Sources of payment for hospitalization and clinical performance: the case of hospitals in São Paulo, Brazil

Fontes de pagamento das internações e desempenho clínico: o caso dos hospitais do estado de São Paulo, Brasil

Juliana Pires Machado[1], Mônica Martins[2], Iuri da Costa Leite[3]

ABSTRACT The aim was to analyze clinical performance through the application of Hospital Standardized Mortality Ratio (HSMR) and its variation according to admissions payment sources and hospitals financing arrangements. Secondary data was used and diagnoses that account for 80% of hospital deaths were analyzed, adjusted by patient risk. Performance observed was worse than expected in public and mixed-public hospitals, and in SUS (Unified Health System) hospitalizations. The relation between source of payment and HSMR may indicate differences in clinical practice or in the severity of cases. This methodology contributes to the monitoring of hospital quality, directing public policies and regulations.

KEYWORDS Outcome assessment (health care). Hospital mortality. Hospital administration. Health systems. Supplemental health.

RESUMO *O objetivo foi analisar o desempenho clínico por meio da aplicação da Razão de Mortalidade Hospitalar Padronizada (RMHP) e sua variação segundo fonte de pagamento da internação e arranjo de financiamento do hospital. Foram utilizados dados secundários e analisadas as causas responsáveis por 80% dos óbitos hospitalares ajustadas por risco. Desempenho pior que o esperado foi observado em hospitais públicos e públicos mistos e em internações SUS (Sistema Único de Saúde). A relação entre fonte de pagamento e RMHP pode indicar diferenças de prática clínica ou de gravidade dos casos. A metodologia aplicada contribui para o acompanhamento da qualidade hospitalar no País, direcionando políticas públicas e regulamentações.*

PALAVRAS-CHAVE *Avaliação de resultados (cuidados de saúde). Mortalidade hospitalar. Administração hospitalar. Sistemas de saúde. Saúde suplementar.*

[1] Agência Nacional de Saúde Suplementar (ANS), Diretoria de Desenvolvimento Setorial – Rio de Janeiro (RJ), Brasil. *juliana.pm@gmail.com*

[2] Fundação Oswaldo Cruz (Fiocruz), Escola Nacional de Saúde Pública Sergio Arouca (Ensp), Departamento de Administração e Planejamento em Saúde – Rio de Janeiro (RJ), Brasil. *martins@ensp.fiocruz.br*

[3] Fundação Oswaldo Cruz (Fiocruz), Escola Nacional de Saúde Pública Sergio Arouca (Ensp), Departamento de Epidemiologia e Métodos Quantitativos em Saúde – Rio de Janeiro (RJ), Brasil. *iuri@fiocruz.br*

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Introduction

Performance assessment of health systems and services has been used to guide decision-making aiming at the implementation of changes and improvements in the different dimensions that compose this concept. In this area, methodologies are necessary to achieve reliable data analysis and therefore guarantee spending transparency, regulate care delivery, control care costs, deliver effective, safe, adequate, and equitable care, and also reduce variations in clinical practice (CHASSIN *ET AL.*, 2010; FUNG *ET AL.*, 2010; MULLEY, 2009). This is a demand in the agenda of various players, including financing agents, providers, professionals, and patients.

In the sphere of hospital care, studies have been demonstrating meaningful variations in clinical performance associated with the public or private nature of hospitals and whether they are not-for-profit or for-profit, with advantages for the latters (BRAND *ET AL.*, 2012; FUNG *ET AL.*, 2010; DEVEREAUX *ET AL.*, 2002). Disparities between these types of hospitals may occur due to differences related to the organization's resources, the spectrum of available strategies, and the relationship with the external context, especially regarding dependency on governmental or private health insurance financing (MEDICI, 2011; LA FORGIA; COUTTOLENC, 2009). In Brazil, the possible combinations between sources of admission payment adopted by hospitals (Unified Health System – SUS, health insurance plans, and/or private-pay), named 'financing arrangement', are characterized as a structural element that may affect care outcomes (MACHADO, 2014).

Hospital mortality, a traditional indicator used to measure care outcomes, is often described in performance variations analyses, in the scientific literature and reports from international agencies (BRAND *ET AL.*, 2013; SHAHIAN *ET AL.*, 2012; CAMPBELL *ET AL.*, 2012). Despite the advantage of being a unique event and mandatorily registered, adding accuracy to its use, and ideally capturing the complexity of the whole care process, the relationship between mortality and quality of care are not entirely comprehended, exempt from measure errors, and applicable to many diagnoses (SHAHIAN *ET AL.*, 2012; CIHI, 2007). In this context, there are important methodological issues whose definition are necessary to broaden the reliability of the analyses, such as: definition of sample population, cases to be selected, risk-adjustments necessary to have a fair comparison between hospitals, and ways of interpreting variations observed between them (BRAND *ET AL.*, 2013).

In this debate, among the methodologies proposed for the analysis of hospital mortality as an indirect measure of the quality of care (FUNG *ET AL.*, 2010), the one developed by Jarman (JARMAN *ET AL.*, 1999; JARMAN *ET AL.*, 2010), based on the Hospital Standardized Mortality Ratio (HSMR) was outstanding and has been included in monitoring systems of several countries (SHAHIAN *ET AL.*, 2012). Jarman's proposal, when analyzing the diagnoses responsible for 80% of hospital deaths, considered a 'global' methodology, presents the advantage of using a unique and generic measure, as the standardized general mortality coefficient. Furthermore, this approach enables the assessment of a larger amount of providers, comprising hospitals with varied case profiles.

Therefore, considering the international importance given to Jarman's approach, this study aimed to analyze clinical performance by means of the application of Hospital Standardized Mortality Ratio (HSMR) and its variation according to admission source of payment and hospital financing arrangement.

Methods

Design

It is a transversal, exploratory study, based on secondary administrative data available at Brazilian data systems. Considering the

accumulated knowledge on the quality of data, this study is circumscribed to the state of São Paulo, in the period between 2008 and 2010. An adaptation of the methodology proposed by Jarman (JARMAN *ET AL.*, 1999; JARMAN *ET AL.*, 2010) was carried out, having HSMR as an indicator of hospital clinical performance.

Setting

The analysis comprised 426 general hospitals, selected for presenting at least 1,095 acute admissions, with length of stay in hospital up to 30 days, of adults aged between 18 and 99 years, between 2008 and 2010, with at least one death in the period. Only admissions whose end was discharge or death were included (excluded were continuities, transfers, and administrative discharge). The selection criteria adopted aimed at the exclusion of hospitals with low volume of admissions in the study period, because not only have studies demonstrated that hospitals with higher admissions volume tend to present better results regarding the care delivered (LUFT, 1990), but also hospitals with a small number of admissions might distort the estimates obtained. By restricting the period of hospitalization, the objective was to exclude the cases of long length of stay, because it jeopardizes the causal validity between process and outcome of care (DONABEDIAN, 2002), when the measure of quality used is intra-hospital mortality.

From the total of 5,784,280 admissions, those with primary diagnosis referring to non-specific groups of causes were excluded, i.e., those in which the first digit of the International Classification of Diseases (ICD-10) was R, T, V, X, Y or Z. Admissions for other causes were selected, including only the causes responsible for 80% of hospital deaths, based on ICD-10 with three digits. The remaining 2,001,522 admissions were grouped in 71 distinct diagnoses codes, in steps developed according to the methodology proposed by Jarman (JARMAN *ET AL.*, 1999; JARMAN *ET AL.*, 2010).

Data sources

This study has used open access data on hospitals from the databases of the National Register of Health Institutions (NRHI) (Cadastro Nacional de Estabelecimentos de Saúde – CNES). Data on private admissions were extracted from the Hospital Admission Register (HAR) (Comunicação de Internação Hospitalar – CIH) and data on public admissions were extracted from the Hospital Data System (HDS) (Sistema de Informações Hospitalares – SIH).

Data analyses

The analyses used the volume of admissions by sources of payment to classify hospitals according to the financing arrangement. Hospitals were categorized according to the combination of volume of admissions by source of payment – public (financed by SUS or philanthropy) and private (financed by private or public health insurance, or private-pay) – in five categories: (1) public (no private admissions); (2) mixed-public (up to 25% of private admissions); (3) mixed (25% to 75% of private admissions); (4) private-mixed (75% to 99% of private admissions); (5) private (100% of private admissions).

To measure clinical performance, the study used the HSMR, a dependent variable calculated by means of the division between the number of deaths observed and expected (Ratio O/E), and multiplying this result by 100. The number of deaths observed was calculated in function of patients' risk factor. In the cases when HSMR was below 100, performance was considered better than expected; when equal to 100, performance was equal to expected; and above 100, hospital performance was lower than expected.

Based on the multiple logistic regression (death: yes/no), several risk-adjusted models were used to calculate the expected amount of deaths, adopting the one with better discriminatory capacity having C-statistics as

base (AYLIN; BOTTLE; MAJEED, 2007). This measure indicates the probability of death risk in a randomly selected patient who died, compared to the probability of death risk in a randomly selected patient who survived. Values under 0.7 indicate poor discrimination; between 0.7 and 0.8 reasonable discrimination; and above 0.8 good discrimination.

The base model, the first to be tested, comprised the variables gender (male or female) and age (in years), which was classified in six categories: 18-49, 50-59, 60-69, 70-79, 80-89, and 90-99. Then, step by step, the variables related to patient risk were included. In model 2, the primary diagnosis with three digits was included (three digits codes according to the International Classification of Diseases – 10th edition – ICD-10); in model 3, there was the inclusion of the Charlson comorbidity index (CI) score (SHARABIANI; AYLIN; BOTTLE, 2012; QUAN *ET AL.*, 2005), that was created based on the secondary diagnosis data, classified in three categories: 0, 1, and ≥ 2; in model 4, there was the inclusion of the occurrence of other morbidity not included in the CI; and in model 5, there was the inclusion of the length of stay (in days) classified in seven categories: 1, 2-5, 6-10, 11-15, 16-20, 21-25, 26-30. Thus, the latter, adopted as final model, was composed of the following variables: gender, age group, primary diagnosis, CI score, occurrence of other morbidity not included in the CI, and length of stay. These variables were selected based on the literature on the theme (CAMPBELL *ET AL.*, 2012; SHARABIANI; AYLIN; BOTTLE, 2012; AYLIN; BOTTLE; MAJEED, 2007) and their availability in the databases used in the study. Among those widely used in similar studies, only the type of admission (emergency/elective) could not be used for not being available at HAR.

The analyses were carried out by using the Statistical Package for the Social Sciences (SPSS).

The study was approved by the Research Ethics Committee of Sergio Arouca National School of Public Health/Oswaldo Cruz Foundation (Ensp/Fiocruz) (Certificate of Submission for Ethics Report nr 02234312.3.0000.5240; Report number 78617, of August 23rd, 2012).

Results

The 426 hospitals in the state of São Paulo that had their performance assessed registered 2,001,522 admissions for the selected causes in the study period. The majority were small size, situated in the inland and private not-for-profit hospitals. Approximately 25% presented public financing arrangement, 22% private, 26% mixed-public, 23% mixed, and 3% mixed-private (table 1). Approximately 29% of admissions were of younger patients, until 49 years old, and the less expressive population segment was composed of elderly of 90 years or older. Only 4% presented comorbidities classified by CI, but 18% presented other comorbidity not included in the composition of this index. Almost 50% presented length of stay between 2 and 5 days. The three major motives for admission were concentrated on the following primary diagnosis: pneumonia – J18 (10%), heart failure – I50 (8%), and Cholelithiasis – K80 (7%). The majority of admissions were for clinical treatment (77%), and the use of intensive care unit (ICU) was only 8%. Concerning the admission payment, 69% corresponded to SUS, 28% to health insurance plans, and only 3% were private-pay *(table 1)*.

Table 1. Characteristics of hospitals and admissions – São Paulo, 2008 to 2010

Characteristics of Hospitals	**(N)**	**(%)**
Total	426	100,0
Size		
1-99 beds	183	43,0
100-199 beds	137	32,2
200-299 beds	77	18,1
300-399 beds	15	3,5
400-499 beds	5	1,2
500 beds or more	9	2,1
Financing Arrangement		
Public (0% private)	108	25,4
Mixed-Public (from 0.1 to 25% of private admissions)	112	26,3
Mixed (from 25.1 to 75% of private admissions)	99	23,2
Mixed-Private (from 75.1 to 99% of private admissions)	13	3,1
Private (100% of private admissions)	94	22,1
Municipality		
Capital	77	18,1
Interior	349	81,9
Total	426	100,0
Legal Nature		
Public	106	24,9
Private not-for-profit	230	54,0
Private for-profit	90	21,1
Characteristics of Admissions	**(N)**	**(%)**
Total	2.001.522	100,0
Gender		
Male	983.517	49,1
Female	1.018.005	50,9
Age (in years)		
18-49	580.121	29,0
50-59	350.537	17,5
60-69	373.954	18,7
70-79	384.054	19,2
80-89	256.450	12,8
90-99	56.406	2,8
Charlson Index (CI) – score		
0	1.919.632	95,9
1	54.247	2,7
≥2	27.643	1,4
Presence of comorbidity besides those included in CI		
No	1.638.977	81,9
Yes	362.545	18,1

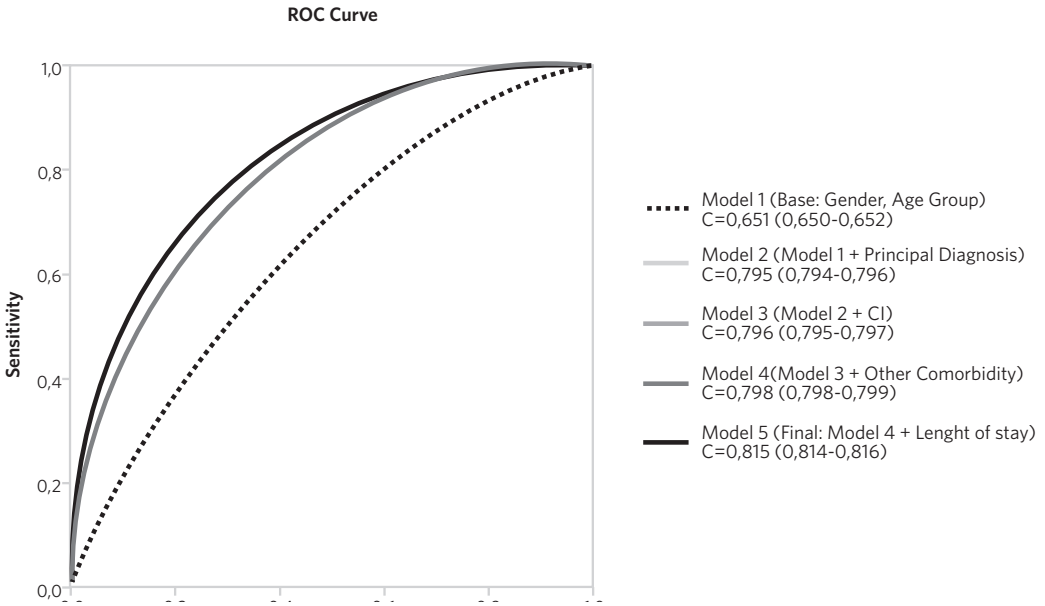
Table 1. (cont.)

Length of Stay (in days)		
1	359.830	18,0
2-5	974.744	48,7
6-10	400.189	20,0
11-15	145.826	7,3
16-20	64.944	3,2
21-25	35.083	1,8
26-30	20.906	1,0
Primary Diagnosis		
J18 – Pneumonia from non-specified organism	205.490	10,3
I50 – Heart Failure	155.901	7,8
K80 – Cholelithiasis	140.751	7,0
I20 – Angina Pectoris	92.065	4,6
K81 – Cholecystitis	88.082	4,4
N39 – Other disorders of urinary system	85.677	4,3
I64 – Stroke, not specified as haemorrhage or infarction	80.153	4,0
I10 – Essential (primary) hipertension	68.947	3,4
I21 – Acute myocardial infarction	58.867	2,9
S72 – Fracture of femur	58.848	2,9
Other	966.741	48,3
Use of ICU		
Yes	166.279	8,3
No	1.835.243	91,7
Type of Procedure		
Clinical	1.532.611	76,6
Surgical	468.911	23,4
Financing Arrangement		
Public (0% private)	559.227	27,9
Mixed-Public (from 0.1 to 25% of private admissions)	476.313	23,8
Mixed (from 25.1 to 75% of private admissions)	545.070	27,2
Mixed-Private (de 75,1 a 99% of private admissions)	75.218	3,8
Private (100% of private admissions)	345.694	17,3
Source of Payment at Admission		
SUS	1.381.569	69,0
Health Insurance Plan	565.095	28,2
Private-pay	54.858	2,7
Outcome of care		
Discharge	1.770.871	88,5
Obit	230.651	11,5

Source: Cadastro Nacional de Estabelecimentos de Saúde (CNES), Sistema de Informações Hospitalares (SIH) of SUS and Comunicação de Internação Hospitalar (CIH).

The predictive capacity of the final model, the best one among the five models tested, was equal to 0.815 (CI 95%: 0.814-0.816), adding discriminant strength when compared to the base model composed only of variables age and gender, whose C-statistics was 0.651 (CI 95%: 0.650-0.652). *Graph 1* shows the evolution of C-statistics in function of the entry of each risk variable in the tested models.

Graph 1. Evolution of C-statistics of assessed risk-adjusted models – São Paulo, 2008 to 2010



Source: Sistema de Informações Hospitalares (SIH) of SUS and Comunicação de Internação Hospitalar (CIH).

The final logistic regression model used for the prediction of expected deaths (available with the authors) indicated greater chance of obit for male patients, in higher age groups, with CI above zero, with another morbidity, and with one day length of stay in hospital (results not presented). It is noteworthy that the chance of obit presented an important variation, according to the primary diagnosis.

The gross hospital mortality rate corresponded to 11.5%, varying between 0.3 and 26.9% in the hospitals included in the study; the standardized mortality rate was 11%, but it varied between 2.7% and 20.0% *(table 2)*. In total, 179 hospitals had worse performance than expected, with HSMR above 100, and 243 had better performance than expected, with HSMR below 100. The HSMR varied between 5.6% and 204%, with the performance in the group of hospitals with public financing arrangement being worse than expected; equal to the expected in mixed-public and mixed hospitals; and better than expected in mixed-private and private hospitals. The results indicate meaningful differences among these groups *(table 2)*.

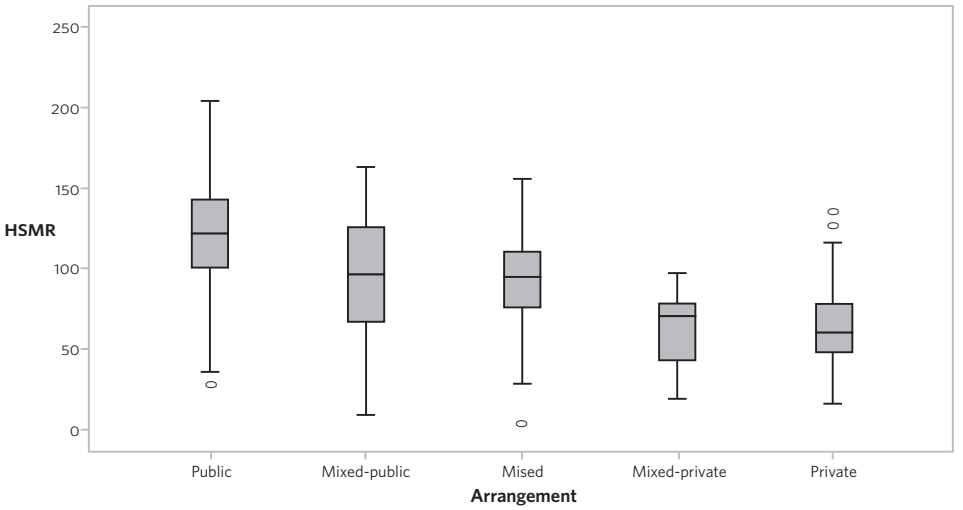
Table 2. Classification of hospital performance, according to hospital standardized mortality ratio (HSMR) – São Paulo, 2008 to 2010

Variables		Total	Financing Arrangement				
			Public (0% private)	Mixed-Public (from 0.1 to 25% of private admissions)	Mixed (from 25.1 to 75% of private admissions)	Mixed-Private (from 75.1 to 99% of private admissions)	Private (100% of private admissions)
Hospitals	N.	426	108	112	99	13	94
Admissions	N.	2.001.522	559.227	476.313	545.070	75.218	345.694
	Variation	(1.099 - 33.827)	(1.123 - 18.943)	(1.127 - 25.870)	(1.105 - 33.827)	(1.350 - 12.704)	(1.099 - 12.228)
	Mean	4.698	5.178	4.253	5.506	5.786	3.678
Deaths observed	N.	230.651	90.579	58.873	53.788	4.591	22.820
	Variation	(3 - 4.405)	(10 - 2.949)	(10 - 4.033)	(3 - 4.405)	(46 - 670)	(24 - 1.002)
	Mean	541	839	526	543	353	243
Deaths expected	N.	230.635	74.335	56.403	53.950	7.804	38.159
	Variation	(34 - 5.049)	(34 - 3.124)	(75 - 5.049)	(53 - 4.077)	(110 - 1.772)	(68 - 1.645)
	Mean	541	688	504	545	600	406
Gross mortality rate	%	11,5	16,2	12,4	9,9	6,1	6,6
	Variation	(0,3 - 26,9)	(0,8 - 26,9)	(0,8 - 22,1)	(0,3 - 17,3)	(2,7 - 11,7)	(1,5 - 17,7)
Expected mortality rate	%	11,5	13,3	11,8	9,9	10,4	11,0
	Variation	(2,7 - 20,0)	(2,7 - 19,8)	(5,9 - 19,5)	(4,5 - 16,2)	(8,1 - 14,0)	(5,8 - 20,0)
HSMR (O/E)	%	100,0	121,9	104,4	99,7	58,8	59,8
	Variation	(5,6 - 204,0)	(29,1 - 204,0)	(9,4 - 162,6)	(5,6 - 156,0)	(19,5 - 97,8)	(16,4 - 134,7)
	Standard deviation	37,0	33,6	36,3	27,1	23,9	24,7
	Confidence Interval	(96,5 - 103,5)	(115,5 - 128,2)	(97,6 - 111,1)	(94,4 - 105,0)	(45,9 - 71,8)	(54,8 - 64,8)

Source: Sistema de Informações Hospitalares (SIH) of SUS and Comunicação de Internação Hospitalar (CIH).

Graph 2 shows HSMR variation according to categories of financing arrangements. The distribution of hospitals presented important heterogeneity, indicating that even in the group of public arrangement hospitals, where the performance was worse than expected, there are hospitals in which the results were better than expected; as well as in the private hospitals, where the performance was better, there are hospitals in which the results were worse than expected.

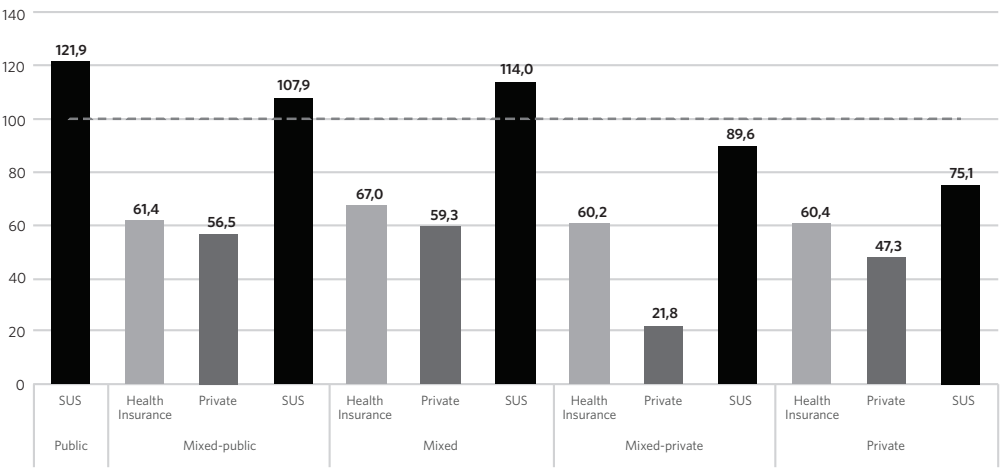
Graph 2. Boxplot of Hospital Standardized Mortality Ratio (HSMR) variation, according to hospitals financing arrangements – São Paulo, 2008-2010



Source: Sistema de Informações Hospitalares (SIH) of SUS and Comunicação de Internação Hospitalar (CIH).

When analyzing the cases by sources of payment at admission, higher HSMR is observed in the SUS cases, in all financing arrangements. However, for the group of hospitals classified as mixed-private or private, the performance was better than expected (HSMR < 100) regardless of the payment source. In the hospitals of public, mixed-public, or mixed arrangements, HSMR indicates worse performance than expected only for SUS patients, while the other cases were classified as better performance than expected *(graph 3)*.

Graph 3. Hospital Standardized Mortality Ratio (HSMR) by admission source of payment, according to hospital financing arrangements – São Paulo, 2008-2010



Source: Sistema de Informações Hospitalares (SIH) of SUS and Comunicação de Internação Hospitalar (CIH)

Note: the value SUS in private arrangement hospitals refers to philanthropy; there is no HAR for those hospitals.

Discussion

The results indicated that the methodology proposed by Jarman (JARMAN *ET AL.*, 1999; JARMAN *ET AL.*, 2010) is applicable to the Brazilian databases, having as an important benefit the possibility of assessing a higher number of providers considering that differently from the analysis by specific causes, this approach allows for the inclusion of hospitals with varied profiles of cases. The specificity of the Brazilian databases and the need to achieve adaptations in the applied methodology hinder the comparison of the results with those from other countries (JARMAN *ET AL.*, 2010; CIHI, 2007; IHI, 2003). However, the adaptation of the intrinsic concepts of this methodology to the data available in each place is a common feature of several studies (BURNETT *ET AL.*, 2013). In this study, the risk model adopted using data registered on the database of the state of São Paulo presented good discriminative capacity (C = 0.815) (AYLIN; BOTTLE; MAJEED, 2007), a result that is above other studies that analyzed specific conditions in Brazilian administrative data (MARTINS, 2010). If on one hand the good predictive capacity and the inclusion of various providers in the analyses constitute an advantage of the methodology used, on the other hand it should be stressed that it may also be considered less accurate due to the inclusion of cases of varied natures with heterogeneous risk, allowing for questioning on causal and attributable validity (VAN GESTEL *ET AL.*, 2012; DONABEDIAN, 2002).

In this specific study, it is noteworthy that the delimitation used for the inclusion of hospitals, according to the volume of admissions and deaths observed, was inferior to that adopted by Jarman *et al.* (1999), thus enabling the inclusion of smaller institutions, which are important in the Brazilian hospital network (MACHADO; MARTINS; LEITE, IN PRINT). For the same reason, the setting was not restricted to hospitals with emergency services, as originally proposed.

The risk-adjustment made to calculate the number of expected deaths used variables similar to those included in other studies (CAMPBELL *ET AL.*, 2012; SHARABIANI; AYLIN; BOTTLE, 2012). However, the information on comorbidity and composite indexes are less used in Brazilian studies due to under-registration and incomplete data, jeopardizing the adjustment and limiting the accuracy of results (MARTINS, 2010). In face of this reality, the use of primary diagnosis in the risk-adjusted model refined the measure of severity of the case.

Studies on the analysis of relations between the clinical performance and sources of admission payment with data from other countries, especially the USA, indicate advantageous variations for patients covered by private insurance or private-pay patients, when compared to patients covered by public insurances (WEISSMAN; VOGELI; LEVY, 2013; SPENCER; GASKIN; ROBERTS, 2013). In this study, HSMR differences were highlighted in private and public hospitals, with advantages for the first-mentioned. The categorization in financing arrangements that discriminate mixed hospitals according to the volume of cases with payment by SUS or by insurance plans or private-pay indicated greater similarity between mixed-private and private than between mixed-public and public. The analysis of HSMR according to the source of payment indicates better results for patients with private payment (plans or private-pay) in all financing arrangements; this may indicate that the performance is dependent on the main source of payment, regardless of the hospital financing arrangement. This result is worrisome because it may indicate the occurrence of differences in clinical practices related to the source of payment at admission (SPENCER; GASKIN; ROBERTS, 2013), though inside the same hospitals, where the same facilities are available. Another possibility would be the heterogeneity in the degree of severity at admission presented by patients of SUS and of insurance plans or private-pay, a factor of difficult measure with the variables available at Brazilian databases and the design of this study.

The limits of this study are mainly due to the low quality and completeness of data used for the analyses, the limited approach of the gravity of cases, and the use of global mortality as clinical performance measure. These questions are intertwined, limiting the analysis of results, since the validity of hospital mortality is associated with the risk-adjustment adequacy and this depends on the quality and comprehensiveness of data composing the patient's severity and may help in the identification of the prognosis. Precisely due to problems in the quality and sufficiency of data on hospital production this study has been circumscribed to the state of São Paulo.

When considering the changes in the demographic and epidemiologic profile resulting from population aging and the subsequent increase of patients with prevalence of multiple chronicle morbidities, it is of utmost importance to broaden those data. In this sense, in December 2015 new data fields were opened for multiple comorbidities in the Hospital Data System (Sistema de Informações Hospitalares – SIH) of SUS. However, it does not seem like actions have been taken to stimulate it being informed. Furthermore, the Hospital and Outpatient Data Register (Comunicação de Informação Hospitalar e Ambulatorial – CIHA) system used to report private admissions needs qualification in order to broaden its completeness and reliability.

Conclusion

The comparison between the analyzed hospitals highlights the strong HSMR variations, with disadvantages for public and mixed-public hospitals, as well as for patients whose source of payment at admission is SUS, regardless of the hospital financing arrangement. The discrepancies observed according to sources of payment at admission in hospitals in the five types of financing arrangements illustrate the risk of aggravation of social inequities; they also show the mix public-private overlapping the Brazilian hospital network. In this sense, the performance assessment achieved in this study drawing on the HSMR methodology has shown its viability to subsidize strategies for quality and management improvement of the Brazilian health system. However, analyses of organizational factors involved in clinical practice differences must be added, and in-depth knowledge should be achieved regarding the degree of severity of patients at admission; both aspects have not been captured in face of the variables available at Brazilian databases. Though there is space for refinement of the methodology and despite the limitations hereby discussed, the application of this methodology for the assessment of hospital clinical performance may contribute to the monitoring of the country's installed network, thus constituting a fundamental instrument for the support and guidance of public policies and regulations in Brazil.

Collaborators

Juliana Pires Machado and Mônica Martins performed the development of the study and wrote the article; Iuri da Costa Leite participated in the data analysis and the critical review of the document.

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