Incidence and avoidability of adverse events in emergency care: a retrospective study

Incidência e evitabilidade de eventos adversos no pronto atendimento: estudo retrospectivo

Incidencia y evitabilidad de eventos adversos en unidad de pronta atención: estudio retrospectivo

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Abstract

Objective: To analyze the incidence and avoidability of adverse events in adult patients hospitalized in an emergency care unit in the countryside of Minas Gerais.

Methods: A cohort study, with a retrospective review of 296 medical records using screening (phase 1) and evaluation (phase 2) forms, completed by non-medical professionals and physicians, respectively. In the first phase, the demographic data, clinical condition of the patients, potential adverse events, and the verification of the quality of the information recorded in the medical records were evaluated. In the second phase, previously tracked adverse events were identified and characterized.

Results: There was a predominance of men, white, aged 60 or older. The cumulative incidence of adverse events was 4.4% (n=13), all of which were considered preventable, and mostly characterized as mild in severity. According to nature, 81.2% of adverse events were related to care in general. In relation to intrinsic and extrinsic factors, an average of 1.17 and 1.5 per patient, respectively, was found. It was found that a total of 17 patients were identified with potential adverse events, with 22 incidents in the analysis.

Conclusion: It was identified that 100% of adverse events were preventable and most related to general care. These findings reinforce the need to assess and understand the incidence and preventability of adverse events in emergency care units, which allows for the planning and implementation of strategies aimed at the development of control and response actions to these events, ensuring safe and quality care.

Resumo

Objetivo: Analisar a incidência e a evitabilidade de eventos adversos em pacientes adultos internados em uma unidade de pronto atendimento no município do interior mineiro.

Métodos: Estudo de coorte, com revisão retrospectiva de 296 prontuários por meio do uso de formulários de rastreamento (fase 1) e avaliação (fase 2), preenchidos por profissionais não médicos e médico, respectivamente. Na primeira fase foram avaliados os dados demográficos, condição clínica dos pacientes, potenciais eventos adversos, e a verificação da qualidade das informações registradas nos prontuários. Na segunda fase, identificou-se e caracterizou-se os eventos adversos previamente rastreados.

Resultados: Observou-se a predominância de pessoas do sexo masculino, da raça branca, com 60 anos ou mais. A incidência de eventos adversos acumulada foi de 4,4% (n=13), sendo todos considerados evitáveis, e caracterizados como de gravidade leve, em sua maioria. De acordo com a natureza, 81,2% dos eventos adversos estavam relacionados ao cuidado em geral. Já em relação aos fatores intrínsecos e extrínsecos, encontrou-se uma média de 1,17 e 1,5 por paciente, respectivamente. Constatou-se que 17 pacientes foram identificados com potencial evento adverso, com 22 incidentes na análise.

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1

Conclusão: Identificou-se que 100% dos eventos adversos eram evitáveis e a maioria relacionados ao cuidado em geral. Esses achados reforçam a necessidade de se avaliar e compreender a incidência e a evitabilidade dos eventos adversos em unidades de pronto atendimento, o que permite o planejamento e implementação de estratégias que visem o desenvolvimento de ações de controle e resposta a estes eventos, garantindo um atendimento seguro e de qualidade.

Resumen

Objetivo: Analizar la incidencia y la evitabilidad de eventos adversos en pacientes adultos internados en una unidad de pronta atención en un municipio del interior del estado de Minas Gerais.

Métodos: Estudio de cohorte, con revisión retrospectiva de 296 historias clínicas mediante el uso de formularios de rastreo (fase 1) y evaluación (fase 2), completados por profesionales no médicos y médicos, respectivamente. En la primera fase se evaluaron los datos demográficos, la condición clínica de los pacientes, los potenciales eventos adversos y la verificación de la calidad de la información registrada en las historias clínicas. En la segunda fase, se identificaron y caracterizaron los eventos adversos previamente rastreados.

Resultados: Se observó la predominancia de personas de sexo masculino, de raza blanca, de 60 años o más. La incidencia de eventos adversos acumulada fue del 4,4 % (n=13), todos fueron considerados como evitables y caracterizados de gravedad baja, en su mayoría. De acuerdo con la naturaleza, el 81,2 % de los eventos adversos estuvo relacionado con el cuidado en general. Por otro lado, con relación a los factores intrínsecos y extrínsecos, se observó un promedio de 1,17 y 1,5 por paciente, respectivamente. Se constató que 17 pacientes fueron identificados con evento adverso potencial, con 22 incidentes en el análisis.

Conclusión: Se identificó que el 100 % de los eventos adversos era evitable y la mayoría relacionados con el cuidado en general. Estos resultados refuerzan la necesidad de analizar y comprender la incidencia y la evitabilidad de los eventos adversos en unidades de pronta atención, lo que permite la planificación e implementación de estrategias que busquen la elaboración de acciones de control y respuesta a estos eventos, y así garantizar una atención segura y de calidad.

Introduction

Despite the progress observed in recent years, patient safety remains an important public health problem and preventable harm remains unacceptably frequent in all healthcare settings and among all user populations.[1]

Research carried out in several high-income countries showed a significant number of Adverse Events (AE) related to health care. In the USA, AEs are the third leading cause of death, after cancer and heart disease. In the UK, an EA is notified every 35 seconds. In Australia, more than 33 000 deaths were caused by preventable AEs.[2] In low- and middle-income countries, the resulting cost of lost productivity caused by AEs ranged from US$1.4 trillion to US$1.6 trillion per year.[1]

AE are conceptualized as any unexpected event that has caused harm to the patient, from an injury to, in some cases, death. In addition, AE are related to the health care provided, and not to the condition of the patients' disease evolution, being grouped according to severity into: mild (did not show prolonged hospitalization); moderate (there was an extension of hospitalization by at least one day); and severe (death, disability at discharge or necessary surgical intervention).[3]

Considering this concept and analyzing the different care scenarios, it is worth highlighting the urgency and emergency services that operate 24 hours a day, every day of the week, with the main objective of restoring the vital parameters of individuals who need urgent care.[4] In Brazil, these environments become essential points of attention of the Emergency Network, especially when considering all changes in the epidemiological profile and in the demands of users who use these services.[4,5]

Thus, considering this context and for standardization purposes, the term Emergency Care (EC) was adopted to characterize urgency and emergency units. So, it is noteworthy that working in an EC unit is a major challenge for health professionals, especially with regard to ensuring a culture of quality and safety in the care provided to users.[5]

EC professionals are routinely faced with adverse situations such as: patient turnover and severity; overcrowding; the limitation of human, material and structural resources; in addition to the multiplicity of tasks that sometimes compromise the quality of care provided.[6]

A study carried out in an EC in Taiwan identified an AE incidence rate of 15%, of which 93.3% were preventable. In this study, the most frequent types of AE were misdiagnosis, management problems and medication-related problems.[7] Also in this context, other studies revealed AEs resulting from the installation, handling and maintenance of

medical devices, failure to communicate and high workload.[8,9]

Thus, investments in research and actions to improve patient safety must go beyond hospital services,[7] such as the EC units. Corroborating this aspect, a recent integrative review points out that studies that use the traceability of medical records for a diagnosis of AEs and their avoidability in health services, such as EC, are extremely necessary.[10]

Based on these considerations, the relevance of this research is highlighted as an opportunity to use the results for the establishment of epidemiological parameters that indicate the dimension of the problem related to the occurrence of AE in EC, supporting decision-making for the benefit of improvements in this care modality. Thus, this study aimed to analyze the incidence and preventability of AE in adult patients hospitalized in an emergency care unit in the countryside of Minas Gerais.

Methods

Retrospective cohort study of the analysis of the incidence and avoidability of AE through a retrospective review of medical records of admissions of adult patients in an emergency room, throughout 2018.

The research was developed in a public emergency care unit, in the countryside of Minas Gerais, which provides care in the medical clinic and traumatology specialties. The unit has nine observation beds for stable patients and two emergency room beds for the accommodation of critically ill patients awaiting transfer to the tertiary service. In both types of beds, it is necessary for the patient to stay longer than 24 hours, characterizing them as inpatient beds.

It is noteworthy that the denomination "hospital bed" is established because the city/region has a lack of infirmary beds and intensive care units, as a result of which the patient remains in the EC for a period of more than 24 hours.

All records of admission to the emergency care unit, from January 1 to December 31, 2018, of adult patients (over 18 years old) admitted to the EC, whose departure (discharges/transfers/deaths) occurred in the same year, were considered eligible; admission with more than 24 hours of stay in the unit. Those with a main diagnosis referring to psychiatric illnesses were not included; of obstetric patients; and patients in palliative care with medical records. Medical records with possible absence of essential information for the study were excluded.

In view of the criteria presented, 1829 eligible medical records were observed, which after sample calculation, totaled 312 medical records. Another 53 medical records that did not meet the research inclusion criteria were excluded. In order to replace the excluded sample, a new draw of medical records was carried out within the remaining 1517. Fifty-three records corresponding to those previously excluded were selected, however, as a criterion for replacing the excluded ones, only 37 records were selected corresponding to the total excluded due to hospitalization of less than 24 hours in the Institution. Thus, 296 records totaled the sample at the end.

To calculate the sample size, a probability of occurrence of AE of 8.6% was adopted, a value used in methodologically similar studies developed in Brazil,[11-15] a significance level of 5%, an absolute error of 3% and estimated loss of 10%. The sample size was calculated using the simple random sample calculation formula: $n = Z\alpha 2.P.Q/d2$, which obtained a total of 296 medical records selected for the study. Participants were selected randomly, using the IBM SPSS Statistics software, version 25®.

The method of retrospective review of medical records proposed by researchers from the Canadian Adverse Event Study (CAES)[11] was applied, using the computerized version of the AE tracking and assessment forms, present in the IBEAS System - Hospital Adverse Event software, version 1.1, developed in 2012 by Fundação Oswaldo Cruz.[12] It is noteworthy that the research group was granted authorization to access the software and use the data collection instruments by the system developers.

The first phase of the study consists of applying the Tracking Form, organized into five data categories, namely: patient demographic data (age, gender, education and race); clinical data (intrinsic and extrinsic risk factors, performance of invasive

procedure and main diagnosis); hospitalization data (length of hospital stay, character of hospitalization and type of exit); criteria for tracking potential Adverse Events (pAE) and checking the quality of the information recorded in the medical records. In this phase, the records are analyzed by non-medical health professionals, previously qualified to screen pAE through at least one positive marker with regard to the 19 screening criteria covered by the form. Soon after, the eligible cases, with pAE confirmation, proceed to the second phase of the study.[12]

The Assessment Form is applied in the second phase of the study, carried out by the medical professional, in order to identify the previously tracked incidents and AEs, consisting of five modules described below: patient information and AE background; the injury and its consequences; hospitalization period during which the AE-case occurred; main problems in the care process; causal factors, contributing factors and the possibility of preventing adverse events with and without injury.[12]

Data collection was carried out from March to December 2020, by a team composed of 03 nurses and 01 physician. In order to minimize collection bias, it is emphasized that the professionals recruited had considerable clinical experience and in the area of patient safety, in addition to being trained in the instruments and objectives of the research. The collected data were stored in the IBEAS System – Hospital Adverse Event software, using a database management system that includes the insertion and exploitation of information through a client-server application. In a second moment, the generated database was exported for storage in spreadsheets. Descriptive statistics were applied to characterize the sample. For associations, Fisher's Exact tests were performed. Groups with or without AE and AE groups with mild and moderate severity were compared. For analyses, the R Version 3.4® software was used, considering a significance level of 5% (α=0.05) and a confidence interval (CI) of 95%.

This project was reviewed and approved by the Research Ethics Committee (Opinion Number: 3 217 868) (Certificate of Presentation of Ethical Appreciation: 06665419 0 0000 5393).

Results

A total of 296 patients took part in the first phase of the research. There was a predominance of men 161 (54.4%), white 110 (37.2%), aged 60 or older 156 (52.6%). Regarding the diagnoses of the evaluated patients, it was noticed the prevalence of conditions related to trauma 76 (25.7%), followed by diseases of the respiratory system 35 (11.8%). Regarding the investigation of the type of procedure performed in each patient, 243 (82.1%) of the patients underwent peripheral venous access (PVA) and only 1 (0.3%) patient did not undergo any type of procedure.

Regarding the intrinsic and extrinsic factors identified in each patient, an average of 1.17 intrinsic factors and 1.5 extrinsic factors per patient was obtained, with the minimum being no factor and the maximum five factors for both. Regarding the proportion of pAE per screening criterion, it was possible to observe that the most frequently selected criteria were: transfer to another acute care hospital, 78 (35.5%); and previous hospitalization in the last 12 months in patients younger than 65 years old, or previous hospitalization in the last 6 months in patients aged 65 or older, 45 (20.5%). These results verify that the EC constitutes a stage of the hospitalization process.

In a second moment, the previously tracked incidents and AEs were identified. Although 50% of the patients had positive screening for the second phase (n=148), patients who only marked screening criteria of 6 or 7 (N=78) were also disregarded because they were transfers to the tertiary service and patients who were evaluated by the physician as false positives (N=53). It was found that 17 patients were identified with pAE, 16 patients had one incident and only one patient had six incidents, totaling 22 incidents in the analysis. Of these incidents, six (27.3%) did not present any harm to the patients, that is, without adverse events; on the other hand, 16 (72.7%) incidents caused some harm to the people under analysis (with adverse events), affecting a total of 13 patients. No statistically significant differences were found between demographic, clinical and hospitalization variables and the occurrence of AEs, as shown in table 1.

Table 1. Associations between categorical variables (demographic, clinical and hospitalization) and the occurrence of adverse events (n = 17)

Variables	Adverse Event		Total	p-value*
	Present n=13	Absent n=4		
	n(%)	n(%)	n(%)	
Demographic Variables				
Gender				
Female	5(38.5)	1(25)	6(35)	1
Male	8(61.5)	3(75)	11(65)	
Age group				
< 60 years old	5(38.5)	3(75)	8(47)	0.2941
60 years old or more	8(61.5)	1(25)	9(53)	
Education				
Illiterate	2(15.4)	0(0)	2(11.8)	1
Complete primary education	1(7.7)	0(0)	1(5.9)	
No information	10(76.9)	4(100)	14(82.4)	
Race				
White	4(30.8)	1(25)	5(29.4)	1
Brown	3(23.1)	1(25)	4(23.5)	
Black	1(7.7)	0(0)	1(5.9)	
No information	5(7.7)	2(0)	7(41.2)	
Clinical variables				
Comorbidity				
Absent	3(23.1)	1(25)	4(23.5)	1
Present	10(76.9)	3(75)	13(76.5)	
Diagnosis				
Nervous System Diseases	2(15.4)	0(0)	2(11.8)	0.605
Respiratory System Diseases	1(7.7)	0(0)	1(5.9)	
Cardiovascular System Diseases	1(7.7)	0(0)	1(5.9)	
Digestive System Diseases	0(0)	1(25)	1(5.9)	
Trauma-Related Diseases	3(23.1)	2(50)	5(29.4)	
Urinary Genital System Diseases	1(7.7)	0(0)	1(5.9)	
Medical Clinical Urgency	0(0)	1(25)	1(5.9)	
Infectious and intestinal Diseases	2(15.4)	0(0)	2(11.8)	
Bacterial diseases	1(7.7)	0(0)	1(5.9)	
Liver / Pancreas / Biliary Diseases	2(15.4)	0(0)	2(11.8)	
Intrinsic Factors				
Absent	4(30.8)	1(25)	5(29.4)	1
Present	9(69.2)	3(75)	12(70.6)	
Extrinsic Factors				
Absent	0(0)	0(0)	0(0)	-
Present	13(100)	4(100)	17(100)	
Procedure				
No	0(0)	0(0)	0(0)	-
Yes	13(100)	4(100)	17(100)	
Hospitalization Variable				
Type of leave				
Discharge on request		1(25)	1(5.9)	0.3391
Improved discharge	3(23.1)	0(0)	3(17.6)	
Transference	10(76.9)	3(75)	13(76.5)	

*Fisher's Exact Test

Of the 13 patients who had AE, 9 (69.2%) had intrinsic risk factors, and 13 (100%) had extrinsic factors. The intrinsic risk factor that had the highest occurrence was arterial hypertension, while the predominant extrinsic risk factor was peripheral venous catheter. Of the 16 AEs observed, 94% (n = 15) were classified as likely to occur. In only one patient, the length of stay was prolonged as a result of the AE. As a result of the AE, 7 (43.75%) patients required additional treatments and 4 (25%) required additional tests. As for severity, 12 AEs (75%) were considered mild and 4 (25%) as moderate; there was no adverse event classified as serious. It was observed that nine AEs (56.25%) had high evidence of avoidability, while two (12.5%) had moderate evidence and five (31.25%) had full evidence of the possibility of avoidability. Among the variables of classification, avoidability, comorbidity and prognoses in relation to the severity of the AE, it was found that there was no statistically significant difference, that is, the variables under study are not different for mild or moderate AEs, as observed in table 2.

Table 2. Associations between the variables classification, avoidability, comorbidity and the severity of cases with adverse events (n=16)

Variables	AE severity		Total	p-value*
	Mild n(%)	Moderate n(%)	n(%)	
Classification of the AE				
Related to general care	11(91.7)	2(50)	13(81.25)	0.1357
Related to medication	1(8.3)	0(0)	1(6.25)	
Related to the procedure	0(0.0)	1(25)	1(6.25)	
Related to diagnosis	0(0.0)	1(25)	1(6.25)	
AE avoidability				
Not avoidable	0(0)	0(0)	0(0)	-
Avoidable	12(100)	4(100)	16(100)	
Comorbidity				
Absent	2(16.7)	1(25)	3(18.75)	1
Present	10(83.3)	3(75)	13(81.25)	

*Fisher's Exact Test

Among the 16 cases with AE, the largest number is related to care in general, n=13 (81.25%); only one (6.25%) of the cases with AE was related to the medication, one (6.25%) to the procedure and one (6.25%) to the diagnosis. Regarding the characterization of the AE, according to the variables related to the type of error evidenced in the medical record, nine errors (56.25%) were linked to the human factor, and of these, 66.7% by commission and 33.3% by omission. Finally, it should be noted that of the 296 patients, 13 had at least one adverse event, totaling an accumulated incidence of 4.4%. Once again, it is highlighted that 100% of AEs were considered avoidable.

Discussion

When analyzing the sociodemographic data of this study, most patients were men and aged over 60 years old, whose predominant diagnoses were diseases related to trauma, followed by diseases of the respiratory system.

Contrasting these findings, research with objectives similar to this study, diseases of the circulatory system and neoplasms were the main groups of diagnoses found, with a predominance of female patients with an average age of 55 years old.[15]

The identification and analysis of AEs are appropriate to favor a denser and more adequate understanding of the susceptibility to failures of health care systems.[10,11] So, the evaluation of aspects that may be related, such as intrinsic and extrinsic factors are necessary.[16] The mean value of intrinsic factors found in this study was 1.17 per patient, with a standard deviation equal to 1.2, while the mean value of extrinsic factors is 1.5, with a standard deviation equal to 1.

Following screening criteria, half of the patients (n=148) did not present any evidence of pAE, that is, no screening criteria were identified. Likewise, it is worth mentioning a study that identified the absence of pAE in 54.9% of the sample and the average screening criteria for pAE per patient was one.[15] On the other hand, three studies found the percentages of medical records at least one positive screening criteria for pAE: 44.5% in a Brazilian study,[14] 45% in an Irish study,[16] and 38.2% in an Iranian study.[17]

For this research, it is emphasized that no association was observed between demographic and clinical variables with the occurrence of adverse events in the subjects of this analysis.

Regarding the degree of severity, despite the AEs being classified as avoidable, most were characterized as mild, similarly to two Brazilian[15,18] and Chilean studies.[19] According to the classification of the nature of the cases that presented adverse events, these are related to care in general. In contrast to these findings, studies have indicated that AEs originated mainly during a procedure are the most present nature.[15,19,20]

AEs related to drugs were another highlight, even more so in this context of urgency and emergency. This result corroborates studies in which medication-related AEs were significant, which were performed in emergency units in Taiwan,[7] Canada,[21] as well as two studies carried out in two Brazilian university hospitals.[18,22] Thus, efforts are essential to reduce adverse drug events, especially preventable ones, in health units.[21,22]

The commission errors that comprise the wrong execution of the planned action and the errors of omission, which consist of not being able to perform the right action, bring to light the reflection on the human factor in the AE, as in both they cause undesirable consequences for the patients, to health professionals and institutions.[23]

The incidence of adverse events found in this study was 4.4%, so, it is worth pointing out an integrative review on the incidence and avoidability of adverse events in hospitals, which pointed out that the incidence rate, for the 13 analyzed studies, varied between 5.7% and 14.2%.[10]

Other studies showed an incidence similar to that observed in this research, with an incidence rate ranging from 1.3% to 33.7%.[7,15,16,19,20]

It is worth emphasizing that 100% of the AEs considered in the analysis are avoidable. Values close to this were evidenced in a study carried out in an emergency unit in Taiwan, which observed that 93.3% of AEs were preventable.[7] Thus, a variation in the preventability of AEs between 31 and 83% was observed in the literature.[10]

In view of the results, the importance of Emergency Care Units is highlighted as important structures in the health sphere and in the Emergency Care Networks. Thus, the implementation of strategies to improve the care provided, continuing and permanent education initiatives, in addition to the promotion of a patient safety culture, become necessary.[8,24] Especially because in these urgent and emergency environments, since they are places where care must be provided quickly, effectively and efficiently.

Considering the particularities of the instrument that was built in the hospital context, which could require minor changes, it did not prevent the

work from highlighting the possible AEs, their causes and avoidability within the emergency scenario.

Conclusion

The cumulative incidence of AEs was 4.4%, all of which were considered preventable, that is, 100% of the AEs considered in the analysis were preventable. This requires surveillance on the part of health professionals, even in events considered to be of mild severity, which represented the largest portion of the events in the study. Furthermore, according to their nature, 81.2% of AEs were related to care in general. In relation to intrinsic and extrinsic factors, an average of 1.17 and 1.5 per patient, respectively, was found. Understanding the incidence of adverse events and their characteristics makes it possible to assess problems in relation to patient safety in an emergency care unit, allowing the design of intervention strategies for the development of new control and response actions by professionals and managers, contributing to the improvement of the quality of care. This is the first step in the quest to incorporate a culture of quality and patient safety in the context of urgency and emergency.

Collaboration

Rocha MS, Gabriel CS, Moura AA, Inácio ALR, Mendonça DF, Bernardes A and Dias BM collaborated with the study design, data analysis and interpretation, article writing, relevant critical review of the intellectual content and approval of the version to be published.

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