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COMPARISON BETWEEN PATIENT SEVERITY AND NURSING WORKLOAD BEFORE AND AFTER THE OCCURRENCE OF ADVERSE EVENTS IN ELDERLY IN CRITICAL CARE

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ABSTRACT

Objective: to compare the patient severity and the nursing workload before and after the occurrence of moderate and severe adverse events in elderly hospitalized at intensive care units.

Method: comparative study developed at nine intensive therapy units of a University Hospital in São Paulo. The events were collected from the patient histories and classified as moderate and severe according to the World Health Organization. For the severity analysis, the Simplified Acute Physiologic Score II was used and, for the workload analysis, the Nursing Activities Score was applied 24 hours before and after the moderate and severe event. The t-test with 5% significance was used to compare the mean clinical severity and workload scores before and after the event.

Results: the sample consisted of 315 elderly, 94 (29.8%) of whom were victims of moderate and severe events at the units. Among the 94 events, the clinical process and procedure type was predominant (40.0%). The installation and maintenance of therapeutic artifacts and catheters were the prevalent interventions that resulted in moderate (76.5%) physiopathological damage (66.0%). The mean workload score (75.19%) dropped 24 hours after the occurrence of the event (71.97%, p=0.008), and the severity, represented by the probability of death, increased from 22.0% to 29.0% after the event (p=0.045).

Conclusion: in the patient safety context, the identification of the changes in clinical conditions and the nursing workload in elderly victims of events supports the prevention of these occurrences.

DESCRIPTORS: Aged. Intensive care units. Patient safety. Nursing care. Workload. Mortality.

COMPARAÇÃO ENTRE GRAVIDADE DO PACIENTE E CARGA DE TRABALHO DE ENFERMAGEM ANTES E APÓS A OCORRÊNCIA DE EVENTOS ADVERSOS EM IDOSOS EM CUIDADOS CRÍTICOS

RESUMO

Objetivo: comparar a gravidade do paciente e a carga de trabalho de enfermagem antes e após a ocorrência de evento adverso moderado e grave em idosos internados em unidades de terapia intensiva.

Método: estudo comparativo, realizado em nove unidades de terapia intensiva de um Hospital Universitário de São Paulo. Os eventos foram coletados dos prontuários dos pacientes e classificados em moderados e graves segundo a Organização Mundial de Saúde. A análise da gravidade foi realizada segundo o *Symplified Acute Phsiologic Score II* e a carga de trabalho segundo o *Nursing Activities Score*, 24 horas antes e depois do evento moderado e grave. O teste t, com significância de 5%, foi utilizado para a comparação das médias da gravidade clínica e da carga de trabalho, antes e após o evento.

Resultados: a amostra foi composta por 315 idosos, sendo que 94 (29,8%) sofreram eventos moderados e graves nas unidades. Dos 94 eventos, predominou o tipo processo clínico e procedimento (40,0%). A instalação e manutenção de artefatos terapêuticos e cateteres foram as intervenções prevalentes que resultaram em danos fisiopatológicos (66,0%), de grau moderado (76,5%). A média de pontuação da carga de trabalho (75,19%) diminuiu 24 horas após a ocorrência do evento (71,97%, p=0,008) e, a gravidade, representada pela probabilidade de morte, aumentou de 22,0% para 29,0% depois do evento (p=0,045).

Conclusão: no contexto da segurança do paciente, a identificação das alterações nas condições clínicas e na carga de trabalho de enfermagem em idosos que sofrem eventos subsidiam a prevenção dessas ocorrências.

DESCRITORES: Idoso. Unidades de terapia intensiva. Segurança do paciente. Cuidados de enfermagem. Carga de trabalho. Mortalidade.

COMPARACIÓN ENTRE LA GRAVEDAD DEL PACIENTE Y LA CARGA DE TRABAJO DE LA ENFERMERÍA ANTES Y DESPUÉS DE LA OCURRENCIA DE EVENTOS ADVERSOS EN ANCIANOS CON CUIDADOS CRÍTICOS

RESUMEN

Objetivo: comparar la gravedad del paciente y la carga de trabajo en enfermería antes y después de ocurrir un evento adverso moderado y grave en ancianos internados en unidades de terapia intensiva.

Método: estudio comparativo realizado en nueve unidades de terapia intensiva de un Hospital Universitario de São Paulo. Los eventos fueron obtenidos a través de los prontuarios de los pacientes y clasificados en moderados y graves según la Organización Mundial de la Salud. El análisis sobre la gravedad fue realizado de acuerdo al *Symplified Acute Physiologic Score II* y la carga de trabajo se hizo conforme al *Nursing Activities Score*, 24 horas antes y después del evento moderado y grave. El test t, con una significancia del 5%, fue utilizado para la comparación de los promedios de la gravedad clínica y de la carga de trabajo antes y después del evento.

Resultados: la muestra incluyó 315 ancianos, siendo que 94 (29,8%) sufrieron eventos moderados y graves en las unidades. De los 94 eventos, predominó el tipo de proceso clínico y el procedimiento (40,0%). La instalación y mantenimiento de artefactos terapéuticos y catéteres fueron las intervenciones prevalentes que resultaron en daños fisiopatológicos (66,0%) y de grado moderado (76,5%). El promedio de puntuación de la carga de trabajo (75,19%) disminuyó 24 horas después de ocurrido el evento (71,97%, p=0,008) y la gravedad, representada por la probabilidad de muerte, aumentó de 22,0% para 29,0% después del evento (p=0,045).

Conclusion: en el contexto de seguridad del paciente, la identificación de las alteraciones en las condiciones clínicas y en la carga de trabajo de enfermería en los ancianos que sufren eventos subsidia la prevención de tales ocurrencias.

DESCRIPTORES: Anciano. Unidades de terapia intensiva. Seguridad del paciente. Cuidados de la enfermería. Carga de trabajo. Mortalidad.

INTRODUCTION

Life expectancy at birth and consequent aging has increased significantly throughout the world. By 1950, globally, there were 205 million people in their 60s or older. In 2012, the number of older people had increased to almost 810 million. This number is projected to reach one billion in less than 10 years and to double to two billion by 2050.[1] In combination with aging, multimorbidity is characterized by a combination of diseases and diversity of implications linked to poor quality of life, physical disability, high utilization of health care, hospitalization, high public spending on health and mortality.[2]

Elderly people's high utilization of health care in health institutions, especially intensive care, is evidenced in several studies, which demonstrate the predominance of patients aged 60 years and over.[3-5]

The high number of elderly people in the complex surroundings of Intensive Care Units (ICU), associated to chronic diseases and progressive loss of the proper functionality of aging, turns this age group into a theme of special concern for safe and high-quality care, free from adverse events (AE). For the World Health Organization (WHO), AE are defined as incidents or circumstances that cause considerable and unnecessary harm to patients.[6]

Several studies have shown the occurrence of AE involving the elderly.[7-15] Medication errors,[8-11] falls,[8,11-12] unscheduled withdrawals of therapeutic artifacts,[8-9] and pressure ulcers[14-15] are more prevalent and are directly related to nursing care, being considered AE sensitive to nursing.

Given the vulnerability of the elderly, characterized mainly by their functional status and the presence of comorbidities, the consequences of an AE, mainly moderate and severe, can lead to a longer hospitalization and an increase in morbidity, mortality and nursing workload.[16]

Different authors define the nursing workload as work related directly to the patient and administrative activities,[17] as the time required to perform the nursing work in a certain period of time,[18] in addition to the product of the daily average of patients attended according to the degree of dependence and type of care, multiplied by the average care time in hours.[19]

Considering the workload as hours of nursing care required by the patients in a given period of time,[18] the consequences of the inadequate allocation of nursing human resources directly affect the quality indicators, such as: infection rates, medication errors and falls; leading to increased hospitalization time and costs.[5] In addition to patient-related risks, occupational hazards such as physical, emotional, and cognitive impairments also reduce attention, interest in work, and increase absenteeism.[5, 20-21]

The consequences of AEs for patients' clinical conditions and the nursing workload, that is, their impact on the number of hours of care required by the nursing team, are evidenced in groups of patients in general,[5,11,22] but not specifically in the elderly.

A study that assessed the consequences of the occurrence of AE for adult patient severity and for

the nursing workload at two ICUs and two semi-intensive units of Brazilian hospitals did not observe changes in the severity of the patients, but found an increase in the nursing workload.[22]

Regarding the nursing workload and the occurrence of AE, a study in two ICUs of a university hospital in Brazil found that, the greater the difference between the available nursing hours and the hours required for patient care in the distribution of nursing team activities, the lower the frequency of these events.[23]

In addition to the nursing workload, studies conducted with adult patients show an association between the occurrence of AE and increased length of hospitalization[24] and mortality.[25] In a study that analyzed the impact of AE during the performance of invasive procedures in critically ill patients, severe AE were associated with 11% of deaths in a total of 828 patients analyzed.[25]

Evidence of the impact of AE on the clinical evolution of critically ill elderly and nursing workload is still incipient, leading to the following research question: What is the impact of moderate and severe AE on patient severity and on the nursing workload of elderly patients hospitalized in ICU? Thus, this study aimed to compare the patient severity and the nursing workload before and after the occurrence of moderate and severe AE in the elderly hospitalized in an ICU.

METHOD

This is a prospective, comparative study carried out at nine specialized ICUs (surgical, medical clinic, emergency medical clinic, infectology, nephrology, neurology, pneumology, trauma and burns) of a high-complexity public hospital located in the city of São Paulo, Brazil, with a total of 75 intensive care beds. Data collection was performed for ninety consecutive days, from September to November 2012. The convenience sample was composed of 315 elderly individuals aged 60 years and over, of any medical specialty, submitted to clinical or surgical treatment, with a minimum stay of 24 hours in the ICU.

Moderate and severe AEs were defined according to WHO[6] as an incident that causes harm or death to the patient. The types were classified into the following categories: clinical administration; clinical process/procedure; documentation; infection associated with health care; medication/fluids for intravenous administration; blood/blood products; nutrition; oxygen/gases/vapors; medical devices/equipment; behavior; accidents with the patient; infrastructure/location/facilities and organizational resources/ management.

As for the type of damage, AE were classified as physiopathological (changes in normal functioning of the body, determined by signs and symptoms that alter clinical characteristics) and injury (tissue damage caused by an agent or event). The degree of damage was classified as moderate (symptomatic consequence requiring additional intervention or causing permanent/long-term damage or loss of function) and severe (a symptomatic consequence that requires major interventions to save life, or caused permanent/long-term damage term or loss of functions).[6]

The demographic and clinical variables of hospitalization related to the elderly were: sex (male/female), age (full years), comorbidities (Charlson Comorbidity Index - CCI), origin (critical area: surgical center, first aid, ICU, hemodynamics (complete days of hospitalization), exit condition (survivor/non-survivor) and clinical interventions: infusion pump medicines, installation and maintenance of therapeutic artifacts/catheters, intubation/invasive/noninvasive mechanical ventilation, vasoactive drug administration and airway aspiration.

These variables included those referring to the main objective of the study, namely the nursing workload according to the Nursing Activities Score (NAS)[26] and the severity of the patient according to the Simplified Acute Physiologic Score II (SAPS II).[27]

Data collection was performed through the analysis of the patients' charts and the monitoring of a probabilistic sample of 10% of the shift transfers during the period, randomized to date, shifts and ICUs. The morning, afternoon and evening hours corresponded to the standard times in the units, that is, 7, 13 and 19 hours, including a total of 390 shift transfers.

The analysis of medical records was carried out by a group of analysts, composed of fifteen nurses, previously trained by the researchers and by two nurses specialized in intensive care. For the data collection, each analyst received a set of medical records related to the ICU admission in PDF format, digitized by 14 technicians from the Department of Health Records of the institution, after due authorization.

For the storage and organization of data, a specialist in Information Technology developed

and implemented a system with a Structured Query Language (SQL) database, hosted on a database server of the School of Nursing at the University of São Paulo. Named Universal, this system was installed on the personal computer of each of the collectors (analysts) of the study, who were previously trained for its use, with access through a login and individual password. In this database, the analysts filled out information on the patient identification form, severity parameters, therapeutic interventions and incidents without and with damage (AE) according to the WHO taxonomy.[6]

Regarding the shift transfers, the data were collected by trained monitors, nurses and nursing undergraduates, who monitored the pre-determined staff on duty at the unit and time, according to the draw, and manually recorded the nursing professionals' reports. Subsequently, the reports produced were sent by e-mail to the researchers, who performed the data analysis and classification of the AE and inserted them into the database.

The WHO International Patient Safety Classification manual was used for the analysis of the AE.[6] In order to standardize the identification and classification of AE, after a consensus between researchers and intensive care nurses, a manual was developed with the description and classification of possible situations considered as AE.

For the analysis of moderate and severe AE, the first event occurred and identified in the medical records during the elderly patients' stay in the ICU was considered.

The nursing workload was measured using the NAS, an instrument that aims to measure the hours of care patients require according to their care needs. With a maximum score of 176.8%, the calculation of the total NAS score results from the sum of the items scored, which expresses, in percentage, the time spent by the nursing team in the care of the critically ill patient.[26]

In relation to severity measurement, SAPS II was used, an index that aims to quantitatively describe the degree of organic dysfunction in critically ill patients. The data are calculated by a mathematical equation that predicts the patients' mortality.[27]

After identifying the AE, the data related to the patient's severity and the nursing workload were collected 24 hours before and 24 hours after the occurrence of the moderate and severe event.

The data were processed using the Statistical Package for the Social Sciences (SPSS) version 18.0. The categorical variables were analyzed according to absolute frequency and percentage and the quantitative variables according to mean, standard deviation, minimum and maximum. Chi-square and analysis of variance (ANOVA) tests were used to compare the groups that were victims or not of moderate and severe AE according to the demographic and clinical variables. To compare the mean NAS and SAPS II before and after the occurrence of moderate and severe AE, the paired t-test was used.

The level of significance adopted for the inferential analysis was 5%.

The project received approval from the ethics committee for the analysis of hospital research projects (CAAE 0196/11).

RESULTS

Of the 315 elderly, 221 (70.2%) did not experience any type of moderate and severe AE, while 94 (29.8%) were victims of these events. In both groups, there was a predominance of male elderly, that is, 114 (51.6%) in the non-AE group and 57 (60.7%) in the AE group.

Table 1 - Descriptive statistics of the demographic and clinical variables of the elderly group, according to moderate and severe adverse events in the Intensive Care Unit. São Paulo, SP, Brazil, 2012

		Adverse Event		Total	p-value*
		No	Yes		
Age	n	221	94	315	0.438
	Mean	71.53	70.76	71.30	
	Stand. Deviation	8.19	7.83	8.08	
	Min.-Max.	60-99	60-91	60-99	
Charlson	n	221	94	315	0.150
	Mean	1.76	2.11	1.86	
	Stand. Deviation	1.85	2.23	1.97	
	Min.-Max.	0-9	0-12	0.12	

		Adverse Event		Total	p-value*
		No	Yes		
Length of stay	n	221	94	315	0.000
	Mean	5.06	10.62	6.72	
	Stand. Deviation	6.47	9.30	7.84	
	Min.-Max.	1-59	1-47	1-59	
Nursing Activities Score	n	221	94	315	0.082
	Mean	71.20	74.27	72.12	
	Stand. Deviation	13.49	15.95	14.31	
	Min.-Max.	31-137	49-173	31-173	
Simplified Acute Physiologic Score II (Mortality Risk %)	n	221	94	315	0.073
	Mean	0.17	0.22	0.18	
	Stand. Deviation	0.19	0.23	0.21	
	Min.-Max.	0.00-0.84	0.00-.95	0.00-.95	

p*Analysis of variance

As observed in Table 1, the mean NAS score (74.7%), probability of death (22%) and mean Charlson score (2.11) were higher in victims of AE than in elderly who were not victims of AE (71.20%, 17% and 1.76, respectively). Nevertheless, there was no statistically significant difference between the groups for the variables age (p=0.438), NAS (p=0.082), SAPS II (p=0.073) and Charlson (p=0.150), which was only found for the length of stay at the ICU (p=0.000).

Table 2 – Descriptive statistics of variables origin and exit condition of the elderly according to moderate and severe adverse events at Intensive Care Unit. São Paulo, SP, Brazil, 2012

		Adverse Event				p-value*
		No		Yes		
		n	%	n	%	
Origin	Non-critical area	148	66.9	50	53.2	0.021
	Critical area	73	33.1	44	46.8	
Total		221	100	94	100	
Exit condition	Survivor	168	76.0	58	61.7	0.010
	Non-survivor	53	24.0	36	38.3	
Total		221	100	94	100	

* Pearson's chi-square test

Table 2 shows that, in the group of patients who were victims of events, 44 (46.8%) came from critical areas and 36 (38.3%) passed away, different proportions than in the group without AE, with 148 (66.9%) who came from non-critical areas and 168 (76.0%) who survived (p=0.021 and p=0.010, respectively).

Table 3 – Descriptive statistics of the therapeutic intervention variables in the group of elderly according to moderate and severe adverse events at Intensive Care Unit. São Paulo, SP, Brazil, 2012

	Adverse Event				p-value*
	No		Yes		
	n	%	n	%	
Installation and maintenance of therapeutic artifacts/catheters	No	125	56.6	22	23.4	0.000
	Yes	96	43.4	72	76.6	
Total		221	100	94	100	

		Adverse Event				p-value*
		No		Yes		
		n	%	n	%	
Medication administered by infusion pumps	No	119	53.9	20	21.3	0.000
	Yes	102	46.1	74	78.7	
Total		221	100	94	100	
Invasive and non-invasive intubation/mechanical ventilation	No	147	66.5	25	26.6	
	Yes	74	33.5	69	73.4	0.000
Total		221	100	94	100	
Airway aspiration	No	176	79.6	44	46.8	0.000
	Yes	45	20.4	50	53.2	
Total		221	100	94	100	
Vasoactive drug administration	No	139	62.9	27	28.7	0.000
	Yes	82	37.1	67	71.3	
Total		221	100	94	100	

* Pearson's chi-squared

It is observed in Table 3 that most of the elderly who suffered AE were submitted to therapeutic interventions related to therapeutic artifacts (76.6%), medications (78.7%), intubation and ventilation (73.4%), aspiration (53.2%) and administration of vasoactive drugs (71.3%). There was a statistically significant difference (p=0.000) between the two groups for all the therapeutic interventions the elderly were submitted to in the ICU.

Of the 94 moderate and severe AE, the clinical process and procedure category was predominant (40.0%), including intubation (non-programmed endotracheal tube withdrawals), failure to perform exams (capillary glucose, blood tests) and catheter and tube care (unscheduled withdrawals, poorly positioned drains), followed by infections and pressure ulcers.

Regarding the types and degree of damage of the AE, 66.0% (66) was of physiopathological type and 34.0% (32) lesions. Regarding the severity of AE, 76.59% (72) was moderate and 23.40% (22) severe. There was no death due to AE in the sample studied.

Table 4 - Mean NAS and SAPS II scores before and after the occurrence of AE in elderly patients victims of moderate and severe AE in the ICU. São Paulo, SP, Brazil, 2012.

		Adverse Event		p-value
		Before	After	
Nursing Activities Score	n	94	94	0.008
	Mean	75.19	71.97	
	Stand. Deviation	15.43	13.26	
	Standard Error	1.59	1.36	
Simplified Acute Physiologic Score II	n	94	94	0.045
	Mean	0.22	0.29	
	Stand. Deviation	0.23	0.23	
	Standard Error	0.02	0.02	

As observed in Table 4, the mean NAS score dropped 24 hours after the occurrence of the AE (71.97%) with p=0.008; on the other hand, severity according to the probability of death increased from 22.0% (24 hours before) to 29.0% 24 hours after the AE (p=0.045)

DISCUSSION

The AE can cause consequences of different dimensions to the patient and should be analyzed through a systemic approach, where nursing professionals, as active participants in this system, have the responsibility and ethical duty to provide safe and risk and damage-free care.

Of the results found, with respect to the predominance of males in the occurrence of AE, the study shows a higher male prevalence of 66.0%,[22] observing a proportion of about 60.7% in this study. Regarding age, however, similar results are found in the literature.[28-29]

The difference between the groups of elderly people who suffered and did not suffer AE is noteworthy regarding the length of stay. It was observed that the elderly who were victims of AE had an average stay of 10.62 days, about twice that of the elderly who did not suffer this type of occurrence (5.06 days). Although this data is similar to that of another study performed with elderly patients who were victims of AE, it is observed that, in the latter, the hospitalization period was about nine days shorter.[30] It should be noted that in this study, the group of elderly patients who were victims of adverse events (Charlson), nursing workload (NAS) and mortality risk (SAPS-II) were higher when compared to the group that did not suffer an AE which, in addition to the presence of the AE, could justify the prolonged stay in the ICU.

The elderly who were victims of AE had a higher mean NAS score (74.27%) compared to those who did not. A study that analyzed AE and workload found a mean NAS score of 70.03%.[5] On the other hand, research that analyzed the workload in patients who did not suffer AE found a score lower than 65.97%.[31]

The relationship between nursing workload and the occurrence of AE has been a source of concern for hospital managers and researchers. The literature has shown that the proper allocation of nursing staff in critical patient care does favor safer care.[32-34] This statement is reiterated in a study carried out in two Brazilian ICUs, which found that the average number of AE in appropriate staff allocations was lower in comparison to the inappropriate ones, with a statistically significant difference of p=0.000.[23]

Although there was no statistically significant difference, the risk of death for the elderly with AEs was higher in comparison with those who did not. This result corroborates a Brazilian study with 171 elderly people from a geriatric unit of a university hospital in Brazil that found a mortality rate of 41.5% in the elderly who suffered clinical adverse events, compared to 22.1% who did not.[35] The dilemma of critical elderly people's mortality has been a subject of controversy in the literature. The age, functional conditions and associated pathologies should be considered in the prediction thereof.[36]

It should be noted that the elderly who suffered moderate and severe AE presented severity and risk of death, as well as a greater nursing workload in comparison to those who did not suffer events. Although without the objective of analyzing the relationship between severity and workload, a French study found that the high turnover of patients and the number of vital support procedures performed by the nursing and medical staff were associated with a higher mortality.[16]

The elderly groups that suffered and did not suffer from AEs presented very close results regarding the origin of critical and non-critical areas. It should be mentioned that, regarding the origin of the elderly in the ICU, a Brazilian study developed in general ICUs showed that most patients entering ICUs come from critical units such as emergency room and surgical center,[3] which indicates the importance of new studies that analyze this variable in depth for its association with moderate and severe AEs.

The types of prevalent AEs in this study were related to clinical processes and procedures, infections and accidents with patients, specifically, pressure injuries. Regarding the clinical processes and procedures, an ICU study found a higher proportion of AE related to clinical processes or procedures in the elderly due to therapeutic interventions.[30]

Regarding healthcare-associated infections, a study that identified AEs reported in adult and pediatric ICUs from three Latin American countries found that infections were the most prevalent events after accidents and injuries, similar to those found in this investigation.[37]

The prevalence of moderate and severe AEs related to medication administration was low in the sample studied. It should be noted, however, that the evidence shows that, among the AEs, medication errors are the most frequent and deserve special nursing care and attention with a view to their prevention.[22,38]

The analysis of the therapeutic interventions performed in the elderly victims of AE in this study showed a homogeneous distribution among the installation of artifacts/catheters, drugs administered by infusion pump and intubation/mechanical ventilation. A study that analyzed therapeutic interventions according to the Therapeutic Intervention Scoring System-28 (TISS-28), found a prevalence scores in the categories of basic and ventilatory, cardiovascular and renal support activities between 73.0% and 100.0%.[39]

Another study that analyzed the interventions performed in adult and elderly patients in the ICU and the evolution of the nursing workload according to the NAS found that, regardless of age, there was similarity in the nursing workload upon

admission, as well as in the evolution of patient care demands.[28]

It should be noted that, according to the TISS-28, basic activities correspond to routine care and medication administration, while the ventilatory and cardiovascular support categories include intubation, any form of ventilation, airway care, vasoactive drug administration by infusion pumps and care related to intravascular catheters,[39] interventions found in this study and associated with the occurrence of moderate and severe AEs in elderly patients.

Among the types of damage found, physiopathological damage affected most of the elderly who suffered from AEs. This is an important cause of clinical instability and is mainly related to increased length of hospital stay and risk of infection.[6] It is important to mention that the second major predominance of moderate and severe AEs in this sample were infections, which certainly caused physiopathological damage with cardiovascular, respiratory and other alterations.

In this study, the degree of damage, understood as the severity, duration and therapeutic repercussions derived from an AE, was predominantly moderate. In view of the presentation of physiological changes and the consequent need for interventions, the risks of longer hospitalization and other complications can result in permanent or long-term damage to the elderly.[6]

The severity of the elderly, represented by the probability of SAPS II death before the occurrence of moderate and severe AEs, amounted to 22% and subsequently increased to 29%. Regarding the nursing workload before the occurrence, the average was 75.2%, close to that found in research carried out in adult patients, with a mean age of around 60 years (66.5%).[5]

When comparing these averages at two moments, that is, before and after a moderate and severe AE, there was a statistically significant difference in severity and nursing workload. Differently from this investigation performed with elderly patients, in a similar study with a sample of adult patients, the only difference found was in the average workload score.[40]

The differences shown in this study regarding the increased severity and reduction of the nursing workload allow us to suppose that the aggravation in the clinical condition of the elderly after AE, contributed to the worsening of their general condition, leading to the maintenance of essential nursing care, which implied a decrease in the workload. These results, however, point to the need for future studies that explore these consequences in a more controlled way.

As a limitation of this study, in addition to being performed in a single institution, the choice of the WHO classification made it difficult to compare and explore AEs with studies that had used the same classification. Regardless of this, a more detailed exploratory analysis of each type of moderate and severe AEs found in critical care is recommended in further studies. Also, the incipient evidence about AE in this population and the impact of the events on the clinical evolution and mortality of this specific group of patients was another limitation when comparing the results with the literature.

CONCLUSION

The development of this study allowed us to conclude that the elderly who were victims of moderate and severe AD showed a long length of stay at the ICU compared to those who were not.

The mean NAS score decreased 24 hours after the occurrence of moderate and severe AE among the elderly in the ICU, while the severity represented by the probability of death increased.

Evidence on the consequences of AEs, specifically involving the elderly, and their impact on patients' severity and hours of nursing care, remains incipient. Hence, in the context of population aging, the objective assessment of these events' behavior was justified, not only due to the existing knowledge gap, but also to support the follow-up and monitoring in view of the characteristics of this age range.

REFERENCES

1. Fundo de População das Nações Unidas (UNFPA), Nova York e pelo Help Age International, Londres. Envelhecimento no Século XXI: celebração e desafio [Internet]. 2012 [cited 2016 Mar 21]. Available from: http://www.unfpa.org/sites/default/files/pub-pdf/Portuguese-Exec-Summary_0.pdf
2. Boeckxstaens P, De Graaf P. Primary care and care for older persons: position paper of the European Forum for Primary Care. Qual Prim Care [Internet]. 2011 [cited 2016 Mar 21]; 19(6):369–89. Available from: http://primarycare.imedpub.com/primary-care-and-care-for-older-persons-position-paper-of-the-european-forum-for-primary-care.pdf
3. Oliveira VCR, Nogueira LS, Andolhe R, Padilha KG, Sousa RMC. Clinical evolution of adult, elderly and very elderly patients admitted in Intensive

Care Units. Rev Latino-am Enfermagem [Internet]. 2011 [cited 2016 Mar 21]; 19(6):[08 screen] Available from: http://www.revistas.usp.br/rlae/article/viewFile/4450/5893

4. Camuci MB, Martins JT, Cardeli AAM, Robazzi MLCC. Nursing Activities Score: nursing work load in a burns Intensive Care Unit. Rev Latino-am Enfermagem [Internet]. 2014 [cited 2017 May 9]; 22(2):325-31. Available from: http://www.scielo.br/pdf/rlae/v22n2/0104-1169-rlae-22-02-00325.pdf
5. Gonçalves LA, Garcia PC, Toffoletto MC, Telles SCR, Padilha KG. The need for nursing care in Intensive Care Units: daily patient assessment according to the Nursing Activities Score (NAS). Rev Bras Enferm [Internet]. 2006 [cited 2016 Apr 03]; 59(1):56-60. Available from: http://www.scielo.br/pdf/reben/v59n1/a11v59n1.pdf
6. World Health Organization (WHO). The Conceptual Framework for the International Classification for Patient Safety v1.1. Final Technical Report and Technical Annexes, 2009. Available from: http://www.who.int/patientsafety/taxonomy/icps_full_report.pdf
7. Naples JG, Hanlon JT, Schmader KE, Semla TP. Recent literature on medication error sand adverse drug events in older adults. J Am Geriatr Soc.[Internet]. Feb 2016 [cited 2016 Apr 10]; 64(2):401-8. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4760841/pdf/nihms724554.pdf
8. Pedreira LC, Brandao AS, Reis AM. Adverse event in elderly patients in Intensive Care Unit. Rev Bras Enferm [Internet]. 2013 [cited 2016 Apr 10]; 66(3):429-36. Available from: http://www.scielo.br/pdf/reben/v66n3/a19v66n3.pdf
9. Inoue KC, Matsuda LM, Melo WA, Murassaki ACY, Hayakawa LY. Risk of falling out of bed. Nursing challenge for the patient's safety. Invest Educ Enferm [Internet]. 2011 [cited 2016 Apr 10]; 29(3):459-66. Available from: http://aprendeenlinea.udea.edu.co/revistas/index.php/iee/article/view/8679/9820
10. Lorenzini E, Santi JAR, Báo ACP. Patient safety: analysis of the incidents notified in a hospital, in south of Brazil. Rev Gaúcha Enferm. [Internet]. 2014 [cited 2017 May 10]; 35(2):121-7. Available from: http://www.scielo.br/pdf/rgenf/v35n2/1983-1447-rgenf-35-02-00121.pdf
11. Mansah M, Griffiths R, Fernandez R, Chang E, Thuy Tran D. Older folks in hospitals: the contributing factors and recommendations for incident prevention. J Patient Saf. 2014; 10(3):146-53.
12. Sattar S, Alibhai SM, Spoelstra SL, Fazelzad R, Puts MT. Falls in older adults with cancer: a systematic review of prevalence, injurious falls, and impact on cancer treatment. Support Care Cancer [Internet]. 2016 [cited 2016 May 02]; Available from: https://link.springer.com/article/10.1007%2Fs00520-016-3342-8
13. Paiva MCMS, Paiva SAR, Berti HW, Campana AO. Characterization of patient falls according to the notification in adverse event reports. Rev Esc Enferm USP [Internet]. 2010 [cited 2016 May 02]; 44(1):134-8. Available from: http://www.scielo.br/pdf/reeusp/v44n1/en_a19v44n1.pdf
14. Pedrosa IL, Silva MSML, Araújo AA, Schwanke CHA, DeCarli GA, Gomes I. Pressure ulcers in elders and in non-elders: a historical cohort study. Online Braz J Nurs [Internet]. 2014 Mar [cited 2017 May 10]; 13(1):82-91. Available from: http://www.revenf.bvs.br/pdf/objn/v13n1/en_v13n1a10.pdf
15. Cremasco MF, Wenzel F, Zanei SS, Whitaker IY. Pressure ulcers in the intensive care unit: the relationship between nursing workload, illness severity and pressure ulcer risk. J Clin Nurs [Internet]. 2013 [cited 2016 May 06]; 22(15-16):2183-91. Available from: http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2702.2012.04216.x/epdf
16. Neuraz A, Guérin C, Payet C, Polazzi S, Aubrun F, Dailler F, et al. Patient mortality is associated with staff resources and workload in the ICU: a multicenter observational study. Crit Care Med [Internet]. 2015 [cited 2016 May 06]; 43(8):1587-94. Available from: https://www.massnurses.org/files/file/Legislation-and-Politics/ICU-Staffing-article-August-2015.pdf
17. Cawthorn L, Rybak L. Workload measurement in a community care program. Nurs Econs [Internet]. 2008 [cited 2016 May 20]; 26(1):45-8. Available from: http://content.ebscohost.com/ContentServer.asp?T=P&P=AN&K=105869376&S=R&D=ccm&EbscoContent=dGJyMNXb4kSeprU4yOvsOLCmr0%2BeprdSs624Sq%2BWx WXS&ContentCustomer=dGJyMPGnsEizr7BOuePfgeyx44Dt6fIA
18. Needham J. Accuracy in workload measurement: a fact or fallacy? J Nurs Manag. 1997 Mar; 5(2):83-7.
19. Gaidizinsk RR, Fugulin MF. Dimensionamento de pessoal de enfermagem en unidade de terapia intensiva. In: Associação Brasileira de Enfermagem, organizador. Programa de atualização em enfermagem: saúde do adulto (PROENF). Porto Alegre (RS): Artmed Pan-americana Editora; 2006.
20. Leone C, Bruyneel L, Anderson JE, Murrells T, Dussault G, Henriques de Jesus É, et al. Work environment issues and intention-to-leave in Portuguese nurses: A cross-sectional study. Health Policy [Internet]. 2015 Dec [cited 2016 May 20]; 119(12):1584-92. Available from: http://www.sciencedirect.com/science/article/pii/S0168851015002432?via%3Dihub
21. Dall'Ora C, Griffiths P, Ball J, Simon M, Aiken LH. Association of 12 h shifts and nurses' job satisfaction, burnout and intention to leave: findings from a cross-sectional study of 12 European countries. BMJ Open [Internet]. 2015 Aug [cited 2016 Jun 07]; 5(9): Available from: http://bmjopen.bmj.com/content/5/9/e008331.full.pdf+html

22. Toffoletto MC, Padilha KG. Consequences of medical errors in intensive and semi-intensive care units. Rev Esc Enferm USP [Internet]. 2006 [cited 2016 Jun 07]; 40(2):247-52. Available from: http://www.scielo.br/pdf/reeusp/v40n2/12.pdf

23. Gonçalves LA, Andolhe R, Oliveira EM, Barbosa RL, Faro AC, Gallotti RM, et al. Nursing allocation and adverse events/incidents in intensive care units. Rev Esc Enferm USP [Internet]. 2012 [cited 2016 Jun 17]; 46(Esp):71-7. Available from: http://www.scielo.br/pdf/reeusp/v46nspe/en_11.pdf

24. Ahmed AH, Thongprayoon C, Schenck LA, Malinchoc M, Konvalinová A, Keegan MTet al. Adverse in-hospital event care associated with increased in-hospital mortality and length of stay in patients with or at risk of acute respiratory distress syndrome. Clin Proc. 2015; 90(3):321-8.

25. Pottier V, Daubin C, Lerolle N, Gaillard C, Viquesnel G, Plaud B, et al. Overview of adverse events related to invasive procedures in the intensive care unit. Am J Infect Control [Internet]. 2012 [cited 2016 Jun 17]; 40(3):241-6. Available from: http://www.sciencedirect.com/science/article/pii/S0196655311003269?via%3Dihub

26. Miranda DR, Nap R, Rijk A, Schaufeli W, Iapichino G. Nursing Activities Score (NAS). Crit Care Med. 2003; 31(2):374-82.

27. Le Gall JR, Lemeshow S, Saulnier F. A new Simplified Acute Physiology Score (SAPS II) based on a European/North American multicenter study. JAMA. 1993; 270(24): 2957-63.

28. Sousa CR, Goncalves LA, Toffoletto MC, Leao K, Padilha KG. Predictors of nursing workload in elderly patients admitted to intensive care units. Rev Latino-am Enfermagem [Internet]. 2008 [cited 2016 Jun 20]; 16(2):218-23. Available from: http://www.scielo.br/pdf/rlae/v16n2/08.pdf

29. Kelly DM, Kutney-Lee A, McHugh MD, Sloane DM, Aiken LH. Impact of critical care nursing on 30-day mortality of mechanically ventilated older adults. Crit Care Med [Internet]. 2014 [cited 2016 Jun 20]; 42(5):1089-95.Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3993087/pdf/nihms570089.pdf

30. Roque KE, Tonini T, Melo ECP. Adverse events in the intensive care unit: impact on mortality and length of stay in a prospective study. Cad Saúde Pública [Internet]. 2016 [cited 2017 May 10]; 32(10):e00081815. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-311X2016001005001&lng=en&tlng=en

31. Lucchini A, De Felippis C, Elli S, Schifano L, Rolla F, Pegoraro F, Fumagalli R. NursingActivities Score (NAS): 5 years of experience in the intensive care units of an Italian University hospital. Intensive Crit Care Nurs [Internet]. 2014 [cited 2016 Jun 20]; 30(3):152-8. Available from: https://www.researchgate.net/profile/Stefano_Elli2/publication/259473263_Nursing_Activities_Score_(NAS)_5_Years_of_experience_in_the_intensive_care_units_of_an_Italian_University_hospital/links/02e7e52bff47c7163b000000.pdf

32. Griffiths P, Dall'Ora C, Simon M, Ball J, Lindqvist R, Rafferty AM, et al. Nurses' shift length and overtime working in 12 European countries: the association with perceived quality of care and patient safety. Med Care [Internet]. 2014 Nov [cited 2016 Jun 20]; 52(11):975-81. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4196798/

33. Kelly D, Kutney-Lee A, Lake ET, Aiken LH. The critical care work environment and nurse-reported health care-associated infections. Am J Crit Care. [Internet]. 2013 Nov [cited 2016 Jun 20]; 22(6):482-8. Available from: http://ajcc.aacnjournals.org/content/22/6/482.full.pdf

34. Silva GLG, Inoue KC, Nicola AL, Matsuda LM. Influence of dimensioning the nursing staff on the quality of care of the critical patient. Texto Contexto Enferm [Internet]. 2011 Out-Dez [cited 2016 Sept 27]; 20(4):796-802. Available from: http://www.scielo.br/pdf/tce/v20n4/20.pdf

35. Szlejf C, Farfel JM, Curiati JA, Couto Junior EB, Jacob Filho W, Azevedo RS. Medical adverse events in elderly hospitalized patients: A prospective study. Clinics [Internet]. 2012 [cited 2017 May 08]; 67(11):1247-52. Available from: http://www.scielo.br/scielo.php?script=sci_abstract&pid=S1807-59322012001100004&lng=en&nrm=iso

36. Pintado MC, Villa P, Luján J, Trascasa M, Molina R, González-García N, et al. Mortality and functional status at one-year of follow-up in elderly patients with prolonged ICU stay. Med intensiva. 2016; 40(5):289-97.

37. Saldaña A, Rodríguez D, Díaz SM, Cavallo JC, Grajales EZ, Tolosa RV, et al. Study of adverse events, factors and periodicity in hospitalized patients in ICU. Enferm Global [Internet]. 2016 [cited 2017 May 10]; 42:324-40. Available from: http://revistas.um.es/eglobal/article/viewFile/215791/192481

38. Silva LD, Camerini FG. Analisys of the intravenous medication administration in sentinel network hospital. Texto Contexto Enferm [Internet]. 2012 [cited 2017 May 10]; 21(3):633-41. Available from: http://www.scielo.br/pdf/tce/v21n3/en_v21n3a19.pdf

39. Garcia PC, Gonçalves LA, Ducci AJ, Toffoletto MC, Ribeiro SC, Padilha KG. Therapeutic interventions in Intensive Care Units: analysis according to Therapeutic Intervention Scoring System-28 (TISS-28). Rev Bras Enferm [Internet]. 2005 [cited 2016 Jun 22]; 58(2):194-9. Available from: http://www.scielo.br/pdf/reben/v58n2/a13.pdf

40. Silva SC. Ocorrências iatrogênicas em unidades de

terapia intensiva: impacto na gravidade do paciente e na carga de trabalho de enfermagem [tese]. São Paulo (SP): Universidade de São Paulo, Escola de Enfermagem; 2003.

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