Rev Rene. 2022;23:e72426.
DOI: 10.15253/2175-6783.20222372426
www.periodicos.ufc.br/rene

Original Article

Incidence and risk factors for incidents in intensive care patients*

Incidência e fatores de risco para incidentes em pacientes em terapia intensiva

How to cite this article:
Campos DMP, Toledo LV, Matos SS, Alcoforado CLGC, Ercole FF. Incidence and risk factors for incidents in intensive care patients. Rev Rene. 2022;23:e72426. DOI: https://doi.org/10.15253/2175-6783.20222372426

Daniela Mascarenhas de Paula Campos[1]
Luana Vieira Toledo[2]
Selme Silqueira de Matos[1]
Carla Lucia Goulart Constant Alcoforado[1]
Flávia Falci Ercole[1]

*Extracted from the doctoral qualification project "Segurança do paciente: uma análise das práticas e incidentes de um Centro de Terapia Intensiva", Universidade Federal de Minas Gerais, 2020.

[1]Universidade Federal de Minas Gerais.
Belo Horizonte, MG, Brazil.
[2]Universidade Federal de Viçosa.
Viçosa, MG, Brazil.

Corresponding author:
Daniela Mascarenhas de Paula Campos
Av. Alfredo Balena, 190, Santa Efigênia.
CEP: 30130-100.
Belo Horizonte, MG, Brazil.
E-mail: danielamascarenhas2021@gmail.com

Conflict of interest: the authors have declared that there is no conflict of interest.

ABSTRACT
Objective: to estimate the incidence and identify the risk factors for incidents in patients of an intensive care center. **Methods:** this is a longitudinal, prospective, analytical, and exploratory study with 173 patients admitted to the intensive care unit. The incidents were categorized as clinical process/procedure, care associated infections, behavior, documentation, medication/intravenous fluids, nutrition, blood products, accidents, and medical equipment. **Results:** the incidence density was 134.45 incidents per 1,000 patient-days, highlighting the main categories: clinical process/procedure (71.5%) and care-related infections (15.3%). Length of stay in the intensive care unit (Risk ratio: 1.03; Confidence interval: 1.01-1.05; p=0.000) and use of central venous catheter (Risk ratio 1.02; Confidence interval: 1.00-1.04; p=0.040) were identified as risk factors. **Conclusion:** there was a high occurrence of incidents in the intensive care unit, especially in patients with longer hospital stay and use of central venous catheters. **Contributions to practice:** identifying incidents and associated risk factors will allow managers and professionals to recognize patients at higher risk and implement measures to ensure systematic and quality care to minimize the occurrence of adverse events in the institution.
Descriptors: Adult Health; Patient Safety; Intensive Care Units; Critical Care Nursing.

RESUMO
Objetivo: estimar a incidência e identificar os fatores de risco para incidentes em pacientes de um centro de terapia intensiva. **Métodos:** trata-se de estudo longitudinal, prospectivo, analítico e exploratório com 173 pacientes internados no centro de terapia intensiva. Os incidentes foram categorizados em processo clínico/procedimento, infecções associadas à assistência, comportamento, documentação, medicação/fluidos endovenosos, nutrição, hemoderivados, acidentes e equipamento médico. **Resultados:** a densidade de incidência foi de 134,45 incidentes por 1.000 pacientes-dia, destacando-se as principais categorias: processo/procedimento clínico (71,5%) e infecções relacionadas à assistência (15,3%). O tempo de permanência no centro de terapia intensiva (Razão de Risco: 1,03; Intervalo de confiança: 1,01–1,05; p=0,000) e de uso de cateter venoso central (Razão de Risco 1,02; Intervalo de confiança: 1,00–1,04; p=0,040) foram identificados como fatores de risco. **Conclusão:** verificou-se elevada ocorrência de incidentes no centro de terapia intensiva, sobretudo nos pacientes com maior tempo de internação e de utilização de cateter venoso central. **Contribuições para a prática:** identificar os incidentes e os fatores de risco associados permitirão aos gestores e profissionais reconhecer os pacientes com maior risco e implementar medidas que garantam assistência sistematizada e de qualidade com vistas à minimização da ocorrência dos eventos adversos na instituição.
Descritores: Saúde do Adulto; Segurança do Paciente; Cuidados Críticos; Unidades de Terapia Intensiva; Enfermagem de Cuidados Críticos.

Received: Nov. 12nd 2021; Accepted: Apr. 11st 2022.

Introduction

Intensive care centers, because they offer specialized care with qualified human resources and high technological density, enable the survival of patients with severe organ dysfunctions[1]. During care, it is necessary to handle medical equipment, patients, and invasive devices, besides administering antibiotics and other drugs, which may predispose to increased risk of incidents[2].

According to the World Health Organization (WHO) International Classification of Patient Safety, incidents are defined as situations that may result or have resulted in unnecessary harm to the patient because of care. Harm is characterized by any impairment of the body's structure or function and/or any effect thereof, including injury, disease, suffering, death, disability, or dysfunction, and can be of a physical, social, or psychological nature. When the incident causes any harm to the patient, it is considered an adverse event[3-5].

Estimates show a 10.5% occurrence of adverse events in Latin America, of which 28% resulted in disability and 6% in death. 60% of the events are considered preventable[5]. In 2016, in Brazil, there were 19,128,382 hospitalizations, of which 1,377,243 patients suffered at least one acquired condition during hospitalization, with 172,154 to 432,301 patients dying from acquired conditions[6].

It is noteworthy that the underreporting and omission of data is still a problem in many institutions, associated with the punitive nature attributed to the error, which hinders the implementation of measures to promote patient safety and improve the quality of care[7]. Patient safety includes a set of measures necessary to reduce, to an acceptable minimum, the risks of unnecessary damage that may be associated with health care[3,8].

In this context, considering the impact of adverse events on patient morbidity and mortality, the characteristics of care and the profile of critically ill patients, it is essential to constantly assess the risk of occurrence of these events. This evaluation should be performed by daily monitoring of incidents, searching for related factors, and establishing safe practices[9-10].

Despite advances in the patient safety area, a high incidence of adverse events in hospitalized patients worldwide and in Brazil is still noted, especially in critically ill patients, who are susceptible to suffering some type of incident during their stay. Thus, further studies are required to address the incidence of events in critically ill patients admitted to the intensive care unit and their intervening factors to support actions that ensure safe and quality care.

It is understood that incidents are related to failures in work processes, and it is important to verify the presence of weaknesses and risk factors, in addition to adopting preventive strategies, since they can cause damage and harm to patients as well as additional costs to the health system. In this sense, there is a need for the development of studies that evaluate this relevant public health problem among critically ill patients, to assist health professionals in the search for strategies to prevent its occurrence and minimize risks.

Thus, this study aimed to estimate the incidence and identify the risk factors for incidents in patients of an intensive care center.

Methods

This was a longitudinal, prospective, analytical exploratory study guided by Strengthening the Reporting of Observational (STROBE). The study was developed with critically ill patients admitted to an intensive care unit of a large, highly complex hospital in Belo Horizonte, Minas Gerais, Brazil. This center has 20 beds for adult and elderly patients in critical situations resulting from clinical or surgical problems.

Initially, the eligible population for the study consisted of 184 adult patients admitted to the intensive care center from September to November 2019 and aged 18 years or older. Of these, 11 patients did not remain hospitalized for at least 24 hours before

the start of data collection and were excluded. Thus, the convenience sample was composed of 173 patients, followed during their stay in the intensive care unit to verify the occurrence of the event. There was no loss of patients or information throughout the follow-up. As patients were admitted to the unit, they were included in the study and followed up daily at the bedside in the morning, afternoon, and evening periods. Data were collected by the main researcher and two auxiliary researchers previously trained in incident identification. The training, conducted by the main researcher, occurred before the beginning of the data collection in the intensive care unit through theoretical and practical training of the auxiliary researchers. At the end, it was verified an agreement of more than 94% between the researchers. It is important to emphasize that the focus of this study was the monitoring of care processes and, therefore, the unit's healthcare workers were not observed in their practice.

As a source of complementary information, we used the incident record spreadsheet and the patient's electronic medical record. The instrument for data collection contained information about the occurrence of incidents, sociodemographic, clinical and hospitalization data of the patients.

The incidents, considered as primary outcomes, were categorized into groups as proposed by the WHO International Classification for Patient Safety[11] in clinical process/procedure (pressure injury; device-related injury; incontinence-related dermatitis; loss of enteral catheter; skin injury related to medical adhesives; skin breakdown; readmission in less than 48 hours; loss of intra-arterial pressure monitoring catheter; reintubation in less than 24 hours; loss of indwelling urinary catheter; loss of central venous access; friction injury; delay in starting dialysis; withdrawal of assistive devices; catheter-associated injury; delay in passing enteral catheter; loss of drain; incorrect blood pressure measurement; loss of peripheral venous access); care-associated infections (catheter-associated bloodstream infection; ventilator-associated pneumonia; pneumonia; urinary tract infection related to indwelling urinary catheter; peritonitis; ventilator-associated tracheobronchitis; phlebitis; endocarditis); behavior (failure to adhere to contact precaution; failure to communicate); documentation (incorrect identification on fluid balance incorrect identification on solution label); medication/intravenous fluids (delayed drug administration; incorrect drug dilution; adverse reaction; higher than prescribed medication flow rate); nutrition (delayed administration of enteral diet; delayed administration of nutritional supplement); blood products (adverse reaction; incorrect filter use); accident (fall from bed) and medical equipment (malfunction of monitor).

Were included as covariates/risk factors the quantitative variables (collected as continuous) as age, length of stay in the intensive care unit, severity scores (obtained from admission until the first 24 hours of hospitalization) as Acute Physiologic and Chronic Health Evaluation II (Apache II), Sequential Organ Failure Assessment (SOFA), Simplified Acute Physiology Score II and III (SAPS II, III), enteral catheter time, orotracheal tube time, tracheostomy time, time of oxygen therapy, central venous catheter time, indwelling urinary catheter time, and arterial catheter time, and the qualitative variables (collected as categorical) such as gender (male/female), comorbidities (no/yes), origin (ward/apartment, operating room, emergency room others), medical diagnosis at admission (infectious, gastrointestinal, neurological, sepsis, pulmonary, musculoskeletal, renal, cardiac, liver transplant and other diseases), use of precaution (standard, contact, aerosol), outcome of hospitalization (discharge/death) and use of vasoactive drugs (no/yes). It is noteworthy that for the bivariate and multivariate analyses, the first category of each variable was chosen as reference, which in the dichotomous variables was represented by "no".

The data obtained were tabulated in Microsoft Excel spreadsheets and analyzed in SPSS, version 23. Descriptive statistics were used, with presentation of absolute and percentage frequencies for qualitative variables and mean/standard deviation for variables

with normal distribution and median/quartiles one and three for variables with non-normal distribution. To test the normality of the variables, the Shapiro Wilk test was used.

Incident incidence density was estimated based on the calculation of the number of new incident cases over the sum of the time patients were at risk of developing an incident.

To evaluate the association of covariates (continuous and categorical) with the occurrence of incidents, Poisson Regression with robust variance was performed to estimate the risk ratios, the respective 95% confidence intervals and p-values. For the multivariate analysis, the covariates that presented a p--value <0.20 in the bivariate analysis were considered. Variables with statistical significance (p<0.05) were retained in the single multivariate model.

This study met all the principles described in Resolution No. 466/2012 for the maintenance of ethical aspects involving research with human beings. It was approved by the Ethics Committee on Research with Human Beings of the proposing institution with opinion No. 3,209,447/2019 and Certificate of Submission for Ethical Consideration No. 90063518.4.3001.5125.

Results

Among the total number of patients who comprised the study, there was a predominance of male patients (56.1%), elderly (71.1%), with comorbidities (92.5%), coming from the operating room (49.7%) and hospitalized due to gastrointestinal diseases (19.6%), followed by neurological disease (15.6%) and sepsis (12.7%). It was found that 61 (35.0%) of the patients had some type of incident.

Based on the bivariate analysis of the quantitative independent variables in relation to the occurrence or not of incidents, it was identified that patients who suffered incidents presented higher scores in the severity scores evaluated as APACHE II, SOFA, SAPS II and III (p=0.000), longer hospital stay and use of invasive devices such as enteral catheter, orotracheal tube, tracheostomy, oxygen therapy, central venous catheter, indwelling urinary catheter, and arterial catheter (p=0.000) as shown in Table 1.

Table 1 – Bivariate analysis of quantitative independent variables in relation to the occurrence or not of incidents. Belo Horizonte, MG, Brazil, 2019

Variables	Intercept (βo)	Wald's Chi-square	df*	Risk Ratio (95% CI)†	p-value
Age	0.32	0.03	1	1.00 (0.99-1.00)	0.820
Time of permanence	0.09	20.31	1	1.04 (1.03-1.05)	0.000
Score					
Acute Physiologic and Chronic Health Evaluation II	0.10	14.96	1	1.01 (1.01-1.02)	0.000
Sequential Organ Failure Assessment	0.20	6.53	1	1.04 (1.01-1.06)	0.000
Simplified Acute Physiology Score II	0.19	7.38	1	1.06 (1.03-1.07)	0.000
Simplified Acute Physiology Score III	0.19	7.02	1	1.05 (1.01-1.08)	0.000
Time of use of invasive devices					
Enteral catheter	0.34	1.21	1	1,04 (1,03-1,06)	0.000
Orotracheal tube	0.34	1.25	1	1.07 (1.05-1.09)	0.000
Tracheostomy	0.32	3.86	1	1.06 (1.03-1.08)	0.000
Oxygen therapy	0.32	3.78	1	1.03 (1.01-1.05)	0.000
Central venous catheter	0.32	3.78	1	1.05 (1.04-1.06)	0.000
Urinary bladder catheter	0.32	4.22	1	1.04 (1.03-1.05)	0.000
Arterial catheter	0.32	2.99	1	1.05 (1.03-1.06)	0.000

*df: Degrees of Freedom; †CI: Confidence Interval (95%)

Regarding the bivariate analysis of qualitative variables and the occurrence of incidents, there was an association between patients referred from the operating room (p=0.000) admitted due to gastrointestinal (p=0.000), neurological (p=0.020), renal (p=0.020), musculoskeletal (p=0.010), renal transplant (p=0.030) and other diseases (p=0.040); used vasoactive drugs during hospitalization (p=0.000) and died (p=0.010). It is noteworthy that the criterion for choosing the reference category related to the medical diagnosis "infectious disease" was due to its lower occurrence and lack of significance (Table 2).

Table 2 – Bivariate analysis of qualitative independent variables in relation to the occurrence or not of incidents. Belo Horizonte, MG, Brazil, 2019

Variables	Intercept (βo)	Wald's Chi-square	df*	Risk Ratio (95% CI)†	p-value
Gender	0.37	0.09	1	-	-
Male	-	-	-	-	-
Female	-	-	-	0.97 (0.84-1.12)	0.700
Comorbidities	0.36	0.09	1	-	-
No	-	-	-	-	-
Yes	-	-	-	1.05 (0.81-1.36)	0.720
Source	0.43	15.92	3	-	-
Ward/apartment	-	-	-	-	-
Surgical center	-	-	-	1.45 (1.25-1.69)	0.000
Emergency room	-	-	-	0.84 (0.66-1.02)	0.120
Others	-	-	-	0.83 (0.64-1.06)	0.140
Medical Diagnosis	0.22	6.37	10	-	-
Infectious Disease	-	-	-	-	-
Gastrointestinal Disease	-	-	-	0.02 (0.00-0.23)	0.000
Neurological Disease	-	-	-	0.08 (0.01-0.67)	0.020
Sepsis	-	-	-	0.19 (0.04-1.75)	0.160
Lung Disease	-	-	-	0.14 (0.02-1.54)	0.140
Musculoskeletal disease	-	-	-	0.04 (0.00-0.38)	0.010
Kidney disease	-	-	-	0.04 (0.01-0.45)	0.020
Heart disease	-	-	-	0.12 (0.01-1.34)	0.090
Liver transplantation	-	-	-	0.09 (0.01-1.08)	0.080
Kidney transplantation	-	-	-	0.03 (0.00-0.41)	0.030
Other - hematological, metabolic, oncological	-	-	-	0.07 (0.01-0.92)	0.040
Precaution Type	0.42	16.35	2	-	-
Standard precaution	-	-	-	-	-
Contact precaution	-	-	-	1.23 (0.48-2.75)	0.720
Aerosol precaution	-	-	-	0.93 (0.11-10.62)	0.890
Use of vasoactive drugs	0.52	7.41	1	-	-
No	-	-	-	-	-
Yes	-	-	-	3.55 (2.15-7.22)	0.000
Outcome	0.61	3.06	1		
Discharge	-	-	-	-	-
Death	-	-	-	2.13 (1.13-7.36)	0.010

*df: Degrees of Freedom; †CI: Confidence Interval (95%)

In this cohort, the incident incidence density was 134.45 per 1,000 patient-days (144 incidents in 1,071 patient-days). Of the total 144 (100%) incidents, the highest percentages found were related to clinical/procedure types 103 (71.5%) and care-associated infections 22 (15.3%).

Among the 103 (71.5%) incidents in the category clinical process/procedure, there was a predominance of pressure ulcers 33 (32%), followed by 11 (10.7%) device-related injuries and 9 (8.7%) incidents of incontinence-related dermatitis. Among the 22 (15.3%) incidents of the category infections associated with assistance, catheter-associated bloodstream infection and ventilator-associated pneumonia were the most frequent with 6 (27.3%) events each.

In the final multivariate analysis, the length of stay of patients in the intensive care unit and the time of use of central venous catheter remained in the

model, explaining the occurrence of incidents. It was found that each day a patient stays in an intensive care bed and each day a central venous catheter is used increases the risk of incident by 3% and 2%, respectively (Table 3).

Table 3 – Multivariate analysis of risk factors and occurrence of incidents. Belo Horizonte, MG, Brazil, 2019

Variables	Intercept (βo)	Wald's Chi-square	df*	Risk Ratio (95% CI)†	p-value
Length of stay in the intensive care unit	-	7.75	1	1.03 (1.01 –1.05)	0.000
Central venous catheter time	-	3.33	1	1.02 (1.00- 1.04)	0.040
Constant	-1.51	72.65	1	-	-

*df: Degrees of Freedom; †CI: Confidence Interval (95%)

Discussion

The high number of patients affected by some type of incident in this study is corroborated by other national[5,10-11] and international studies[12] and points to the need to stimulate corrective and not punitive actions, such as the development of programs aimed at training professionals and improving the quality of care.

It is believed that, to strengthen the patient safety culture, health institutions should devote themselves to the implementation of institutional protocols and professional training, with a view to avoiding the repetition of errors, preventing risks, and improving the care team, especially the nursing team, which works continuously with critically ill patients, most of whom depend on care to perform their self-care activities[13].

A longer stay in the intensive care unit and longer time using a central venous catheter were associated with the occurrence of incidents. These factors measure the intrinsic risk, determined by the patient's severity, as well as the extrinsic risk, verified by the greater exposure to invasive procedures. The high use of medication, the clinical severity profile and the use of invasive devices increase the risk of the patient being affected by incidents, which can lead to increased mortality and length of hospital stay, thus increasing care costs[14].

The length of stay can change according to the patient's clinical condition and care management, being not only an indicator of the patient's severity, but also of the quality of care. In daily practice, there is a "vicious cycle" between the occurrence of incidents and the length of stay of patients. At the same time, a longer stay exposes the patient to incidents, because patients suffering from adverse events may remain hospitalized for a longer period to treat the damage caused. Different studies show that the length of stay of patients increases the occurrence of incidents, corroborating the findings of this investigation[12,15-16].

The time of venous catheter use may be considered a modifiable factor that increases the chance of occurrence of incidents, especially those of infectious origin, such as primary bloodstream infection[17]. It is also important to consider that invasive procedures, such as catheter implantation and use, are part of the treatment indication, as they help in the administration of fluids and monitoring of hemodynamic parameters in the management of patients with decompensated heart failure, pulmonary hypertension, and shock[18]. However, the daily evaluation of the need for maintenance of its use becomes fundamental, as well as the implementation of nursing interventions to minimize complications.

It is noteworthy that the non-punitive culture, with encouragement to report incidents, helps institutions to recognize their weaknesses and promote continuous care improvement[13]. These improvements should include structural aspects of health services and human resources qualification, including the nursing team.

In this context, the nurse's role has great importance in monitoring the patient at the bedside, identifying possible risks of harm to patients and their causes, monitoring the problems identified, disclosing to the team the occurrence rates of incidents, valuing

constant educational practices with the use of evidence-based institutional care protocols, and implementing preventive measures that minimize the occurrence of incidents and adverse events.

Study limitations

This study presents as limitations the use of convenience sampling and the use of secondary data, obtained from the professionals' records in medical charts. It is known that a non-probability sample has inherent limitations and may present results that are not representative of all critically ill patients, usually admitted to the intensive care unit, although during the evaluated period there was a significant turnover of patients admitted to the sector. The use of secondary data may cause problems of data reliability regarding the occurrence of underreporting of incidents, however, in this study, to circumvent this problem, a strategy of incident confirmation based on daily bedside observation was used. It is also noteworthy that the high incidence of different types of incidents evidences the care taken by professionals to record them in the unit. In addition, this study followed up 173 patients continuously, associating the documental analysis to the bedside observation of patients, to make the results closer to reality and, thus, counterbalance the limitations.

Contributions to practice

The findings of this study enabled the characterization of critically ill patients admitted to the intensive care unit regarding incidents and their associations, thus allowing reflection on care practice with a view to minimizing the occurrence of adverse events. Thus, managers and professionals will be able to recognize patients at higher risk and implement measures to ensure systematic and quality care. This assistance should be based on pre-established care protocols, aiming at reducing hospitalization time, costs, and the time of use of invasive care devices.

Conclusion

A high occurrence of incidents was observed in the intensive care unit, especially in patients with longer hospital stay and use of central venous catheters. Among the incidents identified, those related to the clinical process/procedure and care-associated infection categories stand out, reinforcing the importance of prioritizing prevention actions in these areas.

Authors' contribution

Conception and design, data analysis and interpretation, article writing, relevant critical review of the intellectual content: Campos DMP, Toledo LV, Matos SS, Alcoforado CLGC, Ercole FF.

Final approval of the version to be published and agreement to be responsible for all aspects of the manuscript related to the accuracy and/or completeness of any part of the work to be investigated and resolved appropriately: Campos DMP, Toledo LV, Matos SS, Alcoforado CLGC, Ercole FF.

References

1. Siqueira VRB, Carvalho Vasconcelos WPC, Santos GM, Oliveira GKS. Contribuições da tecnologia para assistência de enfermagem da Unidade de Terapia Intensiva. Sustinere. 2019;7(1):19-31. doi: https://doi.org/10.12957/sustinere.2019.40086
2. Galazzi A, Adamini I, Consonni D, Roselli P, Rancati D, Ghilardi G, et al. Accidental removal of devices in intensive care unit: an eight-year observational study. Intensive Crit Care Nurs. 2019;54:34-8. doi: https://doi.org/10.1016/j.iccn.2019.06.002
3. Bica T, Wegner W, Gerhardt L, Predebon C, Pedro E, Breigeiron M. Characteristics of patient safety incidents notified in a pediatric intensive care unit. Rev Enferm UFPE on line [Internet]. 2017 [cited Jan. 13, 2022];11(supl.10):4206-16. Available from:https://periodicos.ufpe.br/revistas/revistaenfermagem/article/view/231184/25164
4. Maia CS, Freitas DRC, Gallo LG, Araújo WN. Registry of adverse events related to health care that

results in deaths in Brazil, 2014-2016. Epidemiol Serv Saude. 2018;27(2):e2017320. doi: https://doi.org/10.5123/S1679-49742018000200004

5. Gadelha GO, Paixão HCS, Prado PR, Viana RAPP, Amaral TLM. Risk factors for death in patients with non-infectious adverse events. Rev Latino-Am Enfermagem. 2018;26:e3001. doi: https://doi.org/10.1590/1518-8345.2069.3001

6. Souza VS, Derenzo N, Costa MAR, Mendonça RR, Lima WLF, Matsuda LM. Climate of safety in intensive therapy for adults: focus on nursing professionals. Av Enferm. 2019;37(1):83-91. doi: https://doi.org/10.15446/av.enferm.v37n1.72594

7. Sousa TJ, Oliveira DF, Santos ACG, Conceição LN, Estrela FM, Marinho CS, et al. Prevention measures related to adverse events in the intensive care unit. Saúde Coletiva (Barueri). 2021;11(65):5940-55. doi: https://doi.org/10.36489/saudecoletiva.2021v11i65p5940-5955

8. Figueiredo ML, D'Innocenzo M. Adverse events related to pratical assistence: an integrative review. Enferm Glob. 2017;16(3):605-50. doi: https://doi.org/10.6018/eglobal.16.3.256091

9. Araya Farías I, Febré N. Impact of interventions in the pressure ulcer rate. Rev Calid Asist. 2017;32(6):322-7. doi https://doi.org/10.1016/j.cali.2017.10.003

10. Figueiredo ML, Oliveira e Silva CS, Brito MFSF, D'Innocenz M. Analysis of incidents notified in a general hospital. Rev Bras Enferm. 2018;71(1):111-9. doi: https://dx.doi.org/10.1590/0034-7167-2016-0574

11. Zanetti ACB, Dias BM, Bernardes A, Capucho HC, Balsanelli AP, Moura AAD, et al. Incidence and preventability of adverse events in adult patients admitted to a Brazilian teaching hospital. PLoS One. 2021;16(4):e0249531. doi: https://dx.doi.org/10.1371/journal.pone.0249531

12. Aikawa G, Ouchi A, Sakuramoto H, Ono C, Hatozaki C, Okamoto M, et al. Impact of adverse events on patient outcomes in a Japanese intensive care unit: a retrospective observational study. Nurs Open. 2021;8(6):3271-3280. doi: http://dx.doi.org/10.1002/nop2.1040

13. Mascarello A, Massaroli A, Pitilin EB, Araújo JS, Rodrigues ME, Souza JB. Incidents and adverse events notified at hospital level. Rev Rene. 2021;22:e60001. doi: https://dx.doi.org/10.15253/2175-6783.20212260001

14. Ortega DB, D'Innocenzo M, Silva LMG, Bohomol E. Analysis of adverse events in patients admitted to an intensive care unit. Acta Paul Enferm. 2017;30(2):168-73. doi: https://dx.doi.org/10.1590/1982-0194201700026

15. Toffoletto MC, Oliveira EM, Andolhe R, Barbosa RL, Padilha KG. Comparison between patient severity and nursing workload before and after the occurrence of adverse events in elderly in critical care. Texto Contexto Enferm. 2018;27(1):e3780016. doi: http://doi.org/10.1590/0104-070720180003780016

16. Barcelos RA, Tavares DMS. Factors associated with patient safety incidents among elderly people in intensive care. Acta Paul Enferm. 2017;30(2):159-67. doi: https://dx.doi.org/10.1590/1982-0194201700025

17. Melo M, Oliveira C, Rodrigues I, Souza C, Sousa C, Mendonça S, et al. Eventos adversos relacionados ao cateter venoso central em pacientes internados em um hospital de ensino. Rev Enferm Atual In Derme. 2020;93(31):e-20049.doi: https://doi.org/10.31011/reaid-2020-v.93-n.31-art.747

18. Bell T, O'Grady NP. Prevention of central line-associated bloodstream infections. Infect Dis Clin North Am. 2017;31(3):551-59. doi: https://doi.org/10.1016/j.idc.2017.05.007