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**EVALUATING THE EFFICIENCY OF THE HOSPITAL MANAGEMENT
– COMPARING PUBLIC AND PRIVATE HOSPITALS**

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ABSTRACT

Analyzing the performance of the hospitals through Data Envelopment Analysis is possible to establish their ranking as well as the optimum values for inputs/outputs of the hospital management. This research employed the DEA technique and elaborated a ranking of efficiency of the public hospitals and variables that improve their practices.

1. INTRODUCTION

Since the late 90 's the Department of Health has been showing a series of financial incentives in order to support the services of primary health care, whose services are run by the municipal sphere (GIL, 2006). However, it has been observed that the Union participation in financing the national health system (Sistema Único de Saúde – SUS) has also decreased from the 90's (Castro, MACHADO, 2010).

This fact is easily observed considering the \$50 billion invested by the Brazilian government in health care in 2007 represent the same per capita expending funded by the government in the early 90's: the equivalent of \$280 annually per person. The amount is above the average registered in Latin America, but it is not even half of the world average of \$806 per capita. Taking into account the percentage of the resources invested in relation to the amount collected by countries, Brazilian spending drops to little over half of the registered in the Latin american neighbors (FIA/USP, 2008)

According to the Brazilian Federation of Hospitals (2011), Brazil has about 6800 hospitals and approximately 464,000 beds between public and private, including organizations that are part of the Sistema Único de Saúde – SUS. According to the Brazilian Federation of Hospitals (2011), Brazil has about 6,800 hospitals and approximately 464,000 beds between public and private, including organizations that are part of the Sistema Único de Saúde – SUS, specially when the scarcity of resources in public health and low income of the brazilian population is taken into consideration.

The scarcity of resources in health can be understood when one considers that \$77 billion for health care in Brazil in 2011 represents only 0.020% of GDP of the country (IBGE, 2011). In 2009, the last year with complete data, the OECD, Organisation for Economic Co-operation and Development, showed that the United States spent 17.4% of GDP, followed by Netherlands (12%), France (11.8%), Germany (11.6%) and Denmark (11.5%). In 2009, Brazil was not listed on the website of the OECD, but estimating the resources devoted to health at approximately \$ 48 billion and the GDP of R\$ 3.42 trillion (IBGE, 2009), It obtains a modest 1.4%, leaving Brazil below countries such as Mexico (6.4%), North Korea (6.9%), Estonia (7.0%) and Poland (7.4%).

Given this context, correctly applying the small share of GDP on health care is an obligation and a great challenge for the public administration. Likewise, managing a portion of the value that goes into a hospital, becomes a matter of drive efficiency. The hospital must be as efficient as possible with the administration of the financial resource, applying it in the input variables, which generate the Administration and service provision, for example, number of beds, number of doctors, and the output variables, which are defined as a result of the provision of service, for example, number of surgeries, number of patients seen, etc.

The analysis of the operational efficiency of private and public hospitals performed with the use of performance indicators (input/output) can be deepened and better understood with the application of the Data Envelope Analysis (AED). EDA is a mathematical model that allows assessing organizational performance in terms of relative efficiency, with a multi-dimensional perspective, i.e. that presents multiple inputs and multiple outputs (Gonçalves, 2007). With the use of AED it becomes possible to establish rankings for hospitals under review, in addition to optimum values of production and consumption in individual and aggregate all inputs and outputs related to hospital management.

Because of the need to test and improve tools for measurement of operational efficiency and performance, both in the public sector and private sector of health, the goal of this article is to evaluate the efficiency of the management of hospitals, using EDA. For both, were selected ten large university hospitals and collected data available in DATASUS, in the period 2008 to 2011.

The article is organized in 4 sections, including this one. The second section brings the theoretical approaches that supported the proposed analysis. The third section describes the methods used in the research and the proposed model. The fourth section is presented the conclusion and prospects for future researches.

2. PERFORMANCE AND EFFICIENCY IN THE HEALTH SERVICE

The management of health systems and services aim at meeting the needs and demands and representations of the population, in a given society, in certain time. The management system of health service consists of three macrofunctions Regulation, financing and delivery of health services (MENDES, 2003, 2008). It is precisely in macrofunctions 'health services' that can be performed the measurement of efficiency and performance.

Although, there is no consensus on how to measure the performance of health systems and services, the performance concept relates to the fulfillment of objectives and functions of the organizations that compose the system, whichever establishes itself as a goal in each country. It is important to remember that the goals, targets and dimensions of analysis of health systems are diverse, even though its indicators (in terms of content) are equal. The experience of several countries indicates that the path for successful implementation of performance evaluation is a broad process of agreement that encompasses not only the goals and objectives of the health system, but also the different actors involved.

Viacava et al. (2004) argumentam que em termos de avaliação de desempenho, a ênfase principal tem sido dada aos serviços de assistência médica, como é o caso dos hospitais.(2004) argue that in terms of performance evaluation, the main emphasis has been given to healthcare services, as is the case of hospitals.

According to the authors, this fact occurs because of several factors, but among them the related search for greater efficiency. Evaluation of the performance, then, would help lead the management of health systems and services, so that they perform their duties in the best possible way forward to the financial constraints which are widely available in all countries in recent decades.

For better understanding of where and how it has been used the tools of evaluation of efficiency and performance in hospitals, some studies are presented below:

2.1 - Preliminary studies on the performance in hospitals

Lynch and Ozcan (1994) studied the hospital closing index. Underutilized and inefficient hospitals in competitive markets supposedly exhibiting greater risk of closing. The criterion of efficiency was not correlated or able to predict the hospitals in the United States from closing. In another word, the efficiency of a hospital does not guarantee that it will remain working.

Chern and Wan (2000) conducted a study of Panel with 80 hospitals in Virginia, United States, between 1984 and 1993. The main hypothesis was that the introduction of a prospective payment system would assist hospitals increase operational efficiencies and there would be technical efficiency gain.

The moderator variable in the study was the size of the hospital, set through number of beds. Contrary to the expectations of researchers, there was no significant difference in technical efficiency in each hospital group (large, medium and small).

Sommersguter-Reichmann., (2000) studied the Austrian hospital system reform, implemented in 1997, which should considerably reduce the inefficiency of the health system. The author researched the productivity of the healthcare system between 1994 and 1998 using the Malmquist index (composed of indexes of efficiency technical change, change in the scale of efficiency and shift

in technology). The findings showed improvement in the technological frontier between 1996 and 1998, though, It hasn't been followed by increased technical efficiency. Chu et al., (2002) studied the efficiency of hospital system in Taiwan. The work verified if the implementation of responsible centers and programs of total quality, in addition to encouraging, increases the efficiency of the hospital system. The sample included 90 hospitals in Taiwan analysed during the period from 1994 until 1996. The results showed that hospitals that implemented responsible centers, quality management system and incentives were more efficient than those that didn't.

Biorn et al., (2003) studied the effect of the regulation in the health system on the organizational outcome of the hospital in Norway.

The introduction of a type of contract management through achievement of goals as a lending mechanism associated with regulation increased the system efficiency in Norway, observed in historical series from 1992-2000. Nevertheless, the analysis of the effect of the budget on the efficiency has not been determined.

Valdmanis et al. (2004) looked at 68 hospitals of Thailand. The Thai economic crisis in 1999 increased the demand for public hospitals as well as for wealthier classes, which were uncovered by private insurance. Therefore, the richest made most use public hospitals, overloading the organizations. A segmentation was done for inpatient and outpatient, those who needed urgent hospital and those who could solve their problems in a clinic, for both poor and not poor patients. The results showed that the increased amount of services provided to poor patients does not reduce the amount of services offered to patients not poor. Still, the increase in health care facilities for the population can be performed through the allocation of resources to the hospitals not full, managing the distribution of patients and improving the budget management.

Ferrier et al. (2006) wrote an article aiming to measure how the free care affects the hospital's capacity to provide for paid services (for which they receive compensation). Os resultados mostraram que o modelo europeu, baseado em práticas gerenciais voltadas para o mercado, é mais eficiente do que o russo além de ser mais rápido para adotar novas técnicas para aumento dos cuidados com a saúde. The results showed that the European model, based on market-oriented management practices,

is more efficient than the Russian one, besides being faster trying new techniques to increase health care.

Lin et al., (2007) held a performance assessment at federal public hospitals managed by the Ministry of education-MEC. The findings showed that among efficient hospitals with the largest number of employees, there is a trade-off between the index of high complexity and number of admissions/bed: the UNB – The Brazilia University is characterized by a greater number of admissions/bed, the UFU - The Federal University of Uberlândia has the highest score of surgery/room (makes more surgeries per room) and the UFRJ - The Federal University of Rio de Janeiro is characterized by the increased complexity of procedures carried out by the hospital. This finding is consistent with the fact that most complex hospitals require greater number of workers and they present a longer average time of permanence in the hospital. Efficient hospitals with fewer employees, UFPEL – The Federal University of Pelotas and UFRN/AB - The Federal University of Rio Grande do Norte, have a low degree of complexity, but a median level of admissions/bed, superior to UFRJ – The Federal University of Rio de Janeiro and equivalent to UNIFESP – The Federal University of São Paulo.

Kjekshuh and Hagen.,(2007) studied the efficiency in the management of Health Services by merging hospitals. A fusão em hospitais é uma temática que está recebendo atenção nos últimos anos. The merger in hospitals is a subject that is receiving attention in recent years For example, the merger of 14 hospitals in 6 new health Centers led to the dismissal of 23 hospital administrators, according to the Ministry of health. The results of Kjekshuh and Hagen's research (2007) showed that (i) there was an increase in the technical efficiency and cost by the merger of hospitals in Norway only for large units, in which the hospital adopted a complex management characterized by administrative centralization; (ii) there has been increased efficiency technique to the other and (iii) there was a negative effect between -2% up to -2.8% in the cost of efficiency. Cautions regarding et al., (2007) studied the health system of Greece, which initiated a reform model in 2001. The new legislation demanded that hospitals should operate as decentralized economic and administrative units.

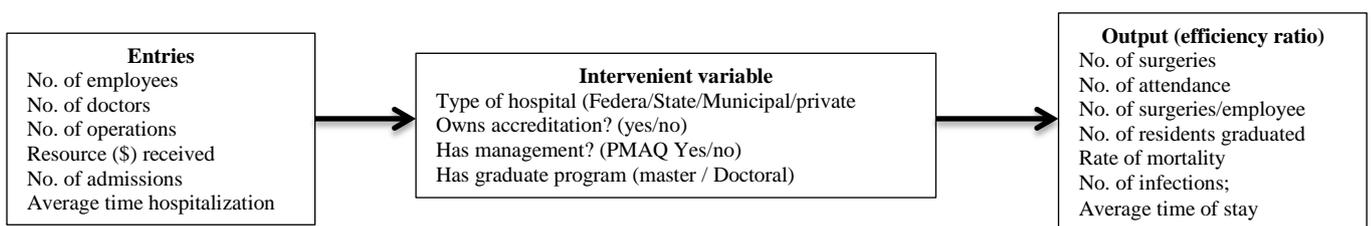
Given this new requirement it was assumed that hospitals could operate more efficiently and effectively. The study used the variables: number of doctors, number of employees and number of beds as input. The output conditions were visits to patients, performing surgeries and hospitalizations. The work showed that the decentralization of service network in Greece, looking at both before and after, did not result in sharp hospital efficiency improvement of the health system after the reform. Moreover, technical and productive efficiency were reduced.

Gonçalves et al., (2007) applied of data analysis methodology in assessing the performance of public hospitals, in terms of admissions in their clinics. The efficiency of hospitals was measured by the performance of decision-units in the variables studied for each hospital, in the year 2000. Data were analyzed regarding admissions in the medical clinic of SUS hospitals in the State capitals of Brazil and Distrito Federal. The inputs variables in the model were: mortality rate and average time stay in the hospital. The output variables were: percentages of hospitalization for the three chapters of An international Disease Classification (CID) with higher percentage of mortality, respectively: Neoplasms; infectious and parasitic diseases (DIP) and system circulatory diseases (circulatory); average amount paid for the Authorization form for hospital admittance (IAH average). Constant returns to scale model was used to generate scores that could assess the efficiency of units. From the scores obtained, the municipalities were classified according to their relative performance in the variables analyzed.

3. METHODS

3.1 - Suggested Framework

The model proposed by this work shows the input variables, which are analysed in case, the variables involved, which may change the result of the level of efficiency, and the output variables, i.e. efficiency in organizational management.



This is an exploratory research, quantitative, whose method of statistical procedure is using the AED. The data envelope analysis is a mathematical model (linear programming), non parametric, capable of assessing organizational performance in terms of relative efficiency among similar units, called DMUs (Decision Making Units) operational units, decision-makers, with a multi-dimensional perspective, i.e. that have multiple inputs and multiple outputs, in which case it is difficult to perform a comparison (Casado, 2007).

According to Logo and Lins (2011), the measure of eficiência in AED is accomplished by comparing a set of similar units, called decision making units (DMUs), which consume the same inputs (resources) to yield the same outputs (products), differing only in quantities consumed and produced.

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Ao definir as DMUs com as melhores práticas, AED constrói uma fronteira de produção empírica, e o grau de eficiência varia de 0 a 1,0 (ou de 0 a 100%), dependendo da distância da unidade à fronteira (LOGO, LINS; 2011). When defining the DMUs with best practices, AED constructs an empirical production frontier, and the degree of efficiency ranges from 0 to 1.0 (or 0 to 100%), depending on the distance of the drive to the border (LOGO, LINS; 2011).

3. 2- Input variables, output Variables and Moderators variables

The input variables to the proposed model are:

- Número de funcionários não médicos (FNM), dimensão assistênciaNumber of non-medical staff (FNM), assistance dimension < } 0 { >

- Number of doctors (MED), assistance dimension
- Total number of teachers (DOC), educational dimension
- Number of teachers with a doctorate (DOCPHD), educational dimension

Output variables are:

- SIPAC (index of high complexity), assistance dimension
- For surgeries/room (monthly) (CIR/S), assistance dimension
- Relação consultas ambulatoriais/sala (CAMB/S), dimensão assistênciaFor outpatient/room (CAMB/S), dimension assistance
- Number of students of Medicine (undergraduate) (GRAMED), educational dimension
- Number of medical residents (RESM), educational dimension
- Number of Master students/PhD students (MESDOUT), research dimension
- Number of graduate programs/medicine (PPG), research dimension
- others

Moderating variables are:

- Type of hospital (municipal vs. federal vs. State)
- Possui acreditação (variável dummy)Has accreditation (dummy variable)Especialidade do hospitalHospital specialty
- Funds received from the government (high vs. median vs. low)
- others

3.3 - Samples and Colect Procedures

Were chosen to compose ten large university hospitals sample. it was understood that a large hospital has over 151 beds, according to the Ministry of Health (1998) classification on size of hospital.

The choice of school hospitals to compose the sample due to the fact of such hospitals to coexist with severe budget constraints and great demand for services, which intensifies the need to properly manage the performance and efficiency of their operations.

The hospitals will be selected based on the university hospitals description in the portal of the Ministry of education (2011), through a random sampling using MS Excel. Data were collected from the following hospitals. Hospital Universitário Getúlio Vargas (Amazonas), Hospital de Clínicas de Porto Alegre, Hospital Universitário da Universidade Federal do Maranhão, Hospital Universitário Polydoro Ernani de São Thiago (Santa Catarina), Hospital de Clínicas da Universidade Federal do Paraná, Hospital das Clínicas da Universidade Federal de Minas Gerais, Hospital de Clínicas Unicamp, Hospital Universitário da USP, Hospital de Clínicas de Uberlândia e Hospital Universitário de Brasília. Hospital Universitário Getúlio Vargas (Amazonas), Hospital de Clínicas de Porto Alegre, Hospital Universitário da Universidade Federal do Maranhão, Hospital Universitário Polydoro Ernani de São Thiago (Santa Catarina), Hospital de Clínicas da Universidade Federal do Paraná, Hospital das Clínicas da Universidade Federal de Minas Gerais, Hospital de Clínicas Unicamp, Hospital Universitário da USP, Hospital de Clínicas de Uberlândia e Hospital Universitário de Brasília.

The data collection will occur through secondary data, i.e. data already published on public management in the Hospital Information System of SUS. Datasus

4. DISCUSSION & FINAL CONSIDERATIONS

In seeking to increase the efficiency of health care services, it was identified some variables that allow one to measure and assess the performance of the health system in hospitals. The data Envelope Analysis methodology (AED) allows the possibility of internal

comparisons of efficiency among the existing hospitals in a given region. In this sense the use of this technique in Brazilian hospitals will make it possible to establish a ranking for these healthcare organizations in order to assess which hospitals are more efficient and on the basis of these indicators, the public manager will develop policies and incentive awards to the funding or cost of these hospitals. Soon, for the forthcoming work it is intended to apply the template data Envelope Analysis (EDA), and the hospitals will be selected based on the Relation of Hospitals described in the portal of the Ministry of education (2011).

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