Original Article

Avoidable causes on the waiting list for admissions to intensive care units

Causas evitáveis na lista de espera para internação em unidades de terapia intensiva

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Objective: to evaluate occurrence of avoidable-mortality causes on the waiting list of patients at the intensive care units. **Methods:** one thousand, two hundred and twelve enrollments of patients from all age groups were analyzed and classified according to the Brazilian Health System for causes of avoidable mortality. Descriptive statistics for simple, relative and mean frequency rates were employed for the comparative analysis of the variables. **Results:** cases of non-communicable diseases, among the avoidable-mortality causes, occupied more than 80.0% of intensive care unit's beds. Hospitalizations comprised illnesses of the circulatory and respiratory apparatus, especially in patients over 40 years old, together with the external causes and consequences of pregnancy and puerperium with mortality rates within the 15-39 age group. **Conclusion:** the high proportion of patients with diseases from avoidable causes on the waiting list for intensive care units hospitalization suggest that improvements in the programs involved with the prevention of diseases, especially non-communicable diseases, are needed.
Descriptors: Mortality; Chronic Disease; Unified Health System.

Objetivo: avaliar a ocorrência de causas de mortalidade evitáveis na lista de espera de pacientes nas unidades de terapia intensiva. **Métodos:** mil e duzentas e doze inscrições de pacientes de todas as faixas etárias foram analisadas e classificadas de acordo com o Sistema Único de Saúde para as causas de mortalidade evitável. Estatística descritiva para taxas de frequência simples, relativas e médias foi empregada para a análise comparativa das variáveis. **Resultados:** casos de doenças não transmissíveis, entre as causas evitáveis de mortalidade, ocupavam mais de 80,0% de leitos da unidade de terapia intensiva. Internações incluíam doenças dos aparelhos circulatório e respiratório, especialmente em pacientes com mais de 40 anos de idade, juntamente com causas externas e as consequências da gravidez e puerpério, com taxas de mortalidade no grupo de 15-39 anos. **Conclusão:** a alta proporção de pacientes com doenças de causas evitáveis na lista de espera para internação em unidades de terapia intensiva sugere que são necessárias melhorias nos programas relacionados à prevenção de doenças, principalmente de doenças não transmissíveis.
Descritores: Mortalidade; Doença Crônica; Sistema Único de Saúde.

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Introduction

The Brazilian Health System was established in Brazil in 1988, and health was proclaimed as a citizen´s right and the duty of the State. After more than two decades, the Brazilian Health System has promoted significant improvements in public health, even though important challenges have still to be met. Brazil, significantly reduced its infant mortality rates (from 69/1000 to 14/1000) between 1980 and 2013[1], together with an increase in the mean life expectancy of the population (from 62.6 to 75.5 years)[2].

Brazil ranks 85th in the Human Development Index (0.730), although extreme differences in Brazilian towns and regions occur in this developing continent-size country. Whereas the city of São Caetano do Sul in the state of São Paulo features the highest Human Development Index score (0.860) in Brazil, the town of Melgaço in the northern state of Pará has an Human Development Index of 0.418. The present analysis was undertaken in the macro-region of Maringá, with an estimated population of 1,719,682 inhabitants (2010)[3], in the southern state of Paraná (Human Development Index =0.749). The city of Maringá has an Human Development Index =0.808, i.e., it ranks 23rd in Brazil and 46th in world ranking.

The demand for intensive-care therapy in Brazil is high and costs are rapidly increasing. The high costs are mainly due to the advanced technology and specialized human resources required for this type of care[4]. The intensive care units are equipped with ventilators, hemodialysis machines, extracorporeal circulation apparatus, and others[5-6]. The costs are paid by the Brazilian Health System, by private health plans, or by the patients and their relatives.

To guarantee total access to health services, the Brazilian Health System organizes assistance regulation centers by subjects or assistance areas, such as obstetrics and neonatal, urgent and emergency care, high complexity, transplants, hospitalization and others. The centers link the existing demand with available resources, so that the best assistance response can be provided equally to all, with good quality and at the appropriate time. In the wake of an increase in the demand for health services by the Brazilian population, an analysis of the occurrence of illnesses related to causes of avoidable mortality seems useful. Causes of avoidable mortality are illnesses which may be prevented by certain health-promoting activities, and which play an important role in combating these causes[7].

The present investigation analyzed the occurrence of avoidable-mortality causes on the waiting list of patients at the Intensive Care Unit Bed Regulation Center in the region of Maringá, state of Paraná, Brazil. This survey will provide data for studies on disease prevention and health promotion activities that would minimize demands for hospital bed space by diverting human, financial and social resources to other health sectors and providing better service to the population.

Methods

This study is a descriptive, retrospective and exploratory analysis, featuring secondary data collection on patients enrolled on the intensive care units waiting list of the health macro-region of Maringá between July and December 2012. Information on 1212 solicitation records for Intensive Care Unit hospitalization was available from the data base of the Hospital Bed Center of the 15th Regional Health Unit of Maringá, and was retrieved by permission.

The variables analyzed comprised: a) patient´s gender, b) age, c) diagnosis classified according to the International Classification of Diseases 10, and d) causes of avoidable and non-avoidable mortality. For data analysis we used the distribution of simple and relative frequency, average calculation and standard deviation and Z statistical test, which is used to test the null hypothesis that there is no difference between the means of two populations against alternative

hypothesis that exist differences between them[8]. The level of significance was 5%.

Patients from all age groups and resident in the macro-region of Maringá were included in the study. Avoidable causes, identified as those cases which could be avoided by prevention and health promotion, were classified according to the list of avoidable causes of death by the Brazilian Health System[9] described as those reducible by: immuno-prevention measures; appropriate measures for health promotion, prevention, control and care of infectious diseases; appropriate measures for health promotion, prevention, control and care of non-communicable diseases; appropriate measures for health promotion, prevention, control and care of external causes.

The records regarding the waiting list of patients at the intensive care units were identified according to the International Diseases Classification as previously described. Only those records included in the list of preventable causes of death adopted by Health Unit System were selected for the study[9].

The study complied with the formal requirements contained in the national and international regulatory standards for research involving human beings.

Results

Of 1212 patients, 50.4% were males, between 0 and 97 years (mean age 51.3 years). The 60-79 and 40-59 age groups showed the highest rates of demand for intensive care unit beds. The 15-19 age group had the lowest intensive care units demand (Table 1). Non-avoidable causes were significant within the 0-14 and 20-39 age groups, whereas the 60-79 age group had the highest rates of avoidable mortality-causing diseases (Table 1).

Table 1 - Reports of intensive care unit hospitalization demand by gender and age comparing avoidable and non-avoidable mortality causes

| Profile | Type of cause | | | |
| | Avoidable | Non-avoidable | p | Total |
	n (%)	n (%)		n (%)
Gender				
Male	539 (54.6)	72 (32.1)	<0.05*	611 (50.4)
Female	449 (45.4)	152 (67.9)	<0.05*	601 (49.6)
Age group (years)				
0 - 14	50 (5.1)	66 (29.5)	<0.005*	116 (9.5)
15 - 19	31 (3.1)	24 (10.7)	0.2377	55 (4.5)
20 - 39	148 (15.0)	60 (26.8)	<0.05*	208 (17.1)
40 - 59	252 (25.5)	21 (9.4)	0.0838	273 (22.5)
60 - 79	367 (37.1)	41 (18.3)	0.05*	408 (33.6)
> 80	140 (14.2)	12 (5.4)	0.3795	152 (12.5)
Total	988 (100.0)	224 (100.0)		1212 (100.0)

*Significant Z Test < 5%

The classification of patients who were ill from avoidable causes and needed intensive care unit beds showed that 69% suffered from non-communicable diseases, followed by infectious diseases and external causes (Table 2).

Table 2 - Classification and occurrence of avoidable causes in intensive care units hospitalization requests, and mean age in years

Classification	n (%)	Age (DP)
Communicable diseases	53 (5.0)	48.7 (31.6)
Infectious diseases	130 (13.0)	61.8 (22.9)
Non-communicable diseases	678 (69.0)	58.4 (20.4)
External causes	127 (13.0)	37.9 (22.7)
Total	988 (100.0)	

As seen in Table 3, diseases of the circulatory system accounted for 43.6% of overall intensive care units bed requests, followed by respiratory diseases (12.9%) and by diseases during pregnancy, birth and puerperium (11.4%). Avoidable causes totaled 82%, with diseases of the circulatory system comprising 50.3% of this category, followed by respiratory diseases (14.6%) and external causes (12.2%).

Table 3 - Intensive care units hospitalization requests classified as avoidable and non-avoidable causes, distributed according to the International Classification of Diseases

International Diseases Classification	Type of cause		
	Non-avoidable n (%)	Avoidable n (%)	Overall n (%)
Diseases of the circulatory system	32 (14.3)	497 (50.3)	529 (43.6)
Respiratory diseases	12 (5.4)	144 (14.6)	156 (12.9)
Pregnancy, birth, puerperium	72 (32.1)	66 (6.7)	138 (11.4)
External causes	-	120 (12.2)	120 (9.9)
Infectious and parasite diseases	4 (1.8)	72 (7.3)	76 (6.3)
Diseases of the digestive system	20 (8.9)	29 (2.9)	49 (4.0)
Illnesses during perinatal period	33 (14.7)	-	33 (2.7)
Diseases of the genito-urinary apparatus	5 (2.2)	26 (2.6)	31 (2.6)
Diseases of the Nervous System	7 (3.1)	11 (1.1)	18 (1.5)
Congenital malformations	17 (7.6)	-	17 (1.4)
Abnormal signs and symptoms	9 (4.0)	7 (0.7)	16 (1.3)
Endocrinal diseases	1 (0.4)	8 (0.8)	9 (0.7)
Cancers	7 (3.1)	1 (0.1)	8 (0.7)
Factors that affect health conditions	-	6 (0.6)	6 (0.5)
Blood diseases	5 (2.2)	1 (0.1)	6 (0.5)
Total	224 (100.0)	988 (100.0)	1212 (100.0)

Table 4 - Avoidable causes and classification according to International Classification of Diseases by age group

Intensive Care Unit	Age group						
	0-14 n (%)	15-19 n (%)	20-39 n (%)	40-59 n (%)	60-79 n (%)	>80 n (%)	Total n (%)
Respiratory diseases	23 (46.0)	1 (3.0)	10 (7.0)	16 (6.0)	66 (18.0)	28 (20.0)	144 (14.6)
External causes	14 (28.0)	12 (39.0)	45 (30.0)	28 (11.0)	18 (5.0)	3 (2.0)	120 (12.1)
Diseases of the digestive system	1 (2.0)	-	4 (3.0)	17 (6.9)	5 (1.0)	2 (1.0)	29 (2.9)
Diseases of the circulatory system	2 (4.0)	-	29 (20.0)	157 (62.0)	224 (61.0)	85 (61.0)	497 (50.3)
Endocrine diseases	3 (6.0)	1 (3.0)	-	-	3 (1.0)	1 (1.0)	8 (0.8)
Diseases of genito-urinary system	-	1 (3.0)	-	7 (3.0)	14 (4.0)	4 (3.0)	26 (2.6)
Pregnancy, birth or postpartum	2 (4.0)	12 (39.0)	48 (32.0)	4 (2.0)	-	-	66 (6.7)
Diseases of the nervous system	3 (6.0)	1 (3.0)	2 (1.0)	4 (2.0)	-	1 (1.0)	11 (1.1)
Abnormal signs and symptoms	-	1 (3.0)	1 (1.0)	1 (0.4)	1 (0.4)	3 (2.0)	7 (0.7)
Factors that affect health conditions	-	-	3 (2.0)	1 (0.4)	-	2 (1.0)	6 (0.6)
Infectious and parasitic diseases	2 (4.0)	1 (3.0)	6 (4.0)	16 (6.0)	36 (10.0)	11 (8.0)	72 (7.3)
Cancers	-	-	-	1 (0.4)	-	-	1 (0.1)
Blood diseases	-	1 (3.0)	-	-	-	-	1 (0.1)
Total	50 (100.0)	31 (100.0)	148 (100.0)	252 (100.0)	367 (100.0)	140 (100.0)	988 (100.0)

Taking age groups into consideration, avoidable causes of mortality within the 0-14 age group comprised primarily respiratory diseases, followed by external causes; within the 15-19 age group, external causes amounted to 39.0%, followed by causes during pregnancy, birth and puerperium, with equal percentages. External causes amounted to 30.0% for the 20-39 age group and 32.0% for causes related to pregnancy and diseases of the postpartum period. Diseases of the circulatory system accounted for 62.0% of the intensive care unit bed requests for the 40-59 age group, and 61.0% in the 60-79 and over-80 groups. Respiratory diseases comprised 18 and 20.0% of the requests respectively within the last two groups (Table 4).

Discussion

Quality and efficient care in medicine require accurate diagnosis of the patients´ illnesses. The main challenges to improving the health of a population, with its continuing changes, must be understood, so that health systems can provide efficacious care. The financial resources for health are never adequate and perhaps never will be. This is due to growing demands that accompany an aging population and changes in the profile of illnesses, especially non-communicable ones. New technologies are added to old ones, which are never replaced and together increase health costs. When financial resources for the health sector are insufficient, the best strategy is not to save money but to apply the available resources in the best possible way[10]. Consequently, emphasis on decreasing the demand caused by avoidable diseases and reducing hospitalization costs is mandatory. This process would be an asset in the application of resources with regard to improvement of treatments, and in improving understanding of diseases in general.

Intensive care units are extremely important health tools for the population, which is increasingly aging and, consequently, incurs high costs for care. Prevention of avoidable diseases and the optimization of intensive care units management, featuring a strategic perspective, patient-centered quality, focus on results and continuous learning[4] all have important roles in decreasing costs and maximizing use of the available resources. The National Health System´s mean monthly expenses in Maringá during the first quarter of 2010 were about US$ 1.6 million for 703 hospital beds, including 64 (9.1%) intensive care unit beds with a mean of 2740 patients per month at a mean cost of US$ 590.00/patient/month. The daily cost per patient in intensive care units is about US$ 285.00[11].

The present results showed that 82% of the demand on the waiting list for intensive care unit beds consisted of patients with illnesses from avoidable causes within the 60-79-year age group (p<0.05). These data concord with the information presented in the 2013 World Health Organization report[12]. Avoidable causes occurred significantly more often (p<0.05) in males. This contrasts with report described in the 2011 summary by the Pan-American Health Organization, which found no significant difference between males and females[13]. The cardiovascular diseases comprise the highest share of non-communicable diseases, in agreement with the present results (69.0%)[14]. Non-avoidable causes were significantly more common in the age groups below 15 years (p=0.0014) and within the 20-39 age group (p=0.0446).

An analysis of intensive care unit demands for cases of diseases from avoidable causes demonstrated that 50.3% were circulatory diseases and 14.6% were respiratory ones, i.e., a significant predominance. Several studies have shown that smoking in developing countries is an important risk factor for mortality. In its 2013 Conference, the Word Health Organization suggested an increase in cigarette taxes as a strategy to decrease smoking[15].

Among the diseases with avoidable causes, external causes predominated in patients younger than 40, whereas in the case of respiratory diseases, patients younger than 15 years predominated.

Educational efforts to decrease violence in the home and on the roads should be prioritized, since they contribute to the decline of the mortality rate from external causes. The joint efforts of governments and organizations to make accessible efficient vaccines for the prevention of respiratory illnesses have increased, combined with scientific, medical and biotechnological progress which improves current vaccines and contributes toward a future in which respiratory diseases decrease[16].

Diseases related to pregnancy, birth and postpartum complications had the highest occurrences within the 15-39 age group, very similar to that in other regions worldwide. Enormous challenges persist in improving mother-infant health on the planet. In developing countries, maternal-infant health programs are still fragmented and must emphasize essential interventions and working with other programs for specific illnesses[17].

Health prevention and promotion programs for the population below 15 years of age should focus on respiratory diseases and diseases related to external causes. These programs should be continued with people up to 39 years of age, combined with care during pregnancy, birth and postpartum[17]. Circulatory diseases occur in more than 60.0% of the population over 40 years of age, and respiratory diseases combined with circulatory ones reappear in the population over 60. Health prevention and promotion programs should be intensified to combat diseases of the circulatory system, such as systemic arterial hypertension, and coronary-arterial and vascular-cerebral diseases. Efforts to promote physical activity, healthy eating habits, maintenance of ideal body weight, and anti-smoking and anti-alcohol campaigns should be addressed to the population over 39 years[18].

Life habits are important factors affecting the patterns of risk for non-communicable diseases, and current efforts to decrease smoking, alcohol intake and, more recently, the consumption of trans fats and salt show that there are many health prevention and promotion initiatives to be undertaken. These may include the establishment of public policies, such as increasing the tax on cigarettes and restrictions on alcohol intake. Bold and creative policies are required to combat the excessive consumption of alcohol, improve dietary habits, and increase physical activity[18].

Non-communicable diseases are a major challenge to public health in the 21st century. The prevention of premature deaths from avoidable causes and the resulting decrease in health costs related to these diseases are the main aims of health policies. Improving the detection and treatment of non-communicable diseases and the prevention of complications and catastrophic events are the main aims of clinical medicine. A multidisciplinary approach that integrates policies, regulations, health education, and adequate health systems sufficient to attain these aims is the great mission of public health. All countries are benefited when they share experiences and technical knowledge for the prevention and control of non-communicable diseases[19]. Forty years after the extinction of infectious diseases and multi-resistant pathogens was declared, new diseases such as human immunodeficiency virus syndrome, viral SARS and the H1N1 influenza virus have caused pandemics, and old diseases such as tuberculosis and cholera are still extant. Increases in life expectancy and rapid social changes have led to a persistent increase in chronic diseases, for which efficacious therapies exist, but which frequently are not available to or sufficiently efficacious for the most needy population[20].

The results of the present study show that non-communicable diseases, represented by diseases of the circulatory and respiratory systems, cause more than 80.0% of the demand for intensive care unit beds in the region of Maringá, especially within the over-40 age group. In addition, adolescents fall ill from external causes, and complications of pregnancy and puerperium are highly important factors affecting mortality rates in the 15-39 age group.

Conclusion

Despite the intensive efforts for disease prevention and health promotion, the high proportion of patients with diseases from avoidable causes on the waiting list for intensive care units hospitalization indicates the enormous task still to be done and great improvements in the prevention of diseases, especially non-communicable diseases, are mandatory. Current prevention and health-promotion campaigns must be implemented and expanded.

Collaborations

Otto GLG and Yamaguchi MU contributed to the collection, organization, analysis and interpretation of data and article writing. Silva MPP contributed in the collection and organization of data. Costa CKF and Bernuci MP contributed to the analysis, data interpretation, article writing and final version to be published.

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