

Mortality from Complications of Medical Assistance in Brazil from 2000 to 2010

Mortalidade Por Complicações de Assistência Médica no Brasil de 2000 a 2010

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Abstract

Analyze the epidemiological profile of the Brazilian population mortality from complications arising from medical and surgical assistance, registered in the database of the Mortality Information System (SIM), from January 2000 to December 2010, according to the place of occurrence. Ecological study on mortality from complications of medical and surgical assistance, from January 2000 to December 2010, data provided online, via Tabnet, by the Department of Informatics of the Unified Health System-DATASUS. Women (52.3%), white (64%) in old age (65.6%), are more prone to complications arising from medical and surgical assistance. The most frequent adverse event was the abnormal reaction or late complication caused by surgery and other surgical acts, without mentioning accidents during the intervention and the majority of deaths (93%) occurred in hospitals. Increased rates of mortality are highlighted in the Northeast and Southeast regions of Brazil. The analysis of mortality on individual and organizational elements, suggest, the potential protectors to the death, the increase in schooling, the average income per capita household and professional investment in the basic attention to health. Changing the punitive posture is an educational stance within the institutions, at the prevention of damage and conscientious record of notifications can subsidize the increase in notifications and, consequently, of the analytical possibilities of this theme.

Keywords: Epidemiological Monitoring. Mortality Registries. Patient Safety.

Resumo

Analisar o perfil epidemiológico da mortalidade da população brasileira por complicações decorrentes da assistência médica e cirúrgica, registrados na base de dados do Sistema de Informações sobre Mortalidade (SIM), no período de janeiro de 2000 a dezembro de 2010, segundo o local de ocorrência. Estudo ecológico sobre mortalidade por complicações da assistência médica e cirúrgica, de janeiro de 2000 a dezembro de 2010, dos dados disponibilizados online, via Tabnet, pelo Departamento de Informática do Sistema Único de Saúde - DATASUS. As mulheres (52,3%), brancas (64%) em idade avançada (65,6%), estão mais propensas às complicações decorrentes da assistência médica e cirúrgica. O evento adverso mais frequente foi a reação anormal ou complicação tardia, causadas por intervenção cirúrgica e por outros atos cirúrgicos, sem menção de acidente durante a intervenção e a maioria dos óbitos (93%) ocorreram em instituições hospitalares. Taxas aumentadas de mortalidade são evidenciadas nas regiões nordeste e sudeste do Brasil. A análise de mortalidade com elementos individuais e organizacionais, sugerem, como possíveis protetores ao óbito, o aumento da escolaridade, da renda média domiciliar per capita e o investimento em profissionais e na Atenção Básica de Saúde. A alteração da postura punitiva para uma postura educativa dentro das instituições, visando a prevenção do dano e o registro consciencioso das notificações, pode subsidiar o aumento das notificações e, conseqüentemente, das possibilidades analíticas desta temática.

Palavras-chave: Monitoramento Epidemiológico. Registros de Mortalidade. Segurança do Paciente.

1 Introduction

The nature of the activities developed within the hospital environment enables human error, which in another location would not have greater repercussions, assume high severity and mortality¹.

The human error can be defined as the inadvertent use of an imperfect plan to achieve a goal or not performing to the satisfaction of a planned action¹. The error can occur by direct human failure, due to the organization of the workplace and/or equipment of the institution by failures of communication, technical knowledge of the individuals, due to fatigue, stress and lack or unpreparedness of management. The source of

the error is multifactorial, which may arise during the period of hospitalization, due to failure in communication among professionals and/or in different work processes, errors in surgical procedures and in the administration of medication, among others. Therefore, it is believed that the errors occur at various stages of care and include all professionals involved in the care process².

The errors associated with health care, until recently, were considered as a byproduct of medical practice. However, in recent years, there has been a considerable increase in the number of studies related to the patient's safety, which has provided greater knowledge on the subject, confirming its

importance as a public health problem worldwide².

The first studies in the area of patient's safety indicated that the errors related to assistance are frequent and may cause permanent injury and death of patients admitted to North American hospitals. Data showed that approximately 100,000 patients die per year due to errors during the hospitalization period, even in hospitals equipped with high technology and in a scenario of developed country³.

In terms of cost, around the world millions of dollars are spent with the adverse drug events. In Australia, in 2000, the costs related to errors in medication administration (EAM) reached US\$ 500 million per year, which represented approximately 1% of the total health expenditures at the national level⁴. In the United States, the financial impacts arising out of adverse events related to drugs that could be avoided totaled US\$4,685 million and the additional costs of hospitalization of patients who suffered EAM were estimated at US\$ 2,000 million, without considering the cost of losses related to patients⁵.

The report published in the United States, *To Err is Human*, of 2009, questions whether efforts to reduce the damage caused by the healthcare system in the USA resulted in real progress for the safety of patients, since it is still high the index of sub-notifications and confidentiality of information⁵.

Between 2007 and 2009, the Ibero-american study on Adverse Events in Attention (IBEAS), developed in five Latin American countries, showed that 10.5% of hospitalized patients suffer some kind of adverse event, and of these, 58.9% could have been avoided⁶. As regards the national literature, this theme is still poorly researched, being scarce the publications on this theme.

A study conducted in 206 hospitals in the state of Rio Grande do Sul, in the year 2005, totaling more than 365 admissions/year, showed that 40 hospitals had significantly higher mortality rate than expected and 58 hospitals identified mortality lower than expected. The mortality rate was 6.3%. The large-scale hospitals had higher mortality rates than would be expected for the characteristics of the interventions carried out⁷.

One of the major obstacles found in studies of adverse events associated with the health care comes from the current behavior of omitting or concealing the undesirable events that occur, compromising the reliability of the data bases in the absence of notifications, configuring scenarios that do not portray the reality of services. The history of punishments for health professionals facing the occurrence of errors shows that they are often accompanied by public exhibition, causing feelings of fear and shame, and thereby contribute to the maintenance of a punitive culture⁸.

Thus, seeking to give visibility and allow the discussion of these indicators, this study was drawn up on mortality due to complications after clinical and/or surgical procedures. In this sense, this study intends to analyze the epidemiological

profile of the main causes of mortality due to complications after several medical and/or surgical procedures, in Brazil, in the period from January 2000 to December 2010.

2 Material and Methods

It is a descriptive ecological study⁹ which presents the mortality rates from January 2000 to December 2010, recorded in the subcategories listed between the letters Y40 to Y84 of the International Classification of Diseases (ICD-10), relating to the medical and surgical complications. The analysis of a historical series of 11 years is justified by the scarcity of literature, critical appraisal of the data and the ability to provide visibility to these indicators.

The subcategories mentioned are: Adverse effects of drugs, medications and biological substances used with therapeutic purpose (Y40-Y59); accidents in patients during the provision of medical and surgical care (Y60-Y69); adverse incidents during diagnostic or therapeutic actions associated with the use of medical devices (equipment) (Y70-Y82) and abnormal reaction in a patient or late complication caused by surgical procedures and other medical procedures without mentioning accident at the time of the procedure (Y83-Y84).

The information was collected in the database of *Sistema Único de Saúde* (SUS - DATASUS) and selected *online* via Tabnet, in May 2013, according to the location of occurrence. It was used as a source for the generation and capture of data, the following elements available at DATASUS: health care network, vital, demographic and socioeconomic statistics. The variables used in the study were: sex, age and race/color; total of deaths recorded in the subcategories (Y40-Y84) of ICD 10; resident population (as of the census of 2010); number of physicians (in December 2010); investment in primary health care (2000 to 2006) and average household income *per capita* (according to 2010 census). The data classified as ignored were excluded from the analysis.

In some relational proposals among the variables, Pearson's correlation coefficient was applied. For data analysis, an electronic spreadsheet and the TabWin® programs and TerraView® were used.

3 Results and Discussion

The results correspond to the analysis of 12,971 medical and surgical v registered in the period from January 2000 to December 2010 on the database of DATASUS, within the national territory.

The study identified four types of adverse events related to the complications of medical and surgical assistance according to ICD-10 (Table 1). In this study, 93.6% of deaths due to medical and surgical complications occurred within the hospital institutions. The domicile with 3.7% of the data and other health establishments (1.3%) amounted to 5% of the records. The other records were distributed between the public via and other places.

Table 1 - Mortality due to medical and surgical assistance complications in the period from January 2000 to December 2010, according to ICD-10, in Brazil

Year	CID-10								Total
	Y40-Y59 ¹		Y60-Y69 ²		Y70-Y82 ³		Y83-Y84 ⁴		
	n	%	n	%	n	%	n	%	
2000	95	9.8	24	13.0	22	13.3	1036	8.9	1,177
2001	91	9.4	20	10.9	14	8.4	1176	10.1	1,301
2002	99	10.2	16	8.7	18	10.8	1261	10.8	1,394
2003	81	8.4	13	7.1	17	10.2	1153	9.9	1,264
2004	99	10.2	12	6.5	07	4.2	1095	9.4	1,213
2005	86	8.9	16	8.7	11	6.6	1086	9.3	1,199
2006	64	6.6	12	6.5	14	8.4	811	7.0	901
2007	67	6.9	18	9.8	10	6.0	882	7.6	977
2008	83	8.6	13	7.1	21	12.7	958	8.2	1,075
2009	92	9.5	16	8.7	20	12.0	1144	9.8	1,272
2010	112	11.6	24	13.0	12	7.2	1050	9.0	1,198
Total	969	100	184	100	166	100	11652	100	12,971

Note¹ Adverse effects of drugs, medications and biological substances used with therapeutic purpose.

Note² Accidents in patients during the provision of medical and surgical care.

Note³ Adverse incidents during diagnostic or therapeutic actions associated with the use of medical devices (equipment).

Note⁴ Abnormal reaction in a patient or late complication caused by surgical intervention and by other surgeries, without mentioning accident during the intervention.

Source: Research data.

The data analysis in relation to the sex of victims indicated that women had the highest percentages (Table 2) and mortality coefficients, indicating 7 deaths for every 100,000 women. Men showed mortality coefficient of 6.6 for every 100,000 men. As regards the age range, you will notice that the number of deaths increases with age, in this case the individuals aged 60 years or higher has 11.8 times more likely to suffer from health problems of this nature than individuals from 20 to 59 years (data for 100,000 inhabitants).

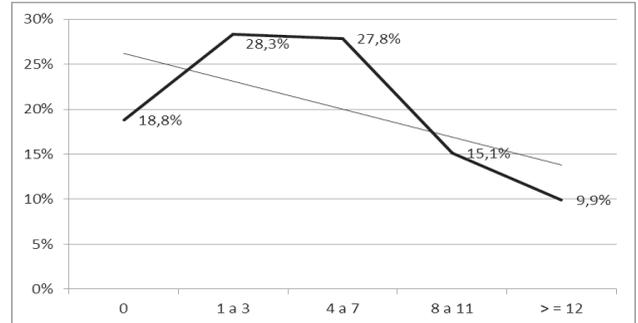
Table 2 - Association of mortality due to medical and surgical assistance complications from January 2000 to December 2010 in Brazil, by sex, age and race/color

Variable	n (%)	Coefficient of Correlation
Sex		
Male	6,183 (47.7)	R=0.98
Female	6,784 (52.3)	R=0.92
Total	12,967 (100)	
Age Range		
< 1 year	251 (1.9)	R=0.48
1 - 19 years	468 (3.6)	R=0.35
20 - 59 years	3,733 (28.8)	R=0.90
> or = 60 years	8,508 (65.6)	R=0.95
Total	12,960 (100)	
Race/color		
White	7,470 (64.0)	R=0.87
Brown	3,294 (28.2)	R=0.78
Black	794 (6.8)	R=0.89
Yellow	108 (0.9)	R=0.79
Indigenous	07 (0.1)	R=0.48
Total	11,673 (100)	

Source: Research data.

For the analysis of race/color the individuals of race/color black showed the highest correlation coefficient (0.89), however with regard to percentages and the relational rates with the population (data for 100,000 inhabitants) individuals of white color has 1.5 more chances of death of this nature than black ones, 2.1 more chances that mulattoes, 1.6 more chances that the yellows and 9.1 times more likely that the indigenous peoples.

Table 1 - Distribution of percentage of mortality due to medical and surgical assistance complications from January 2000 to December 2010 in Brazil, according to the patients' schooling

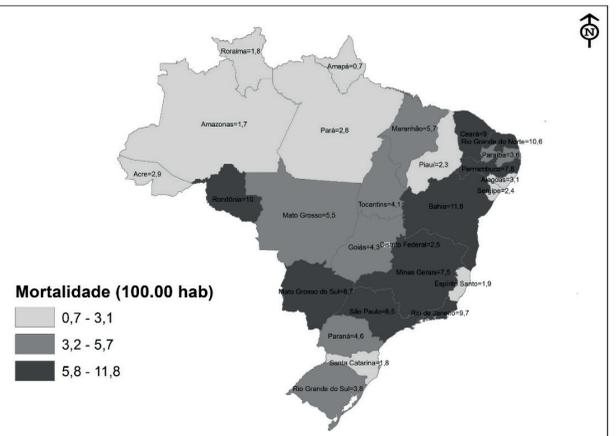


Source: Research data.

Figure 1 shows the percentage of 7,936 records of deaths due to medical and surgical assistance complications, according to the patients' years of study. These results show a decrease in the number of deaths in the measure to the extent that the victims accumulate years of study.

The distribution of mortality by medical-surgical complications (data for 100,000 inhabitants) according to the State in Brazil (Figure 2) demonstrates increased rates of mortality for the northeast and southeast. Bahia is the State with the highest mortality rate (11.8), followed by Rio Grande do Norte (10.6). The ration of mortality rates with the number of medical professionals, the investments of SUS in Primary Health Care and the per capita household income presented, respectively, the following coefficient of correlation ($r = -0.21$), ($R = -0.17$) and ($R = -0.02$).

Figure 2 - Mortality rate due to medical and surgical assistance complications from January 2000 to December 2010 in Brazil, according to the State



Source: Research data.

The data in this study show that the percentage of deaths due to medical and surgical complications remained stable over the eleven years analyzed, with a smaller percentage in 2006 (6.96%) and the largest in 2002 (10.75%). In comparison with the literature they suggest the occurrence of sub-notifications or the lack of relationship between the death and the question of origin, configuring a registry problem. This second reason occurs when the death is delayed and, sometimes, is not assigned to the medical and/or surgical complication.

It is also emphasized, the cases in which the adverse event of care or medical diagnosis may be related to non-human factors, such as complications of drugs (interactions, multidrug resistance, among others), medical equipment and inadequate structural conditions in the institutions. These conditions seem to be related to the lack of continuous notification of events, which makes it difficult to know the reality of the same within the hospital, the measure which conceals the daily practice of health professionals, committed to evaluate and implement measures for the prevention and control of adverse events.

A study that evaluated the causal factors that lead to deaths considered unnecessary in orthopedics and surgical trauma by the National Agency for Patient Safety (NPSA) London, during a period of four years (2005-2009), identified and analyzed 257 reports of incidents. Out of a total of 191,257, 74.3% of the incidents had sufficient information to generate the thematic analysis. The incidents were evaluated in relation to the types of scenarios: (1) Stages of surgical journey - 62% of the deaths occurred in the postoperative phase, (2) causes of death - 32% were related to severe infections (3) quality of medical interventions - 65% of the patients received minimum treatment or with delay; (4) skills of health professionals - in 44% of deaths there was failure in non-technical skills (lack of situational awareness, communication, teamwork and decision making). The research concluded that the majority of orthopedic surgery complications can be adequately treated, since they are predicted and that strategies for the reduction of risks are imposed on institutions¹⁰.

Due to the need to establish strategies for patient's safety in healthcare institutions, the World Health Organization (WHO) created the World Alliance for patient's safety, in 2004, whose goal is to develop programs and guidelines, raise awareness and mobilize health workers and the population for the culture of patient's safety. This organization promotes and disseminates knowledge, develops tools and solutions for healthcare improvements in health institutions, besides providing reflections on the forms of activity of the various health teams, in search of care and managerial improvements².

The estimate that approximately one in every 10 admissions of patients in a hospital environment results in the occurrence of at least one adverse event is alarming. Even more if we consider that half of these incidents could have been avoided, according to studies conducted in American hospitals^{11,12}.

In Brazil, a study carried out in three teaching hospitals in the state of Rio de Janeiro, with hospitalized patients, in the year 2003, showed a prevalence of 7.6% of adverse events, of which 66.7% were considered preventable. The density of incidence of adverse events was 0.8 per 100 patient-day (103 to 13,563 patients-day). The infirmary of the patient was the most frequent place of adverse events (48.5%). In relation to the classification, the surgical adverse events were the most frequent (35.2%)¹³.

Considering the advancement of human longevity and the results described in Table 2, it is believed that the rates of mortality resulting from medical and surgical complications will tend to increase, if no measures are imposed for protection and prevention. The health of elderly patients many times undermined, possibly related to chronic degenerative diseases and cancer, makes these individuals, especially, more prone to these events. It can be inferred that the complications become more severe and difficult to treat at that age, contributing to increased mortality rates⁸.

The high correlation coefficient shown in Table 2 confirms the relationship between these events and the advanced age of the victims. ANVISA in 2012 developed a project to stimulate the patient's participation and his or her relatives in the process of care and devised various materials and documents for their exploitation. The project named: Patient by Patient Safety in Healthcare Services involves both the communication/dissemination of the project as the publication of informational/educational materials such as folder, pamphlets, posters, *hotsite* and videos on the topic¹⁴.

A study on database about the incidents in anesthetics in National Agency for patient's safety in the UK, has identified 12,606 reports of adverse events in patients for two years. Of the events that have occurred, 2,842 (22.5%) resulted in little damage or a moderate degree of damage and 269 (2.1%) situations have resulted in serious damage to the procedure or treatment of problems generating higher risk, or death. One thousand and thirty-five incidents (8%) were related to preoperative evaluation, being evidenced damage in 275 (2.6%); of the 552 (4.4%) cases related to epidural anesthesia, damages were reported in 198 (35.9%) of those patients. Data also showed that approximately 15.5% of the incidents are related to surgery, each quarter¹⁵.

In England, in 2009 and 2010, a study analyzed security incidents of patients reported from intensive care units. A total of 4,219 cases was identified during 127 days of intensive care. The pressure ulcers were the most common cause of damage, totaling 3.9 incidents per 1000 days, and only 89 (2.1%) described incidents were temporary damage¹⁶.

Regarding the distribution of the mortality rate of medical-surgical complications in the units of the federation (Figure 2), it is believed that, although this study presents a population indicator, the size of the health care network influences directly on these data. However, this analytical hypothesis is unable to explain the cases in the states of Mato Grosso

and Rondônia, seventh and fifth place, respectively, among the least populated states of Brazil. These states have high rates of mortality due to medical and surgical v and are distant from the coastal strip of the country, where the majority of the population, economic resources and human resources in health are concentrated. In this sense, it can be inferred that difficulties in accessibility to health services or the lack thereof and of qualified human resources, impact the data in these states. However, it is worth remembering that this study was carried out in the database, therefore, it has the limitation of these records, a factor that may compromise some findings.

One study evaluated the association between deaths and adverse events adjusted for risk factors of the patient in a sample of 1,103 records of patients hospitalized in 2003, in three teaching hospitals in the state of Rio de Janeiro. It evidenced the hospital mortality rate of 8.5%, which was related to the occurrence of an adverse event of 2.9% (32/1103) and the rate related to adverse events of 2.3% (25/1103). Among the 94 analyzed deaths, 34% were related to cases involving adverse events and 26.6% occurred in cases whose adverse events were considered preventable. This research emphasizes the fact that the adverse events, in addition to being prevalent, are associated to severe damages and death¹⁷.

Despite the relevance of mortality due to medical and/or surgical complications, there are still gaps of knowledge in this field, mainly among the least developed countries. Studies show that the lack of resources, infrastructure, and informatization limits the ability of these countries in systematizing information, collecting data and developing research. It is understood that the rates of occurrence of these events are underestimated, preventing a portrait of the true extent of this health problem, which includes the suffering of patients and relatives^{12,18}.

4 Conclusion

The prevalence of adverse events in the hospital environment is an expected evidence due to increased demand and the complexity of the procedures in this assistential context. However, it is known that the services of Primary Health Care also produce events of this nature, in particular in relation to morbidity data, requiring a directed study.

The results suggest that individual and organizational elements can act as protectors to death due to medical clinical and/or surgical complications. It is believed that the increase in years of study and average domicile income *per capita* may interfere positively on the decline in death rates. In the perspective of health management, the investment in the recruitment of health professionals and the primary care network of SUS stand out. And it is recommended the elaboration of programs of continuing education in the health services of any nature and complexity of care, as a determinant factor for the increase of patient's safety. In this sense, the sentinel network of hospitals, established by the

National Agency of Sanitary Surveillance, and currently with 195 accredited hospitals, as well as the National Policy of patient's safety, launched by the Brazilian Ministry of Health in 2015, has been guiding the actions of improvements in health through the provision of manuals of good practices and guidelines clinicians, managerial and financial incentives to managers.

Thus, all social actors directly linked to assistance, has at their disposal grants for the elaboration of an institutional diagnosis and problems which undermine the patient's safety. It is also highlighted that it is necessary to invest in scientific technical enhancement of multidisciplinary teams, in the construction of informational processes that lead to the patient becomes active in the adoption of security measures against adverse events. In addition, there is a need for amendment of punitive posture of managers for an educational approach, aiming at the prevention of damage and the conscientious registry of notifications, allowing the analytical possibilities of data and proposing measures to contain the damage.

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