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ABSTRACT: This study aimed to compare clinical characteristics, evolution and severity of adult patients admitted to public and private Intensive Care Units. It is a retrospective, longitudinal and quantitative analysis of 600 patients admitted to four Intensive Care Units of São Paulo, Brazil. Differences were found between patients admitted in private and public hospitals regarding the following variables: age, origin, length of stay and mortality in the critical unit, cardiologic, hematologic, neurologic and renal failures and some comorbidities. The results reveal the importance of analyzing in detail clinical characteristics and healthcare of patients admitted in public institutions, because of the high mortality found. The Intensive Care Nurse can contribute to change this scenario, because she/he plays a leading role in planning and providing resources for intensive care.

DESCRIPTORS: Public sector. Private sector. Intensive Care Units. Clinical evolution. Nursing.

CARACTERÍSTICAS CLÍNICAS E GRAVIDADE DE PACIENTES INTERNADOS EM UTIS PÚBLICAS E PRIVADAS

RESUMO: Este estudo objetivou comparar as características clínicas, evolução e gravidade de pacientes adultos internados em Unidades de Terapia Intensiva públicas e privadas. Trata-se de uma análise retrospectiva, longitudinal e quantitativa de 600 pacientes admitidos em quatro Unidades de Terapia Intensiva em São Paulo, Brasil. Diferenças foram encontradas entre os pacientes admitidos nos hospitais privados e públicos em relação às seguintes variáveis: idade, procedência, tempo de internação e mortalidade na unidade crítica, insuficiências cardiológica, hematológica, neurológica e renal, além de algumas comorbidades. Tais resultados revelam a importância de se analisar detalhadamente as características clínicas e a assistência prestada aos pacientes admitidos em instituições públicas, frente a maior mortalidade encontrada. O Enfermeiro de Terapia Intensiva pode contribuir para alterar esse panorama, visto que detém um papel de liderança no planejamento assistencial e na provisão de recursos necessários para assistência intensiva.

DESCRITORES: Setor público. Setor privado. Unidades de Terapia Intensiva. Evolução clínica. Enfermagem.

CARACTERÍSTICAS CLÍNICAS Y GRAVEDAD DE PACIENTES INGRESADOS EN UCI PÚBLICAS Y PRIVADAS

RESUMEN: La investigación tuvo como objetivo comparar las características clínicas, evolución y gravedad de pacientes adultos ingresados en Unidades de Cuidados Intensivos públicas y privadas. Este es un estudio retrospectivo, longitudinal y cuantitativo de 600 pacientes ingresados en cuatro Unidades de Cuidados Intensivos en São Paulo, Brasil. Fueron encontradas diferencias entre los pacientes de los hospitales privados y públicos para las variables: edad, procedencia, tiempo de internación y mortalidad en la unidad crítica, insuficiencia cardiológica, hematológica, neurológica y renal, además de algunas comorbilidades. Los resultados revelan la importancia de se analizar las características clínicas y la asistencia prestada en las instituciones públicas, en comparación a la tasa de mortalidad. La Enfermera de Cuidados Intensivos puede ayudar a cambiar esta situación, ya que tiene un papel de liderazgo en la planificación de la atención y la provisión de recursos para cuidados intensivos.

DESCRIPTORES: Sector público. Sector privado. Unidades de Terapia Intensiva. Evolución clínica. Enfermería.

INTRODUCTION

Intensive Care Units (ICUs) are high-cost units, due to the need for a distinguished physical space, high-tech equipment and a qualified multidisciplinary team. An increasing number of critical patients are admitted to these units, entailing a growing need to characterize them with a view to better human and material resource distribution, aiming for care quality.

In Brazil, funding for health actions has always come mainly from the public sector. This context has been changing in the last 20 years though, with considerable growth in the private sector.[1-2]

The analysis of the evolution in public and private hospital care between 1986 and 1996, i.e. after the Unified Health System (SUS) was put in practice, revealed that public hospital care showed no absolute growth during that period and indicate selective patient migration to the private system, in search of an alternative care system with better conditions than those the SUS offered.[1] Recent statistics from the National Complementary Health Agency (ANS) show an 18.1% coverage rate of private health insurances in the year 2000, with constant growth in subsequent years, reaching 24.4% in 2011.[2] In addition, data from the Brazilian Intensive Medicine Association (AMIB) reveal that maintenance of ICUs is mainly in private hands.[3]

In Brazil, few studies distinguish public and private medical-hospital care in their analyses. In a previous literature review, we identified only 11 studies that investigated health care in view of institutions' legal status.[1,4-13] Some of these studies disclosed a lack of equity in the clinical characteristics of patients hospitalized at public and private ICUs, as well as human and structural resource related differences between these units.[5-6,9-12]

In this context, interest in getting to know the characteristics of patients admitted to public and private ICUs is justified, exploring yet unanalyzed variables, in the attempt to provide managers and health professionals, mainly nurses, with information about the profile and clinical evolution of the care population, with a view to identifying care resource needs and facilitating the elaboration of a strategic plan directed at care quality and safety for critical patients.

In the current hospital care model, nursing plays a fundamental role in the patient care process, in the public as well as the private system, as these professionals are responsible for managing human, technological and financial resource needs, mainly based on patients' clinical characteristics.[14]

In view of this scenario and our interest in identifying and strengthening evidence related to the characteristics of patients admitted to critical units with different legal status, this study was proposed, aiming to comparatively analyze the clinical characteristics, evolution and gravity of adult patients hospitalized at public and private ICUs.

METHOD

A comparative, retrospective and longitudinal study with a quantitative approach was developed, involving adult patients hospitalized at ICUs of two public and two private hospitals.

Data stored in an electronic file of patients hospitalized at these units were the primary source in this research. The study that originated this worksheet received approval from the institutions' Research Ethics Committee (No. SMS52/2006, HU650/06, HSL2006/03 and AE06/510).

Sample size calculations for the file were based on literature results about readmissions and mortality at ICUs in São Paulo City. With a view to including at least 40 cases of readmission in the sample, the need for 400 survivors was estimated, in view of an approximate readmission rate of 10%.[15] The approximate mean mortality rate of 33%, observed at ICUs in São Paulo City,[16] required adding approximately 200 patients to the number of survivors, totaling an estimated sample of about 600 patients.

The following institution selection criteria were adopted: medium, large or extra large size; located in São Paulo City; offering a general ICU and Semi-Intensive Unit, besides the number of ICU beds higher than 6% of all hospital beds and at least five Semi-Intensive beds.[17]

All patients hospitalized at the places of study during data collection, aged 18 years or older and who stayed at the ICU for at least 24 hours were included in this research.

The sample comprised 600 patients, 201 admitted to private and 299 to public hospitals, between August 2006 and January 2007.

The death risk (DR) of the patients under analysis was measured with the help of the Sim-

plified Acute Physiology Score II (SAPS II)[18] and Logistic Organ Dysfunction Score (LODS).[19] The evolution of gravity according to these scores was analyzed in view of the difference between the death risks calculated through these scores on the first and last day of the patient's ICU hospitalization (DR SAPS II admission – DR SAPS II discharge or death and DR LODS admission – DR LODS discharge or death).

Stata for Windows 8.0 and SPSS 13.0 for Windows were used for data treatment.

To analyze the nominal variables (gender, comorbidities according to the International Classification of Diseases – ICD10, type of organ failure according to the LODS, origin and mortality), Pearson's Chi-Square association test was used. In case of expected frequencies <5 in more than 80% of the cells, Fischer's test was applied.

Numerical variables were first analyzed through the Kolmogorow-Smirnov test to identify normal (p>0.05) or non-normal (p≤0.05) distribution. In case of normal distribution, Student's t-test was applied to identify significant difference or not between patients at public and private institutions. In case of non-normal distribution, Mann-Whitney's test was applied to the variable.

For all analyses, α≤0.05 was considered.

RESULTS

Among the 600 patients analyzed, the male gender predominated (56.50%). The mean age was 60.76 years (SD=18.75), ranging from 18 to 97, with a median 62 years. The most frequent category of antecedents, according to the ICD-10, was related to diseases of the circulatory system (56.17%), followed by endocrine, nutritional and metabolic diseases (27.83%) and neoplasms (18.83%). The main origins were the Operating Room (36.06%) or the Emergency Room (35.39%). The mean length of ICU stay was nine days, ranging from one to 79 days. Most patients displayed one (34.75%) or two (38.67%) indications of organ failure, most frequently renal failure (69.68%). The mean death risk, calculated through the SAPS II and LODS, corresponded to 25.50% and 21.43% upon admission and 23.14% and 20.73% upon discharge, respectively, and the general mortality rate was 20%.

Table 1 shows that, at the public hospitals, most patients admitted to the ICU came from the Operating Room (52.84%) and the Emergency

Room (31.10%). The opposite was the case at private institutions: Emergency Room (39.67%), followed by the Operating Room (19.33%). As for origin, differences among patients were found (p=0.00). In terms of gender, groups were similar (p=0.25).

Table 1 - ICU patients (n=599*) according to type of institution and origin. São Paulo, 2006-2007

Origin	Type of institution				p†
	Public		Private		
	N	%	N	%	
Ward	24	8.03	33	11.00	
Semi-intensive	17	5.69	51	17.00	
Emergency Room	93	31.10	119	39.67	0.00
Operating Room	158	52.84	58	19.33	
Others	7	2.34	39	13.00	

* missing: 1 private hospital, † Chi-Square test.

In the analysis of comorbidities, according to the ICD-10, patients admitted to private hospitals differed from public institutions concerning the presence of the following antecedents: certain infectious and parasitic diseases, 10.96% at private versus 3.68% at public ICUs (p=0.00); neoplasms, 31.23% private versus 6.35% public (p=0.00); endocrine, nutritional and metabolic diseases, 31.89% private versus 23.75% public (p=0.02); diseases of the nervous system, 8.64% private versus 4.01% public (p=0.02); diseases of the digestive system, 11.30% private versus 4.35% public (p=0.00); diseases of the genitourinary system, 15.95% private versus 9.70% public (p=0.02); and injury, poisoning and other consequences of external causes, 4.65% private versus 1.00% public (p=0.01). For all of these comorbidities, patients from private hospitals showed higher levels than from public institutions.

In table 2, a significant age difference (p=0.00) can be observed between the patients under analysis, with higher mean and median age at private hospitals. As for the length of ICU stay (p=0.00), patients admitted to public hospitals showed a considerably higher mean duration than in private hospitals. The death risk, according to the SAPS II and LODS, upon ICU admission as well as discharge, was similar between the study groups.

Table 2 - Descriptive measures of numerical variables according to type of institution. São Paulo, 2006-2007

| Variables | Type of institution | | | | p* |
| | Public | | Private | | |
	Mean (SD)	Median (Min-Max)	Mean (SD)	Median (Min-Max)	
Age	57.51 (18.82)	58 (18-94)	63.98 (18.08)	69 (18-97)	0.00
Length of ICU stay	10.59 (11.04)	6 (1-54)	7 (10)	3 (1-79)	0.00
SAPS II† admission	24.68 (21.72)	16.70 (0.50-95.70)	26.21 (22.46)	19.60 (0.00-94.10)	0.44
SAPS II† discharge	22.99 (24.61)	12.80 (0.00- 98.10)	23.64 (23.31)	16.70 (0.00-98.10)	0.24
LODS‡ admission	21.52 (17.33)	15.00 (3.20-92.00)	21.28 (19.92)	15.00 (3.20-92.00)	0.15
LODS‡ discharge	21.77 (21.67)	15.00 (3.20-92.00)	19.75 (20.94)	10.40 (3.20-98.40)	0.15

* Mann-Whitney test, †Simplified Acute Physiology Score II, ‡Logistic Organ Dysfunction Score.

Concerning the number of organ failures according to the LODS, both groups displayed a majority of patients with one or two indications of organ failure, totaling 73.40% at public and 72.42% at private institutions. The p-value (0.30) identified through the Mann-Whitney test revealed no significant difference between the patient groups with regard to this variable.

Table 3 - ICU patients (n=587*) according to type of institution and organ failure. São Paulo, 2006-2007

| Organ failure | Type of institution | | | | p |
| | Public | | Private | | |
	n	%	n	%	
Cardiologic	56	19.11	78	26.53	0.03†
Hematologic	16	5.46	34	11.56	0.01†
Neurologic	67	22.87	44	14.97	0.01†
Renal	219	74.74	190	64.63	0.01†
Pulmonary	148	50.51	145	49.32	0.77†
Hepatic	2	0.68	3	1.02	1.00‡

* missing: seven private hospital, six public hospital,† Chi-Square test, ‡ Fisher's test.

Table 3 demonstrates that, according to the LODS, renal failure was the most frequent at both types of institutions, followed by pulmonary failure. Patients differed concerning the presence of the following types of failure: cardiologic (p=0.03), hematologic (p=0.01), neurologic (p=0.01) and renal (p=0.01).

Table 4 - ICU patients (n=600) according to type of institution and mortality. São Paulo, 2006-2007

| Variable | Categories | Type of institution | | | | p* |
| | | Public | | Private | | |
		n	%	n	%	
Mortality	Yes	76	25.42	44	14.62	0.00
	No	223	74.58	257	85.38	

* Chi-Square test.

Table 4 highlights the fact that a higher mortality rate was found at ICUs in public institutions, approximately twice as high as in private institutions (25.42% versus 14.62%). The mortality variable showed a statistically significant difference between the patients under analysis (p=0.00).

Table 5 - Evolution in SAPS II and LODS of patients hospitalized at ICUs (n=600), for survivors (n=480) and non-survivors (n=120). São Paulo, 2006-2007

Difference admission/ discharge	Score	Type of institution				p
		Public		Private		
		Mean (SD)	Median (Range)	Mean (SD)	Median (Range)	
Survivors and non-survivors	SAPS II	+1.69 (21.57)	+2.10 (-78.70 ⊢⊣ +59.50)	+2.57 (20.77)	0.00 (-80.60 ⊢⊣ +75.70)	0.81*
	LODS	-0.24 (20.91)	0.00 (-87.20 ⊢⊣ +73.40)	+1.53 (19.34)	0.00 (-83.50 ⊢⊣ +73.30)	0.78*
Survivors	SAPS II	+6.81 (14.64)	+3.80 (-66.10 ⊢⊣ +59.40)	+5.69 (15.01)	+1.30 (-45.90 ⊢⊣ +75.70)	0.09*
	LODS	+4.87 (14.20)	+1.60 (-48.30 ⊢⊣ +73.40)	+4.92 (14.26)	0.00 (-29.80 ⊢⊣ +73.30)	0.12*
Non-survivors	SAPS II	-13.36 (30.10)	-7.35 (-78.70 ⊢⊣ +59.50)	-15.62 (35.65)	-7.25 (-80.60 ⊢⊣ +54.90)	0.71†
	LODS	-15.26 (28.88)	-15.95 (-87.20 ⊢⊣ +54.30)	-18.27 (30.46)	-10.30 (-83.50 ⊢⊣ +38.00)	0.60†

* Mann-Whitney test, † Student's t-test.

As presented in table 5, no significant difference was found in patient evolution as calculated through the SAPS II and LODS, even when specific groups (survivors and non-survivors) were analyzed.

DISCUSSION

Concerning demographic characteristics, the male gender predominated at public and private ICUs. In the comparative analysis, the victim's gender distribution was similar at both institution types. A similar result was found in a research developed in the United States[7] and also in Brazil.[9]

As for age, patients at private hospital showed a higher mean and median age. The same profile was identified in a research that analyzed mortality and length of hospital stay: 62 years at private and 59 at public institutions.[4] In the present study, patients at the institutions under analysis differed in terms of this variable. A similar result was found in a research on the incidence of sepsis at ICUs in Brazil.[5]

Authors that compared elderly patients attended in the private and in the public (SUS) network indicated that the mean age for hospitalization in the SUS is lower when compared with other hospitalized patients.[13]

The larger number of elderly ICU patients follows the rising life expectancy, as confirmed in the study that analyzed the characteristics of 35,327 patients hospitalized in ICUs between 1980 and 1995.[20] The lack of ICU places in public hospitals is a Brazilian reality and, consequently, refusals to admit patients to the critical unit are frequent. A research that analyzed factors associated with non-hospitalization at ICUs of referred patients identified that age older than 70 years was one of the reasons for refusal.[21]

Thus, the presence of younger patients at the public hospitals found in this study may be related with the lack of ICU beds in comparison with demand, turning age into one of the decisive factors when screening and admitting patients at these critical units.

In this study, the comorbidities that showed significant differences between the study groups revealed higher frequencies at private hospitals. A research that correlated antecedents with ICU types (public and non-public) identified a significant difference between the groups concerning neoplasms, and this was also a more frequent comorbidity at private hospitals.[9]

In the present study, this result can be related with the more advanced age of this patient group. The ageing process is considered physiological,

but is pictured by the progressive decrease in organic functional reserves. In burden situations, homeostatic balance maintenance is impaired, making the elderly more susceptible to problems and illnesses; therefore, it is not very common for individuals to reach old age without developing a chronic illness.[22]

Besides, in view of this result, it should be highlighted that SUS funding is limited in Brazil, and this limitation maintains a repressed demand for care delivery to poorer people.[1] This deficient coverage probably results in failures in the early diagnosis of comorbidities, contributing to the lower frequency of these antecedents in public network patients.

The analysis of origin showed differences among patients, in that most of them were admitted from the Operating Room at public and from the Emergency Room at private institutions. The same result was found in other studies[6,9] and may be related with the higher incidence of emergency surgical interventions at public institutions.

The length of ICU stay was longer at public hospitals, with a significant difference between the groups. A similar result can be observed in other studies.[6,10] The low rotation level of ICU beds aggravates the lack of places at the public institutions, entailing an accumulation of patients who need intensive care at other hospital sectors; on the other hand, the long hospitalization time at the critical unit directly implies increased hospital costs.

A research at a public hospital in Rio de Janeiro evidenced that the probability of surviving the hospitalization without any medication-related adverse events corresponds to 96%, 93% and 73% in hospitalizations of up to 30, 60 and 100 days, respectively.[23] These results appoint strategies aimed at reducing these events, and also the hospitalization periods.

Concerning the risk of death calculated through the SAPS II and LODS, patients were similar upon admission and discharge. The same was not the case in a research that compared public and private institutions in Trinidad and Tobago, whose results demonstrated a significant difference between institutions regarding death risk calculated through the SAPS II, with higher levels at public institutions.[10] No study was found in the literature that analyzed the LODS in this context. Other gravity indices are used, though, to compare institution types, such as the Acute Physiology And Chronic Health Evaluation II

(APACHE II)[5,7] and Sequential Organ Failure Assessment (SOFA).[5]

The ICU mortality rate at the public institutions was higher than at the private establishments, with a statistically significant difference between the groups analyzed. The same result was found in other Brazilian studies.[4-5] A study in the United States revealed that the difference found in mortality rates between institutions is associated with public hospital patients' more severe conditions as calculated through the APACHE II.[7]

A study developed in a city in the Brazilian Northeast showed that lethality due to acute myocardial infarction corresponded to 19.5% at public and 4.8% at private hospitals. In addition, individuals attended in the public network received treatment later, with an ICU hospitalization rate of 8%, against 94% at private hospitals.[8]

The lack of ICU beds in public hospitals and the possible delay to admit patients for intensive treatment leads to the aggravation of patients' health condition.[21] Upon ICU admission, however, patients' gravity was similar in comparison with patients attended at private institutions. This fact may be related to the composition of the severity scores applied in this research. To estimate patients' gravity, besides physiological data, consider the more advanced age and presence of comorbidities, frequent characteristics among patients at private ICUs.

In line with this premise, the analysis of SUS and non-SUS patients' death risk revealed no statistical difference between these patient group, although it was observed that the risk of death increased almost six times when the number of associated illnesses increased.[13]

The Standardized Mortality Ratio (SMR) is calculated by dividing observed by expected mortality. SMR above 1 indicate that the observed exceeded the expected mortality, reflecting possible failures in care quality.[24]

In the present study, the SMR at the public hospitals corresponded to 1.02 according to the SAPS II and 1.18 according to the LODS. At private hospitals, the ratios equaled 0.56 according to the SAPS II and 0.69 according to the LODS. Although the analysis of these data may appoint differences in the quality of care delivery at public and private hospitals, the evolution in the SAPS II and LODS, calculated for the total sample, survivors and non-survivors, was similar at the different institutions. Although better human

and material resource infrastructure conditions at private institutions are a reality in comparison with public establishments, including possible repercussions for care quality, patient-related aspects can justify the higher mortality rate at the ICUs in this study.

This finding may be associated with a decreased treatment response among patients at public hospitals, resulting from low adherence to their disease treatment, entailing a lower organic physiological reserve to reestablish their health. Multiple factors may be associated with this low adherence, including: medication cost, devaluation and lack of knowledge on the effectiveness and importance of treatment, occurrence of side effects and medication distribution errors by the public service.[25-26] In this context, strategic planning needs to be set up to strengthen primary care delivery to patients, through the multidisciplinary team's firm action as a facilitator of health education and treatment adherence, so as to minimize the disease severity and possible sequelae.

The fact that ICU patients at public hospitals more frequently come from the Surgery Center can be a factor that contributes to high mortality rates. One of these ICUs under analysis is located in a hospital that is a referral center for care delivery to trauma victims. Hence, most of these patients are admitted for non-programmed surgeries, entailing lack of due time for complete pre-operative assessment and patient stabilization for the surgical procedure.

The longer ICU hospitalization period at public hospitals may have contributed to these rates, as patients become more susceptible to adverse events, such as hospital infection, medication errors, among others.[23,27]

In that sense, a study in European countries proposed the hypothesis that economic conditions in a region can influence care quality and, consequently, intervene in the observed outcomes. This hypothesis was validated in the results found, which showed higher mortality, SMR and sepsis frequency levels at the ICUs located in low-income regions when compared with medium and high-income zones. The authors appoint that the smaller number of nurses at the ICUs in medium and low-income regions may have contributed to this higher sepsis and mortality rate.[28]

These assertions are mere suppositions, in view of the lack of research to compare patients at different institution types. Therefore, further comparative studies, focusing on ICU patients' clinical characteristics, evolution and gravity at public and private institutions are needed to confirm the hypotheses raised.

The strict hospital selection criterion, based on the establishment of different qualification requisites, as described in the method, represents a limitation to generalize the study results. All hospitals selected offered semi-intensive beds and an adequate number of ICU beds in relation to the number of hospital beds, and were located in São Paulo City, in the state with the largest number of health establishments with ICUs in Brazil.[3] Therefore, these findings do not picture the Brazilian reality, characterized by the presence of poorer regions in terms of intensive care.

CONCLUSIONS

These study results appointed that, independently of the type of institution, patients were similar concerning the variables: gender, number of organ failures and presence of pulmonary and hepatic failure according to the LODS, gravity and clinical evolution of ICU patients. Nevertheless, differences were found regarding: age, comorbidities, origin, length of ICU stay, type of organ failure (cardiologic, hematologic, neurologic and renal) according to the LODS and mortality.

The high mortality rate at public hospitals, without increased gravity, entails the need for further research that compares institutions' legal status, as it cannot be affirmed that this fact is directly related with care quality failures.

Based on the panorama presented in this study, nurses are responsible for considering patients' clinical characteristics and gravity found at the different ICU types to elaborate the care planning and nursing staff dimensioning, as well as for investigating possible particularities of the care population. In addition, multidisciplinary teams and hospital managers need to take into account and respect the principles of the SUS (integrality, universality and equity), guaranteeing care to ICU patients, always oriented towards the search for intensive care quality.

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