

A SYSTEMATIC REVIEW OF THE WORKLOAD OF NURSES IN INTENSIVE CARE UNITS USING NAS

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ABSTRACT

Introduction: The appropriateness of nursing workload is an important factor in ensuring the safety and quality of care for patients. So measuring the nursing workload in intensive care units is necessary. The study aims to systematically review the evidences regarding the nursing workload in intensive care units using NAS.

Methods: To find papers related to the nursing workload, international databases (PubMed / Medline, Scopus, Science Direct, Google Scholar) and Iranian databases such as Magiran, SID and IranMedex Biomedical were searched. The search was done in order to find papers related to the nursing workload in the intensive care units in both Persian and English languages with a release date from 2000 to March 2015. To search in electronic references, keywords such as nursing workload, nursing activities score (NAS) and Intensive Care Unit were used.

Results: From among 180 papers available in databases under study, 23 articles qualified inclusion criteria. Nursing workload in Intensive Care Units ranged 36.1 in Greece to 109.03 in Iran according to NAS.

Conclusion: According to the results, nursing workload in Intensive Care Units varies among different countries. Accordingly, nurse to Patient ratio must be revised in Intensive Care Units in terms of demands and conditions.

Key words: Nursing Workload, Nursing Activities Score, Intensive Care Unit.

Received May 30, 2015; Accepted November 02, 2015

Introduction

Nursing workload refers to the time spent for patients care and nursing activities as well as training necessary skills for patients care⁽¹⁾. Assessment of nursing workload is useful for predicting the time being spent for patient care, nursing knowledge and combining necessary skills for care⁽²⁾. Increasing workload is one of the main concerns in the field of health and treatment particularly among the intensive care units. It is also one of the most important stressors among nurses working in intensive care units. Excessive workload can lead to adverse outcomes for nurses, other staff working in the intensive care units and patients. Patients' care in ICUs is specified with interventions and medical and emergency supports⁽³⁾.

Low number of nursing staff causes high workload, more complications, high costs, inappropriate patient assessment, lack of standards for patient care by nurses and inaccurate registration of patients' information^(4,5). Excessive workload can lead to increase in occupational injury, higher job demands and difficult decision making resulting in mental tension and job exhaustion⁽⁶⁾.

Several studies have been carried out reporting that appropriate nursing staff in intensive care units has a positive effect on reduction in the rate of nosocomial infection, bed sore, duration of mechanical ventilation and ICU stay⁽⁷⁻⁹⁾.

Results of many studies indicated that the appropriate number of nurses according to the working unit can cause reduction in mortality and morbidity, job exhaustion and job dissatisfaction among nurses.

Therefore, for effective nursing function, it is necessary to evaluate their workload^(7, 9, 10).

During the last 30 years a lot of efforts have been made to investigate the nursing workload in ICUs. At first, traditional or indirect medical based indicators were developed to assess workload according to some interventions on patients. However, such indicators had a lot of limitations. For example, patients' care requirements were ignored during the assessment⁽¹¹⁾.

By the promotion of the assessment methods, many indicators evaluating the nursing workload were developed such as Nursing Activities Score (NAS) which belonged to the Therapeutic Intervention Scoring System⁽¹²⁾. This indicator consists of 23 items addressing basic activities, respiratory, cardiac, vascular, neural, and metabolic supports as well as special interventions. A score was assigned to each item. The total score varies from zero to 178 indicating the time spent by a nurse for direct patient's care. NAS more than 100 indicates a high workload⁽¹²⁻¹⁴⁾. This indicator has been applied for assessment of nursing workload in several countries and reported different results. For example, this workload has been estimated as of 74.62% in Brazil⁽⁵⁾, while the workload for nursing activities in Norway was 85.5% per shift or 54.7% per 24 hours⁽¹⁵⁾.

Assessment of the nursing workload particularly in the ICUs is an important and critical factor for appropriate allocation of nursing staff in these units, reasonable planning for reduction in working pressure on nurses, identifying the high workload associated problems, reduction of care & treatment costs and increasing the quality and effectiveness of patients' care. In addition, nursing workload has been considered by researchers for many years and several relevant studies were identified by our primary electronic search. Since pooling the results of different relevant studies can provide reliable evidences, we aimed to assess the nursing workload in ICUs of different hospitals using systematic review.

Materials and methods

Search strategy

We searched national (SID, Magiran, Medlib) and international (Pub Med, Science direct, Scopus and Google scholar) databanks to identify electronic papers published in Persian or English from 2000 to 30 March 2015. We used sensitive and crit-

ical keywords in title or abstracts such as nursing workload, nursing activities index and intensive care unit or their Farsi equivalents. We also reviewed the references to increase the search sensitivity. One of the researchers independently evaluated the search results and found that no relevant study was ignored.

Study selection

At first, full texts or abstracts of all articles identified during the advanced searches were extracted. Relevant studies were selected after exclusion of duplicates and reviewing the titles, abstracts and full texts respectively.

Quality assessment

We designed an appropriate checklist using the contents of STROBE (strengthening the reporting of observational studies in epidemiology) checklist⁽¹⁷⁾ and another checklist applied during a systematic review⁽¹⁸⁾. This checklist contained questions regarding different aspects of the study such as type of the study, sample size, study objectives, study population, inclusion/exclusion criteria, matching of samples, statistical analysis, presentation of the results based on the objectives. One score was assigned to each question. Studies provided at least eight scores were eligible for systematic review.

Data extraction

Required information such as title, first author name, date of the study conduction, sample size, place of the study conduction, type of the study, average, minimum and maximum nursing workload in ICUs were extracted from the primary studies.

Inclusion criteria

All papers written in Persian or English provided minimum quality scores and reported sample size and nursing workload based on NAS in ICUs were included in this systematic review.

Exclusion criteria

Studies did not reported NAS-based nursing workload or sample size, abstracts presented in congresses without full texts, case series and studies without minimum quality score were excluded from the systematic review.

Results

Primary search in national and international databanks revealed 180 evidences. Having limited the search strategy and increasing its specificity, irrelevant papers were excluded. Finally, 23 articles were entered into the systematic review.

Table 1 shows a summary of the studies used in the current systematic review. Most of which were descriptive and prospective. The minimum NAS was estimated as of 36.1% attributed to the study carried out by Gerasimou Angelidi et al. in Greece (2014) among 106 patients⁽¹⁴⁾. The highest NAS was estimated as of 109.3% in the study conducted by Alizadeh et al among 285 Iranian patients in 2015⁽¹⁹⁾.

Min	SD	NAS	Sample size	Publication date	Country	Type of the study	First author
32.42	109.03	285	2015	Iran	descriptive-analytical study	(19)Mehrdad Alizadeh	
6.63	65.18	100	2013	Brazil	Cross sectional study	(20)Alda Ferreira Queijo	
2.53	65.97	5856	2014	Italy	retrospectively analyse	(21)Alberto Lucchini	
5.2	47.31	156	2011	Brazil	descriptive study	(21)Ana Paula de Brito	
	66.28	730	2013	Spain	prospective correlation study	(6)Francisco Javier Carmona-Monge	
	54.7	255	2012	Belgium	prospective, observational research	(22)Debergh	
6.6	65.9	563	2013	Spain	prospective, descriptive	(23)Francisco Javier Carmona-Monge	
8.51	74.4	437	2014	Brazil	longitudinal, prospective study	(24)Juliana Aparecida Morini Altafin	
47.6	66.5	200	2008	Brazil	Cross cultural adaptation and validation	(25)Alda Ferreira Queijo	
10.65	56.25	104	2008	Brazil	comparative study	(26)Adriana Janzante Ducci	
22.35	96.24	235	2011	Norway	descriptive study	(15)Riv K. Stafseth	
54.3	66.4	200	2008	Brazil	descriptive study	(27)Katia Grillo Padilha	
51.5	68.1	66	2012	Brazil	A descriptive, quantitative, retrospective study	(28)Iloma Rosssany Lima Leite	
20.8	62.2	107	2011	Brazil	descriptive study	(29)Marcia Raquel Pamuto	
5.2	36.1	106	2014	Greece	retrospective study	(14)Gerasimou Angelidi	
11.82	55.6	545	2014	Brazil	Prospective, observational and analytical cohort study	(30)Andriza Oliveira Moschetta Campagner	
52.5	70.4	50	2014	Brazil	exploratory, descriptive cross-sectional study	(31)Marcia Bernadete Camuci	
16.2	81.2	43	2012	Brazil	prospective cohort study	(32)Renata M. Daud-Gallotti	
37.4	12	62.9	160	2012	Brazil	Prospective descriptive study	(33)Mariana F Cremasco
2.4	63.7	68	2010	Brazil	Pilot	(5)Katia Grillo Padilha	
14.1	40.8	350	2004	Spain	descriptive study	(39)Bernat Adell	
	61.92	600	2010	Brazil	prospective longitudinal study	(37)Maria Claudia Moreira da Silva	
7.98	80.1	87	2009	Brazil	descriptive, cross-sectional and correlational study	(41)Alexandre Pazetto Balsanelli	

Table 1: Characteristics of studies included to this study.

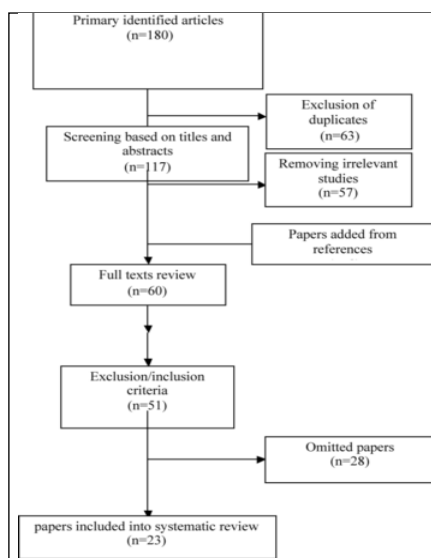


Figure 1: flow chart of searching and selection of primary studies.

Discussion

Out of 180 papers identified during primary search, 23 articles were identified eligible for the current systematic review. The nursing workload in ICUs based on NAS varied from 36.1% in Greece to 109.03% in Iran.

Increasing the nursing workload causes low quality of patients' care and dissatisfaction of medical staff particularly nurses. Excessive workload of a nurse not only influences the nurse itself, but also affects other medical staff and health providers. It also reduces the time in which nurses spend for patients' care. This time limitation leads to ineffective training and supervision of new nursing staff⁽³⁴⁾.

According to a study carried out in Iran in 2015, mean NAS in ICUs was estimated as of 109.03% indicating the need to allocate enough nursing staff in these units⁽¹⁹⁾. Several studies in Brazil reported the NAS as of 74.62% (Dias et al), 73.70% (Ducci et al.), 69.30% (Silva et al) and 104% (Inue et al.)^(26, 35-37). This indicator was also estimated as of 40.80% in Spain⁽³⁸⁾, 41% in Greece⁽¹⁵⁾ and 96.24% in Norway⁽³⁹⁾. The differences between workload in different regions can be due to nurse-to-patient ratio in each shift, patients' characteristics and type and regulations of care and treatment services in the countries.

According to the study carried out in Iran, a significant difference was observed between workload and various ICUs so that the highest and lowest workloads were attributed to surgical ICU and CCU respectively⁽¹⁹⁾. The highest NAS in Ducci study⁽²⁶⁾, Silva study⁽³⁶⁾ and Balsanelli study⁽⁴⁰⁾ were 52.70%, 62.13% and 80% respectively for general ICU. The mean NAS was 70% for open heart ICU according to studies carried out by Ducci⁽²⁶⁾ and Giakoumidakis⁽³⁹⁾. Dias et al⁽³⁵⁾ reported that open heart ICU had the highest NAS (96.79%).

Excessive nursing workload is associated with different factors such as inadequate number of nursing staff and increased duration of hospitalization⁽³⁴⁾. Lucchini (2014) during a five years working experience in Italian ICUs showed that NAS was 65.97% for all patients. He also reported that the NAS for general, neurology and cardiac ICUs were 72.55%, 59.33% and 63.51% respectively. The results showed that this indicator was significantly associated with length of stay and age group⁽²¹⁾.

Increased nursing workload can lead to several important outcomes. It has an adverse influence on the patients' safety⁽⁹⁾. It also reduces the quality of patients' care leading to patients' dissatisfaction of nurses and other medical staff⁽⁴¹⁾. In addition, nursing dissatisfaction may cause desertion and manpower shortage⁽⁴²⁾. Muler et al. in a study carried out in Brazil found that increase in the number of patients, increases the probability of falling out of bed, infection of intravenous lines, nursing desertion and absence. They also observed a significant association between nursing workload and patient safety⁽⁴³⁾.

Each excessive patient increases the rate of job depression and job dissatisfaction as of 23% and 15% respectively. However, inappropriate nurse to patient ratio is only a little part of this problem. In addition to the number of nurses, authorities should consider the nursing workload under any circumstances⁽⁷⁾. In the study carried out by Debregh et al. (2011), the mean NAS per patient during each shift and during 24 hours were 85.5% and 54.7% respectively⁽²²⁾.

Mean NAS for nursing workload in Brazil has been reported as of 47.31%⁽²⁾. In Norway, this indicator has been estimated between 75% and 90% indicating more need to nursing staff in this country⁽¹⁵⁾.

There are strong evidences reporting that the number of nurses has significant effect on the patients' outcomes. Inadequate nursing staff in ICUs increased the rates of mortality and morbidity, hospital acquired pneumonia, urinary tract infection, sepsis, nosocomial infections, bed sore, upper gastro-intestinal bleeding, shock, cardiac arrest, drop out of bed and length of stay⁽⁴⁴⁾. Another study showed that the low number of nurses associated with the rate of pneumonia⁽⁴⁵⁾.

Gallotti et al. in a study conducted in Brazil among 195 patients reported that 43 (22%) were infected (16 pneumonia, 12 UTI, 8 blood infection, two surgical wound infection, two respiratory infection and three other infections). Moreover, a high NAS was observed among patients infected with health care-associated infections⁽⁴⁵⁾. Results of a descriptive study carried out by Camuci et al. in Brazil, the 24 hours NAS for burn ICUs was estimated as of 70.4%⁽³¹⁾. Carmona et al reported that there was a significant difference between days of admission and discharge regarding nursing workload. During the first seven days, workloads for patients with pulmonary failure and sepsis were

higher than that of patients with acute coronary syndrome, while after the eighth day, the workload was the same for all patients⁽⁶⁾.

According to the Queijo study carried out in Brazil, the mean (SD) nursing workload in neurology ICUs was 68.18% (6.63). It means that the time spent for patient by a nurse is 5.21 hours. This study represents the importance of planning for nursing resources considering the patients' needs in neurology ICUs⁽²⁰⁾.

Several studies have been conducted in California indicating that each hour increase in the nursing workload causes 8.9% increase in the risk of pneumonia⁽⁴⁶⁾. Different studies reported significant relationships between the low number of nursing staff and developing pneumonia⁽⁴⁷⁾. Some other studies reported considerable associations between the number of nursing staff and mortality. Another study investigated relationship between nurse to patient ratio and mortality among 232000 patients and 10000 nurses in 168 hospitals in Pennsylvania, reported significant results. This study indicated that adjusting the nurse to patient ratio reduces the mortality. Without this adjustment, there will be a 7% increase in the mortality per each patient adding to the intensive care unit⁽⁷⁾.

Based on the Padilha study, the average NAS in ICUs was 66.4%. Increasing the NAS causes the increase in mortality and length of stay in ICUs⁽²⁷⁾. Nursing shortage increases the nursing workload. One of the factors associates with increase in the health & treatment costs from 1990 was reducing the number of nursing staff which being responsible for patients care. The policy of compulsory overtime working which is planned by government to settle this problem, results in a considerable increase in nursing workload^(48,49).

Nursing workload affects the time specified for different activities among nurses. When the nursing workload is increased, no enough time will be remained for nursing staff to spend for patients' health and safety⁽⁵⁰⁾. Excessive workload can also influence on nursing decision making regarding patients' care activities⁽⁵¹⁾ resulting in wrong decision making and low quality of care and cooperation. It also causes limitation in nursing inter-relationships⁽⁵²⁾.

Unfortunately, we had to search only Persian and English written papers and other studies regarding nursing workload were ignored in our study. Another limitation of the current study was the methodological differences between primary

studies so that they applied different indicators such as mean or percent to represent the nursing workload. That was the reason we did not use meta-analysis to combine the results.

Our study showed that the nursing workload is very different among the countries in the world. This indicator was at a high level in most of the countries. However, the NAS in Iran is higher than many other countries. This problem not only causes dissatisfaction of nursing staffs, reduces the quality of patient's care and safety. The quality of services by medical staff is directly associated with their workload. It seems that high workload makes decreased patient's care, affecting decision making by nurses and health care providers. It also weakens the relationship between nurse and patient and confounds the cooperation between them. Excessive workload results in burnout and job dissatisfaction among nursing staff. Therefore, it is necessary to revise the nurse to patient ratio in the intensive care units.

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Acknowledgment

This study was conducted based on a research approved by the research committee of Mazandaran University of Medical Sciences and a thesis presented by Mr. Mehrdad Alizadeh for master degree of critical care nursing. We just like to thank the research deputy of Mazandaran University of Medical Sciences as well as managers of educational hospitals and nurses of ICUs for their kindly cooperation.

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