative day. Our results did not show an association between the first day NAS value and the outcome of the treatment in terms of mortality.

Our study contributes to the science of assessment of nursing workload in ICUs. The unique contribution is the comprehensive approach to understanding of the NAS as a tool that can supply information regarding the process of caring for patients that are hospitalized in a CSICU as well as the nursing workload in the same settings. Nevertheless, we agree with most of the authors who

concluded that large differences between nursing workload among countries could be a consequence of various nurse-to-patient ratio on a shift-by-shift basis, patients' characteristics, and type and regulations of care and treatment services in the countries. What is clear from most of the studies is that nurse workload in the ICU is high and that average number of nursing staff calculated by NAS is higher than the average number of nursing staff stipulated by country legislation. The average NAS value varies significantly not only between different countries and populations for the same type of ICU but also within the same country. NAS value summarizes the overall settings in which the patient is treated, including the following: 1 – patient profile (the presence of comorbidities requiring increased postoperative nursing care); 2 – institution profile and its unit's structure and organization; and 3 – available nursing workforce, and its effective management as a component of the effectiveness of the health care [5, 12, 13, 21].

Study limitations

We acknowledge that our study has potential limitations: it was performed in a single-center and in a single ICU, hence our data can be associated with site-inherent limitations and site-specific biases. Caution must be used in extrapolating the results of our study to other centers with similar settings.

CONCLUSION

In conclusion, the NAS tool provided useful information regarding the process of caring for patients hospitalized in a CSICU; by applying it in our study, it was confirmed that there was the optimal level of nursing workload in our CSICU. Patients treated in our CSICU had a higher average NAS value compared to other similar hospitals, indicating greater nursing workload in our settings. No significant fluctuations in nursing workload were observed during the period, suggesting effective resource allocation and planning. The application of the NAS instrument for measuring the nursing workload can assist us in planning the size of the required nursing staff in our CSICU to ensure high quality patient care and to improve patient outcomes.

However, given that the NAS system is a new instrument for assessing workload and was used for the first time in our institution, research should be extended to more cardiac surgery centers in the country and the surrounding area for a better assessment of its performance.

Conflict of interests: None declared.

REFERENCES

1. Lucchini A, Elli S, De Felippis C, Greco C, Mulas A, Ricucci P, et al. The evaluation of nursing workload within an Italian ECMO Centre: A retrospective observational study. Intensive Crit Care Nurs. 2019;55:102749. [DOI: 10.1016/j.iccn.2019.07.008] [PMID: 31400831]
2. Crilly G, Dowling M, Delaunois I, Flavin M, Biesty L. Critical care nurses' experiences of providing care for adults in a highly technological environment: A qualitative evidence synthesis. J Clin Nurs. 2019;28(23–24):4250–63. [DOI: 10.1111/jocn.15043] [PMID: 31429996]
3. Murphy A, Griffiths P, Duffield C, Brady NM, Scott AP, Ball J, et al. Estimating the economic cost of nurse sensitive adverse events amongst patients in medical and surgical settings. J Adv Nurs. 2021;77(8):3379–88. [DOI: 10.1111/jan.14860] [PMID: 33951225]
4. Oliveira EM, Secco LMD, Figueiredo WB, Padilha KG, Secoli SR. Nursing Activities Score and the cost of nursing care required and available. Rev Bras Enferm. 2019;72(suppl 1):137–42. [Article in English, Portuguese] [DOI: 10.1590/0034-7167-2017-0655] [PMID: 30942355]
5. McHugh MD, Aiken LH, Sloane DM, Windsor C, Douglas C, Yates P. Effects of nurse-to-patient ratio legislation on nurse staffing and patient mortality, readmissions, and length of stay: a prospective study in a panel of hospitals. Lancet. 2021;397(10288):1905–13. [DOI: 10.1016/S0140-6736(21)00768-6] [PMID: 33989553]
6. Strazzieri-Pulido KC, S González CV, Nogueira PC, Padilha KG, G Santos VLC. Pressure injuries in critical patients: Incidence, patient-associated factors, and nursing workload. J Nurs Manag. 2019;27(2):301–10. [DOI: 10.1111/jonm.12671] [PMID: 30238676]
7. Markewitz A, Trummer G, Pilarczyk K, Beckmann A. Status of cardiac surgical intensive care medicine in Germany during 2013: a report on behalf of the German Society for Thoracic and Cardiovascular Surgery. Thorac Cardiovasc Surg. 2014;62(7):536–42. [DOI: 10.1055/s-0034-1384803] [PMID: 25148606]
8. Velozo KDS, Costa CAD, Tonial CT, Crestani F, Andrades GRH, Garcia PCR. Comparison of nursing workload in a Pediatric Intensive Care Unit estimated by three instruments. Rev Esc Enferm USP. 2021;55:e00547. [DOI: 10.1590/1980-220X-REEUSP-2020-0547] [PMID: 34460896]
9. Ko Y, Park B. Calculating the optimal number of nurses based on nursing intensity by patient classification groups in general units in South Korea: A cross-sectional study. Nurs Open. 2023;10(6):3982–91. [DOI: 10.1002/nop2.1657] [PMID: 36852629]
10. Miranda DR, Nap R, de Rijk A, Schaufeli W, Iapichino G; TISS Working Group. Therapeutic Intervention Scoring System. Nursing activities score. Crit Care Med. 2003;31(2):374–82. [DOI: 10.1097/01.CCM.0000045567.78801.CC] [PMID: 12576939]
11. Lucchini A, De Felippis C, Elli S, Schifano L, Rolla F, Pegoraro F, et al. Nursing Activities Score (NAS): 5 years of experience in the intensive care units of an Italian University hospital. Intensive Crit Care Nurs. 2014;30(3):152–8. [DOI: 10.1016/j.iccn.2013.10.004] [PMID: 24370275]
12. Santos Nobre RA, Rocha HM do N, Santos F de J, dos Santos AD, de Mendonça RG, de Menezes AF. Application of Nursing Activities Score (NAS) in different types of ICUs: an integrating review. Enf Global. 2019;18(4):485–528. [DOI: 10.6018/eglobal.18.4.362201]
13. Esmaeili R, Moosazadeh M, Alizadeh M, Afshari M. A Systematic Review of the Workload of Nurses in Intensive Care Units Using NAS. Acta Medica Mediterranea. 2015;31(7):1455–60.
14. Padilha KG, Stafseth S, Solms D, Hoogendoom M, Monge FJ, Gomaa OH, et al. Nursing Activities Score: an updated guideline for its application in the Intensive Care Unit. Rev Esc Enferm USP. 2015;49 Spec No:131–7. [DOI: 10.1590/S0080-623420150000700019] [PMID: 26761703]
15. Nashef SA, Roques F, Sharples LD, Nilsson J, Smith C, Goldstone AR, et al. EuroSCORE II. Eur J Cardiothorac Surg. 2012;41(4):734–44; discussion 744–5. [DOI: 10.1093/ejcts/ezs043] [PMID: 22378855]
16. Riklikiene O, Didenko O, Ciutiene R, Daunoriene A, Ciarniene R. Balancing nurses' workload: A case study with nurse anaesthetists and intensive care nurses. Econ Sociol. 2020;13(2):11–25. [DOI: 10.14254/2071-789X.2020/13-2/1]
17. Ferreira PC, Machado RC, Vitor AF, Lira ALB de C, Martins QCS. Nursing measure in Intensive Care Unit: evidence about the Nursing Activities Score. Rev Rene. 2014;15(5):888–97. [DOI: 10.15253/2175-6783.2014000500019]

18. Bruyneel A, Tack J, Droguet M, Maes J, Wittebole X, Miranda DR, et al. Measuring the nursing workload in intensive care with the Nursing Activities Score (NAS): A prospective study in 16 hospitals in Belgium. J Crit Care. 2019;54:205–11. [DOI: 10.1016/j.jcrc.2019.08.032] [PMID: 31521017]

19. Dias MCCB. Application of the Nursing Activities Score (NAS) as a nursing workload measurement tool in a Cardiac Surgery Intensive Care Unit. MS Dissertation. University of São Paulo, School of Nursing. [Accessed March 8, 2018] [Available at: http://www.teses.usp.br/teses/disponiveis/7/7131/tde-17102006-131800/]

20. Sardo PMG, Macedo RPA, Alvarelhão JJM, Simões JFL, Guedes JAD, Simões CJ, et al. Nursing workload assessment in an intensive care unit: A retrospective observational study using the Nursing Activities Score. Nurs Crit Care. 2023;28(2):288–97. [DOI: 10.1111/nicc.12854] [PMID: 36336353]

21. Cyrino CMS, Dell'Acqua MCQ, Castro MCN e., Oliveira EM de, Deodato S, Almeida PMV de. Nursing Activities Score by assistance sites in Intensive Care Units. Esc Anna Nery 2018;22(1):e20170145. [DOI: 10.1590/2177-9465-ean-2017-0145]

22. Ferretti-Rebustini RE, Nogueira LS, Silva RC, Poveda VB, Machado SP, Oliveira EM, et al. Aging as a predictor of nursing workload in Intensive Care Unit: results from a Brazilian Sample. Rev Esc Enferm USP. 2017;51:e03216. [Article in English, Spanish] [DOI: 10.1590/S1980-220X2016237503216] [PMID: 28380163]

23. Araújo RT, Papathanassoglou E, Gonçalves MM, Bonacim GCA, Valle Dallora LME, Jericó CM, et al. Critical care nursing service costs: Comparison of the top-down versus bottom-up micro-costing approach in Brazil. J Nurs Manag. 2021;29(6):1778–84. [DOI: 10.1111/jonm.13313] [PMID: 33772914]

24. Bruyneel A, Maes J, Di Pierdomenico L, Tack J, Bogaert M, Leclercq P, et al. Associations between two nursing workload scales and the cost of intensive care unit nursing staff: A retrospective study of one Belgian hospital. J Nurs Manag. 2022;30(3):724–32. [DOI: 10.1111/jonm.13544] [PMID: 34989040]

25. Giakoumidakis K, Baltopoulos GI, Charitos C, Patelarou E, Fotos NV, Brokalaki-Pananoudaki H. Risk factors for increased in-hospital mortality: a cohort study among cardiac surgery patients. Eur J Cardiovasc Nurs. 2012;11(1):23–33. [DOI: 10.1016/j.ejcnurse.2010.09.005] [PMID: 20956090]

26. Padilha KG, de Sousa RM, Queijo AF, Mendes AM, Reis Miranda D. Nursing Activities Score in the intensive care unit: analysis of the related factors. Intensive Crit Care Nurs. 2008;24(3):197–204. [DOI: 10.1016/j.iccn.2007.09.004] [PMID: 17976989]

27. Driscoll A, Grant MJ, Carroll D, Dalton S, Deaton C, Jones I, et al. The effect of nurse-to-patient ratios on nurse-sensitive patient outcomes in acute specialist units: a systematic review and meta-analysis. Eur J Cardiovasc Nurs. 2018;17(1):6–22. [DOI: 10.1177/1474515117721561] [PMID: 28718658]

Процена радног оптерећења медицинских сестара у кардиохируршкој јединици интензивне неге помоћу Бодовног система активности медицинских сестара (*NAS*)

Наташа Стојаковић[1,2], Бојан Б. Михајловић[1,2], Јелена Никовић[1,3], Јован Рајић[2], Јелена Вучковић[1,2], Миодраг Голубовић[1,2], Лазар Велицки[1,2]

[1]Универзитет у Новом Саду, Медицински факултет, Нови Сад, Србија;
[2]Институт за кардиоваскуларне болести Војводине, Сремска Каменица, Србија;
[3]Универзитетски клинички центар Војводине, Нови Сад, Србија

САЖЕТАК

Увод/Циљ Бодовни систем активности медицинских сестара (*Nursing Activities Score – NAS*) један је од најприхваћенијих и најшире коришћених система који се користе за процену радног оптерећења медицинског особља у погледу квалитативне и квантитативне адекватности.
Циљ рада је био да се применом система *NAS* процени и анализира оптерећење медицинских сестара у кардиохируршкој јединици интензивне неге у групи болесника после кардиохируршке операције.

Методе Студија је обухватила 809 болесника који су смештени у јединицу интензивне неге после кардиохируршке операције у току 2019. године. Демографски подаци су прикупљени из медицинске документације (пол, старост, врста лечења, дужина боравка и отпуста) и *NAS*.

Резултати Највећи број болесника био је подвргнут коронарној (43,1%), затим валвуларној (32,6%) и комбинованој хирургији (24,2%). Просечна дужина боравка у јединици интензивне неге била је 2,5 ± 3,4 дана. Средња вредност *NAS* у узорку износила је 100,8 ± 63,1. Вредност *NAS* током првог постоперативног дана била је лош маркер исхода у погледу морталитета (*C*-индекс 0,520, 95% *CI* – 0,422–0,617, *p* = 0,676). Уочена је значајна разлика у погледу просечне вредности *NAS* између болесника подвргнутих коронарној хирургији и комбинованој хирургији (*p* = 0,001). *NAS* се показао корисним за процену активности после кардиохируршке операције у јединици интензивне неге, потврђујући оптимално оптерећење медицинских сестара, док веће вредности *NAS* у нашој болници указују на повећано оптерећење у поређењу са сличним установама.

Закључак *NAS* је пружио одрживе информације о нези и хоспитализацији болесника у кардиохируршкој јединици интензивног лечења. У нашим болничким условима успостављено је оптимално оптерећење медицинских сестара.

Кључне речи: јединица интензивног лечења; радно оптерећење; кардиохирургија; дужина боравка