HOSPITAL PRODUCTIVITY AND IMPACT OF QUALITY MANAGEMENT IN TWO UNIVERSITY HOSPITALS OF THE BRAZILIAN NATIONAL HEALTH SYSTEM

PRODUTIVIDADE HOSPITALAR E IMPACTO DA GESTÃO DA QUALIDADE EM DOIS HOSPITAIS DE ENSINO DO SISTEMA NACIONAL DE SAÚDE BRASILEIRO

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ABSTRACT

Objectives: This study aimed to evaluate the performance of two large university hospitals in the Northeast of Brazil before and after administration by the Brazilian Hospital Services Company (EBSERH), and to analyze the impact of a quality certification program implanted in one of the institutions. **Methods:** A quantitative, cross-sectional, and analytical study evaluated the performance of the institutions from January to July 2013 and 2016. **Results:** The number of hospital beds increased by 3.23% at the University Hospital of the Federal University of Pernambuco (HU/UFPE), while no change was observed at the University Hospital of the Federal University of Bahia (HU/UFBA). Regarding the human resources indicator, a significant increase in staff was observed after EBSERH administration: 60.86% at HU/UFPE and 28.22% at HU/UFBA. For mortality rates, HU/UFPE showed an increase of 60.71%, while HU/UFBA a decreased of 33.33%. **Conclusion:** Both hospitals demonstrated improved performance following implementation of EBSERH. Additionally, the implementation of a quality certification program at HU/UFBA may have contributed to its more favorable outcomes.

Keywords: Hospital administration; Efficiency; Management

RESUMO

Objetivo: O objetivo deste estudo foi avaliar o desempenho de dois grandes hospitais de ensino do Nordeste brasileiro, antes e após a gestão administrativa da Empresa Brasileira de Serviços Hospitalares (EBSERH), e analisar comparativamente o impacto de um programa de certificação de qualidade implantado em um dos hospitais. **Metódos:** Foi realizado uma pesquisa quantitativa, transversal e estudo analítico para mensurar o desempenho dessas instituições, constituído em uma avaliação de desempenho. Foi realizada de janeiro a julho, dos anos de 2013 e 2016. **Resultados:** Em relação ao Hospital das Clínicas de Pernambuco (HC/UFPE), houve um aumento de 3,23% do número de leitos de internação. No entanto, no Hospital Universitário da Bahia (HU/UFBA), não houve alterações no mesmo período. Em relação ao indicativo de recursos humanos, observou-se um aumento significativo no número de funcionários após a gestão da EBSERH: 60,86% no HC/UFPE e 28,22% no HU/UFBA. Em termos de mortalidade, o HC/UFPE apresentou um aumento de 60,71% no número de óbitos, enquanto o HU/UFBA registrou uma redução de 33,33%. **Conclusão:** O estudo mostra que o desempenho em ambos os hospitais de ensino, HC/UFPE e HU/UFBA, foi satisfatório, o que pode ser justificado pela inserção do EBSERH e também pelo programa de acreditação de gestão da qualidade, especificamente implementado no HU/UFBA.

Palavras-chave: Administração hospitalar; Eficiência; Gestão

INTRODUCTION

Hierarchization organizes the health system into levels of care, starting with primary care and referring unresolved cases to higher complexity services when appropriate[1].

One of the main challenges faced by hospitals is the length of hospital stay, which is a key quality indicator used to evaluate bed turnover and productivity by specialty. It also reflects the amount of care provided, shorter hospitalizations, and reduced healthcare costs[2]. In Brazil, the average cost of inpatient care is 100 times higher than outpatient care[3].

Due to their complexity and relevance, especially hospitals requires an evaluation of services using performance and quality indicators to monitor operational processes and support decision-making[4].

In this context, the Brazilian Hospital Services Company (EBSERH) was created in 2011 by Law No. 12,550/11 to address administration and investment needs in university hospitals and overcome challenges related to performance indicators. As a public company linked to the Ministry of Education (MEC)[5], EBSERH manages the National Program for the Restructuring of Federal University Hospitals (REHUF), established by Decree no. 7.082 of 2010[6].

The impact of this administrative shift on healthcare productivity and quality have not yet been evaluated. This study aimed to evaluate the performance of two large university hospitals in Northeastern Brazil before and after implementation of EBSERH administration.

METHODS

This study evaluated the performance of two university hospitals over two periods: January to July 2013 (212 days) and January to July 2016 (213 days).

The 2013 period was selected as it marked the contractual agreement between EBSERH and the university hospital of the Federal University of Pernambuco (HU/UFPE) and Bahia (HU/UFBA). The 2016 period was selected to enable a comparative analysis of institutional performance following the implementation of administrative management by EBSERH.

In 2009, HU/UFBA implemented the international hospital accreditation program, a quality certification model ensuring care quality and patient safety.

Data were obtained from the hospital information system (SIH) and the National Registry of Health Establishments (CNES) for both periods. The aim was to evaluate hospital bed utilization, human resource indicators, mortality rates, and the impact of EBSERH management[7].

Indicators related to bed utilization were categorized as follows: total number of active beds, hospital admission authorizations (HAA), total hospitalizations, total cost of hospitalizations, mean HAA costs, mean cost per hospitalization, total length of stay (days), and mean length of stay[7]. Box 1 details the indicators and their corresponding variables.

Box 1. Hospital performance indicators: bed utilization, human resources, and mortality and corresponding variables.

Measured dimensions	Corresponding variables
Bed utilization	- Total number of active beds Paid HAA Total hospitalizations Total cost of hospitalizations Cost of hospital services Mean HAA costs Mean cost per hospitalization Length of stay (in days)
Human resources	- Total number of staff Nurses/bed Physicians/bed Nursing technicians/bed Other professionals (number)/bed Cost of professional services
Mortality	Number of deaths

Source: Developed by the author based on Brazil (2016)[7].

Mean length of stay, hospital productivity, and hospital mortality rate were used to evaluate hospital performance. Box 2 presents the calculation basis for these indicators.

Box 2. Indicators for the evaluation of hospital performance and calculation methods.

Indicators	Acronyms	Calculation methods
Mean length of stay	ALS	Numerator: total number of patients per day during a given period Denominator: total number of discharges during the same period
Hospital productivity rate	HPR	Numerator (output): number of discharges per period Denominator (input): number of admissions per period Multiplication factor: 100
Hospital mortality rate	HMR	Numerator: Number of deaths during the period Denominator: Number of discharges during the period Multiplication factor: 100

Source: Developed by the author based on ordinance no. 1101/GM by June 12, 20028 and the work of RAMOS & MIYAKE (2010)9. Legend: ALS: mean length of stay; HPR: hospital productivity rate; HMR: hospital mortality rate.

Descriptive statistics were used to present the results. As this study used publicly available secondary data sources, submission to the research ethics committee of UFPE (CEP/CCS/UFPE) was not required.

RESULTS AND DISCUSSION

a) Bed utilization

According to MEC, 13 university hospitals operate in the Northeast region of Brazil, apart from three maternity hospitals and one pediatric hospital. EBSERH manages all of these institutions. Box 3 presents the university hospitals and their respective contract dates. The institutions selected for this study were HU/UFPE and HU/UFBA, chosen due to their location in the same geographic region and similar institutional characteristics, which made them suitable for comparative analysis.

Box 3. List of university hospitals in the Northeast region of Brazil.

No.	Universities / University hospitals (HU) (*)	FU	Contract date with EBSERH
1	Federal University of Sergipe / HU	SE	October 2013
2	Federal University of Alagoas / HU PROF. ALBERTO ANTUNES	AL	January 2014
3	Federal University of Bahia (**) / HU PROFº EDGARD SANTOS	BA	December 2013
4	Federal University of Pernambuco (**) / HOSPITAL DAS CLÍNICAS	PE	December 2013
5	Federal University of Vale do São Francisco (***) / HU DR. WASHINGTON ANTÔNIO DE BARROS	PE	January 2014
6	Federal University of Campina Grande / HU ALCIDES CARNEIRO	PB	December 2015
7	Federal University of Campina Grande (***) / HU JÚLIO MARIA BANDEIRA DE MELLO	PB	December 2015
8	Federal University of Paraíba / HU LAURO WANDERLEY	PB	December 2013
9	Federal University of Rio Grande do Norte / HU ANA BEZERRA	RN	August 2013
10	Federal University of Rio Grande do Norte / HU ONOFRE LOPES	RN	October 2013
11	Federal University of Ceará / HU WALTER CANTÍDIO	CE	November 2013
12	Federal University of Piauí / HU	PI	April 2013
13	Federal University of Maranhão / HU	MA	January 2013

Legend: FU: federative unit. (*) University maternity hospitals (03) and the Prof. Heriberto Ferreira Bezerra Pediatric Hospital were excluded from the list. (**) University hospitals included in the analysis of this study. (***) Not listed by the Ministry of Education, but included in the list of the EBSERH[10].

Data from the SIH on hospital bed utilization at HU/UFPE in 2013 included an analysis of 371 beds across clinical, surgical, day hospital, pediatric, obstetric, and complementary categories.

For HAA, total cost was BRL 7,728,150.45, corresponding to 6,841 approved HAA and effective hospitalizations. Mean length of stay was 6.8 days.

In 2016, HU/UFPE had 383 beds for all specialties. Total cost of approved HAA for this period was estimated at BRL 8,476,580.39, referring to 8,254 approved HAA and effective hospitalizations. Mean length of stay was 6.2 days.

In 2013, at HU/UFBA, a total of 272 hospital beds was recorded. An increase in the number of surgical beds was observed, from 61 in May to 72 in July. Regarding clinical specialty beds, the number increased from 92 to 100. Beds categorized under other specialties increased from 12 to 14, and day hospital beds increased from 13 to 23. No records of obstetric beds were found.

In the HAA and hospital admissions records for 2013, a total cost of BRL 7,844,147.80 was verified, corresponding to 4,561 approved HAA and effective hospitalizations. Mean cost per case was BRL 1,719.83, and length of stay was 10.1 days.

In 2016, HU/UFBA had 256 beds. Total cost of approved HAA was BRL 7,212,817.26, with 4,591 hospitalizations and mean length of stay of 7.8 days.

In the comparison from 2013 to 2016, HU/UFPE increased 3.23 beds. However, HU/UFBA did not change bed availability. Regarding approved HAA in HU/UFPE, an increase of 20.66% was registered, while HU/UFBA increased HAA and effective hospitalizations by 0.66%.

The mean costs of approved HAA and hospitalizations decreased by 9.09% at HU/UFPE and 8.65% at HU/UFBA. Notably, an increase in the provision of care was observed, reflected by the number of approved HAA and hospital admissions. However, this increase was not accompanied by a rise in

the mean expenditure, indicating a reduction in the financial resources allocated per authorization and length of stay.

For total costs of approved HAA, HU/UFPE showed an increase of 9.68%, whereas HU/UFBA decreased by 8.05%.

The mean length of stay at both HU/UFPE (-8.82%) and HU/UFBA (-22.77%) decreased between 2013 and 2016. Table 1 summarizes the data mentioned above.

Table 1. Number of hospital beds and hospital admissions, including the mean and total costs of hospital services for approved admissions, hospital discharges, and mean length of stay from January to July of 2013 and 2016.

Variables	Beds	HAA/approved hospitalizations	Mean costs of HAA (BRL)	Total costs of approved HAA (BRL)	Hospital discharges	Mean length of stay (days)
2013						
HU/UFPE	371	6,841	1,129.68	7,728,150.45	1,006	6.8
HU/UFBA	272	4,561	1,719.83	7,844,147.80	452	10.1
2016						
HU/UFPE	383	8,254	1,026.97	8,476,580.39	1,331	6.2
HU/UFBA	256	4,591	1,571.08	7,212,817.26	589	7.8
Comparison 2013 – 2016 (%)						
HU/UFPE	+3.23	+20.66	-9.09	+9.68	+32.30	-8.82
HU/UFBA	-5.88	+0.66%	-8.65	-8.05	+30.30	-22.77

Source: Brazil. Ministry of Health - CINES/SIH (National Registry of Health Facilities / Hospital Information System), 20167.
Legend: HU/UFPE: university hospital of the Federal University of Pernambuco. HU/UFBA: university hospital of the Federal University of Bahia. SH: Hospital service. HAA: hospital admission authorizations. BRL: monetary unit of Brazil.

b) Human resources management

In the human resources indicator for 2013 at HU/UFPE, the number of employees was 1,505 in January and 1,377 in July, including 817 physicians, 102 nurses, 255 nursing technicians and assistants, and 203 other professionals. Total cost of professional services was BRL 1,939,546.05.

In 2016, the number of employees at the HU/UFPE was 2,215, comprising 1,165 physicians, 219 nurses, 481 nursing technicians and assistants, and 350 other professionals (healthcare and administrative staff). Total cost of professional services was BRL 1,985,029.77, with the highest monthly expense in March (BRL 342,082.61) and the lowest in February (BRL 206,417.14.) In 2013, the total number of employees at the HU/UFPE was 1,846, including 679 physicians, 180 nurses, 563 nursing technicians and assistants, and 424 other professionals. Total cost of human resource services was BRL 1,121,439.38. In 2016, the 2,367 professionals included 800 physicians, 239 nurses, 701 nursing technicians and assistants, and 627 other professionals. Total cost of professional services over the period was BRL 1,082,201.80. In March, the expenses of BRL 194,874.55 corresponded to the highest amount recorded among the analyzed months, while the lowest was observed in January, at BRL 106,027.39. The workforce at both university hospitals included medical residents, statutory public servants, federal employees, and contracted professionals.

In human resources indicator analysis before and after the implementation of EBSERH, a significant increase in staff was observed at HC/UFPE (60.86%) and HU/UFBA (28.22%). Regarding physicians, HU/UFPE increased by 42.59%, and HU/UFBA increased by 17.82%. For nursing staff, an increase of 114.71% at HU/UFPE and 32.78% at HU/UFBA was observed.

For nursing technicians and assistants, HU/UFPE increased by 88.63% and HU/UFBA increased

by 24.51%. For other professionals, HU/UFPE increased by 72.41%, and HU/UFBA increased by 47.88%. Total costs of professional services slightly increased for HU/UFPE (+2.35%), whereas HU/UFBA experienced a negative variation (-3.50%) in salary expenses. Table 2 summarizes the information above.

Table 2. Total number of employees, physicians, nurses, nursing technicians, and other professionals relative to available beds and the cost of professional services, from January to July of 2013 and 2016.

Variables	Total employees	Physicians	Nurses	Nursing technicians and assistants	Other professionals	Available beds	Cost of professional services
2013							
HU/UFPE	1377	817	102	255	203	371	1,939,546.05
HU/UFBA	1846	679	180	563	424	272	1,121,439.38
2016							
HU/UFPE	2215	1.165	219	481	350	383	1,985,029.77
HU/UFBA	2367	800	239	701	627	256	1,082,201.80
Comparison 2013-2016 (%)							
HU/UFPE	+60.86	+42.59	+114.71	+88.63	+72.41	+3.23	+2.35
HU/UFBA	+28.22	+17.82	+32.78	+24.51	+47.88	-5.88	-3.50

Source: Brazil. Ministry of Health - CINES/SIH (national registry of health facilities/hospital information system), 20167.
Legend: HU/UFPE: university hospital of the Federal University of Pernambuco. HU/UFBA: university hospital of the Federal University of Bahia.

c) Productivity of university hospitals

In 2013, 157 deaths were recorded at HU/UFPE, with the highest incidence in March and May (28 deaths each) and the lowest in April (17 deaths), resulting in a hospital mortality rate of 2.29. In 2016, 202 deaths were recorded during the study period at the same hospital. An increase was observed for number of deaths (+30.32%) and mortality rate (+43.67%).

At HU/UFBA, 150 deaths were recorded in 2013, corresponding to a mortality rate of 3.29. In 2016, 90 deaths were observed, with the highest number in April (20 deaths) and the lowest in January (8 deaths), resulting in a mortality rate of 1.96. Overall, the total number of deaths decreased by 40.00% and the mortality rate decreased by 40.43%. Table 3 summarizes these results.

Table 3. Total number of deaths, highest and lowest monthly values, hospital mortality rate, and hospital productivity rate from January to July of 2013 and 2016.

Variables	Month ≥ number of deaths	Month ≤ number of deaths	Total deaths	Hospital mortality rate	Hospital productivity rate	Mean length of stay
2013						
HU/UFPE	28	17	157	2.29	14.71	6.8
HU/UFBA	30	8	150	3.29	9.90	10.1
2016						
HU/UFPE	45	20	202	3.29	16.13	6.2
HU/UFBA	20	8	90	1.96	12.82	7.8
Comparison 2013 – 2016 (%)						
HU/UFPE	+60.71	+17.65	+30.32	+43.67	+9.65	-8.82
HU/UFBA	-33.33	0.00	-40.00	-40.43	+29.49	-22.77

Source: Brazil. Ministry of Health - CINES/SIH (National Registry of Health Facilities/Hospital Information System), 20167.
Legend: HU/UFPE: university hospital of the Federal University of Pernambuco. HU/UFBA: university hospital of the Federal University of Bahia.

The mean length of stay decreased at HU/UFPE (-8.82%), with a more significant reduction at HU/UFBA (-22.77%). The productivity rate increased at both HU/UFPE (9.65%) and HU/UFBA (29.49%).

Many factors may influence death and mortality rate, including aspects related to therapeutic care for patients, such as health equipment, qualified human resources, and the clinical complexity of the patients11.

By comparing hospitals, before and after administration by EBSERH and the implementation of a quality certification program at HU/UFBA, the perspective is to examine progress, performance, and potential weaknesses. Notably, in 2008, 1,124 hospital beds were deactivated nationwide in teaching institutions due to personnel shortages[12].

The implementation of hospital accreditation programs is of great importance, leading to reduced costs and morbidity and mortality rates. Quality certification ensures planning and efficiency of care services and identify potential weaknesses in work processes that affect treatments provided to patients13.

Regarding human resources, the HU/UFPE showed significant performance, with all health professional categories presenting positive growth, alongside increases in bed capacity and service costs, likely due to administration by EBSERH.

The literature supports this finding, noting that two government measures were proposed to mitigate the human resource shortage in university hospitals; the first was implementing of the compensation for additional hospital shifts, and the second conducting public examinations for staff hiring via EBSERH[14].

However, to mitigate issues in shift coverage due to insufficient staffing, the additional compensation failed to effectively resolve the human resource deficit in university hospitals. This measure did not adequately address the workforce shortages in these facilities.

Although both universities share similar management structures, each institution has unique characteristics that influence outcomes. These include differences in hospital infrastructure, which affect beds capacity and admissions, and organizational management and work processes tailored to epidemiological demands, such as prevalent morbidities and causes of mortality, which can lead to different final and productivity results.

Through REHUF, several measures were implemented, including physical and technological restructuring of facilities with modernization of technological equipment; revision of network financing with progressive budget increases for institutions; improvement of management processes; recovery of hospital human resources; and enhancement of hospital activities linked to teaching, research, extension, and healthcare services, all based on Brazilian population projections[15].

CONCLUSION

As positive aspects, the indicators related to

bed utilization show that HU/UFPE increased in the overall number of beds, differing from HU/UFBA that maintained a stable bed count. As for human resources, both hospitals reported an increase in their workforce.

Regarding deaths and mortality rate, HU/UFBA showed favorable results, with reductions in both indicators, unlike HU/UFPE, where increases were observed along with funding issues related to HAA payments. These differences are likely due to the implementation of accreditation programs exclusively at HU/UFBA.

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