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COST-EFFICIENCY ANALYSIS OF A MULTI-PAVILION HOSPITAL IN CLUJ COUNTY

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Abstract

Background and aim. *Multi-hospital health systems have become the most popular administrative structure in healthcare, leading to both opportunities and challenges for hospital administrators. In government-funded healthcare systems, there is a balance between costs and the provision of health services.*

The aim of the present study is to assess the efficiency in terms of costs of a multi-pavilion hospital from Cluj County, Romania.

Methods*. The institution analyzed in this article is the Adults' Clinical Hospital in Cluj-Napoca. A descriptive retrospective study collected data from January 2004 to December 2010. A set of indicators were compiled, divided into three main categories: personnel, statistics, and financial.*

Results. *Twenty-one financial indicators were investigated. Heterogeneity between different years was observed for the continuous hospitalization indicator and the wage budget indicator. The highest variability was observed between the budget and expenses indicators, while a smaller variability was observed at the average costs per patient. The costs per patient have increased at all pavilions in the studied time frame, the higher costs being at the Internal Medicine and Surgery pavilions: 10,203 RON in 2010 (1 euro ~ 4.4 RON)*

Conclusion. *The pavilions included in the Adults' Clinical Hospital Cluj-Napoca have different expenses patterns, as each pavilion is focused on different specialties. Each pavilion serves different target groups, requiring different procedures. This in turn results in different expense patterns across each pavilion.*

Keywords: Public Health, Health Care Economics and Organizations, Hospitals, Romania

Introduction

Background

Hospitals are complex organizations which face a unique challenge in this ever changing economic environment: they need to increase the quality of care offered to their patients, while still reducing the specific associated costs. In this respect, many countries have set multiple forms of future funding policies to pay for healthcare, whereby hospitals receive a certain amount for treating patients according to their number and type, and are unable to impact this price [1]. This system creates clear financial incentives to contain expenses, as hospitals that stay within the threshold will make a profit, while those delivering high-priced care will make a loss [2].

For example, a DRG (diagnosis-related group) system used to distinguish between patients with a certain diagnosis does not account for cost variability across disease progression. Thus, the main cause for cost variability even between hospital departments is attributed to the case mix index [2]. Specialist or teaching hospitals (secondary hospitals, respectively tertiary hospitals) might make an argument that they treat relatively more severe patients due

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to their reputation for providing high quality care [3]. Thus, the associated hospital costs also increase.

Multi-hospital health systems have become the most popular administrative structure in the hospital industry [4], leading to both opportunities and challenges for hospital administrators. In government funded healthcare systems, a balance between costs and health services exists. Thus, pooling demand for specialized services can help contain healthcare expenses, but it can burden the patients as there will be increased travel distance [5].

Research identified several reasons for establishing multi-hospital systems. One might be restraining operations to become more efficient, or to distinguish them from the competition, by offering enhanced products and services. Other possible reasons include increasing spending on public relations, or reinforcing their bargaining power with health plans [6].

Specialized care units have the potential to increase the patient volume, reduce expenses, and increase quality. Thus, aggregative common tasks can help at reducing healthcare associated costs, while still improving patient outcomes. Research showed that quality increases when a high patient-volume for a specialized procedure allows medical personnel to develop their accumulative experience in managing the service and avoid a loss of learning between occasional procedures. In terms of multi-system hospitals, containing expenses for medical capacity can be transmitted to the patients in forms of smaller hospital costs, or used by the network to offer additional services [5].

Research on multi-system hospitals is contradictory. While some have found that multi-hospital systems have higher costs per case than freestanding hospitals, others have found the contrary. However, other research had found no difference between them [7]. Multi-system hospitals might save in terms of general management and administration costs. For example, one accounting office might be in charge of all units with little appreciable increase in costs. Moreover, hospital systems can scope economies on the production side by reducing identical equipment and efficiently managing employment and supply inventories [8]. Research also shows that hospital systems help increase quality of care through better coordination and better tailoring of local needs. They can also have an advantage with bargaining health plans, which can lead to higher prices and lower patient volumes.

Multi-system hospitals are characterized by the consolidation of information processing and procuring functions, but also by increased access to capital, management expertise, and increased physician recruiting. Moreover, they also have improved market power and better capacity to participate in managed care contracting [9]. Systems may also increase information sharing activities among medical personnel. Research showed that discussions and consultations with peer "opinion leaders", merged with performance feedback are associated with enhanced acceptance of certain nonsurgical treatments [9].

Apart from these, hospital affiliations can impact on the treatment of patients through two channels. Firstly, multi-system hospitals may offer a wider array of health services, through service proliferation, by providing management expertise and funds to build new facilities and recruit medical personnel [9]. System affiliation also affects patient treatment patterns, as patients may need to be transferred from one hospital to another in order to receive a certain service [9]. Secondly, multi-system hospitals have improved coordination and information transfer among facilities, which also impacts on patient treatment. Therefore, system hospitals face lower transaction expenses in developing and implementing procedures and protocols. Having protocols in place means that hospitals may have quicker transfer times between facilities [9].To conclude, research has shown different aspects on the functioning of multi-hospital systems. Unfortunately, most of these data are business-oriented reports, ignoring one of the most vulnerable issues in such circumstances – healthcare-associated infections, with their tremendous burden (medical, epidemiological, economical etc.). Thus, very few details were identified regarding expenses and expenditure control of multi-hospital systems.

Purpose

The aim of the present study is to assess the efficiency in terms of costs of a multi-pavilion hospital from Cluj County, Romania.

Materials and Methods

Hospital description and served population

The institution analyzed in this article is the Adults' Clinical Hospital in Cluj-Napoca (which, in the meantime, has been re-organized and is currently named Professor Octavian Fodor Institute of Gastroenterology and Hepatology Cluj-Napoca). The hospital was comprised, in the studied period of 2004-2010, of four pavilions, offering medical services pertaining to psychiatry, obstetrics-gynecology, orthopaedics-traumatology, and internal medicine, general surgery and gastroenterology. The addressability of the hospital is high, over 30,000 patients from nearby counties benefitting annually from medical services.

The flowchart of the medical structure of the investigated multi-pavilion hospital during 2004 – 2010 is depicted in Figure 1. It should be noted, however, that, starting with 2011, the Adults' Clinical Hospital Cluj-Napoca is only comprised of the General Surgery and Internal Medicine compartments (M3-C3).

A descriptive retrospective study was conducted from January 2004 to December 2010 to reach the aim of this study. A set of indicators were compiled, divided into three main categories: personnel, statistics, and financial. Data related to these indicators was collected at a hospital level, from all four compartments pertaining to the Adults' Clinical Hospital Cluj-Napoca. The main indicators assessed in this study are presented in Table I.

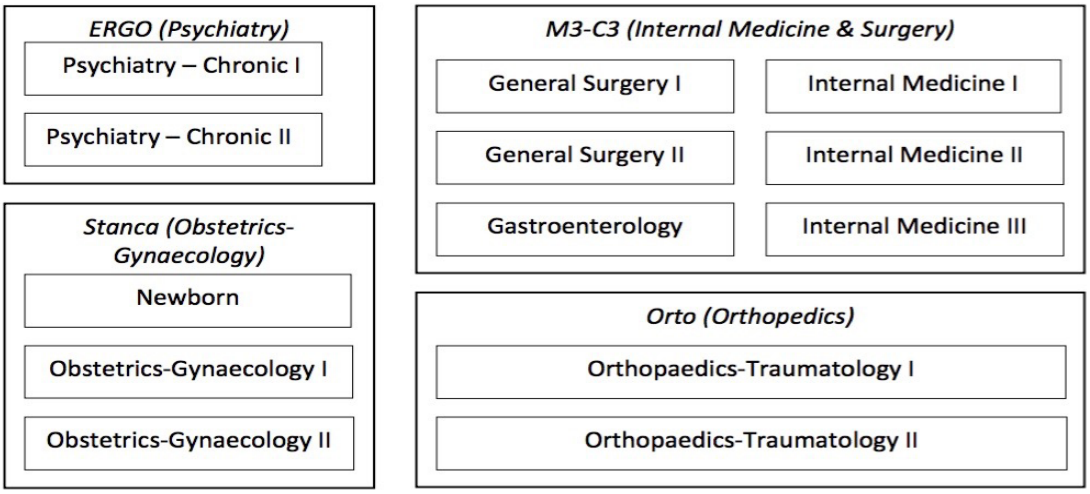

Figure 1. Medical structure of the Adults' Clinical Hospital Cluj-Napoca (as of the covered period – 2004 to 2010).

Table I. Indicators of health care services.

Personnel	Statistics	Financial
1. No. of MD needed 2. No. of filled MD positions 3. No. MD 4. No. beds/needed MD 5. No. beds/filled MD positions 6. No. of needed nurses 7. No. of filled nursing positions 8. No. beds/needed nurses 9. No. beds/filled nurses positions 10. No. of needed auxiliary personnel 11. No. of filled position - auxiliary personnel 12. Additional health care personnel needed 13. Additional health care personnel filled	1. No. of beds 2. No. of discharges 3. No. of discharges patients/doctor 4. No. of discharges/nurse 5. Case Mix Index 6. Use index of beds 7. Mortality 8. Average hospitalization 9. Lab tests 10. Lab tests/patient 11. Imagistic exams 12.Imaging exams/patient	1. Continuous hospitalization (income) budget 2. Day care (income) budget 3. Total budget 4. Wage budget 5. Budget for drugs 6. Supplies budget 7. Lab supplies budget 8. Food budget 9. Other budget 10. Budget vs expense 11. Actual expenditure 12. Wage cost 13. Drugs cost 14. Supplies cost 15. Labs cost 16. Food cost 17. Other cost 18. Days of IC hospitalization 19. Day cost 20. Number of patients 21. Average costs per patient

Statistical analysis

Descriptive statistics were performed on the variables, such as frequencies, means and standard deviations, medians (Q1-Q3).

Inferential statistics were performed the check for significant differences between the means of the four hospitals, such as an ANOVA test.

Results

Personnel indicators

Regarding the personnel, thirteen indicators were analyzed in the investigated hospital. Variability in the personnel indicators was observed for several indicators, such as number of filled MD positions (Figure 2), number of beds per filled MD positions (Figure 3), and number of beds per filled nurses positions (Figure 4). The highest values were observed for M3-C3 pavilion.

An increase can be observed for the Ergo pavilion from 2008. Thus, even though the Ergo pavilion has the lowest number of filled MD positions overall for the investigated period, in 2010 its values for the number of beds per filled MD positions were higher than for the M3-C3 pavilion.

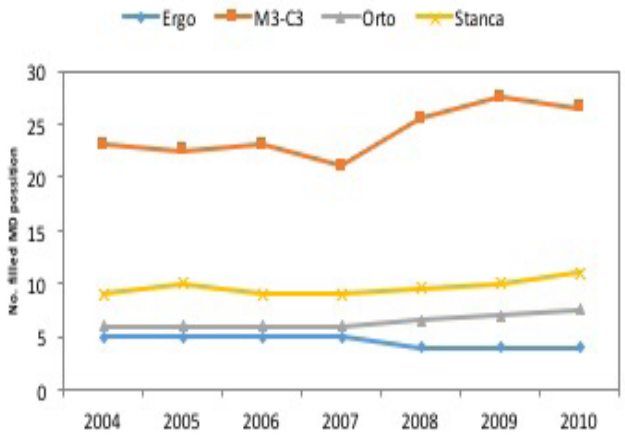

Figure 2. Number of filled MD positions.

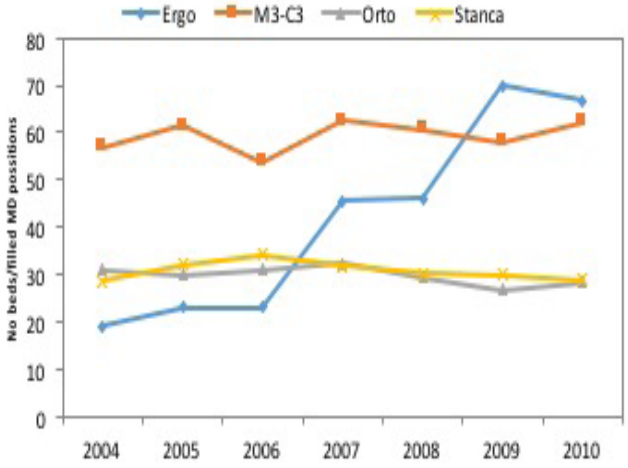

Figure 3. Number of beds per filled MD positions.

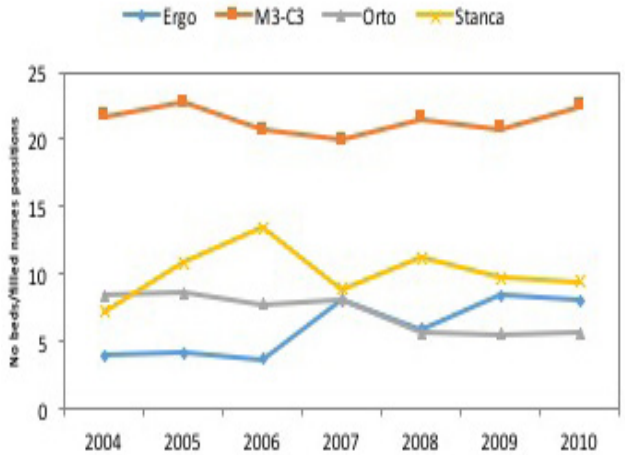

Figure 4. Number of beds per filled nurses positions.

The values were consistent for the M3-C3 pavilion. However, the lowest number of beds per filled nurses' positions pertained to the Orto pavilion.

Even though from 2009 to 2010 the number of physician positions has increased from 34 to 53, the number of doctors per number of beds has decreased, for the same time frame, from 62.05 to 38.63, due to an increase in the number of beds.

Statistical indicators

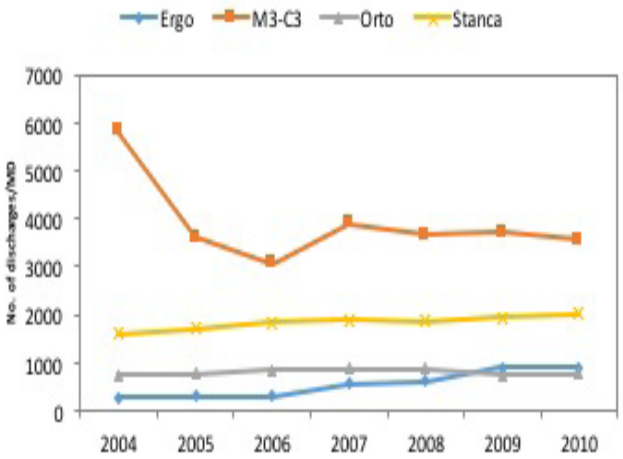

Figure 5. Number of discharges per medical doctor.

M3-C3 had the highest values for the number of discharges per medical doctor, compared to the other pavilions. Moreover, while the other pavilions had steady values for this indicator for the investigated period, we can observe the 2004 values dropped to almost half in 2010.

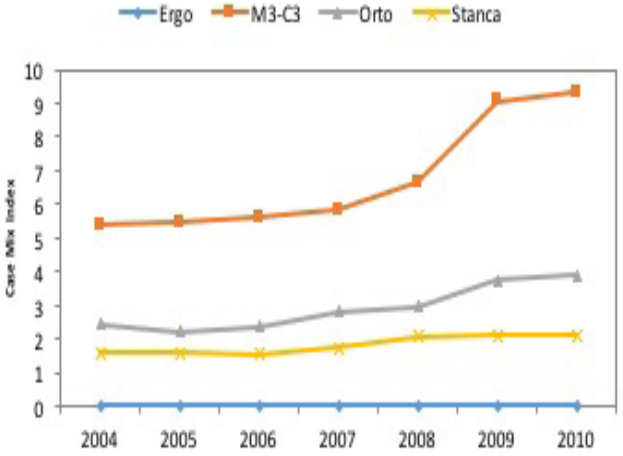

Figure 6. Case Mix Index.

The Case Mix Index differs for each pavilion, with the highest values identified for M3-C3, compared to the lowest for ERGO. Moreover, while ERGO has had consistent values for the investigated period, the values for M3-C3 have almost doubled in 2010, compared to 2004.

An interesting pattern was observed in terms of mortality, as the numbers inconsistent for the ERGO, Orto and Stanca pavilions. By comparison, the mortality indicator for M3-C3 did not fluctuate much for the investigated period. However, the M3-C3 pavilion had higher mortality indicators, being 13.76 in 2010 when compared to the other pavilions, which had values between 0.08 and 1.05 in 2010.

While the M3-C3, Orto and Stanca pavilions have had relatively consistent values for the average hospitalization indicator within the observed timeframe, a drastic increase was observed from 2006 to 2007 for the ERGO pavilion, from 24.52 to 47.40.

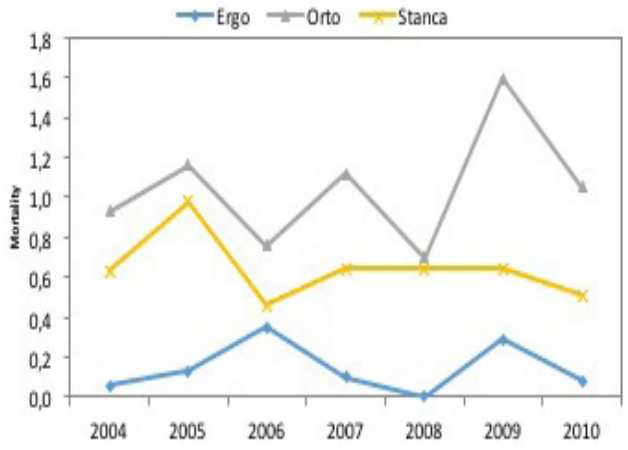

Figure 7. Mortality (ERGO, Orto, Stanca).

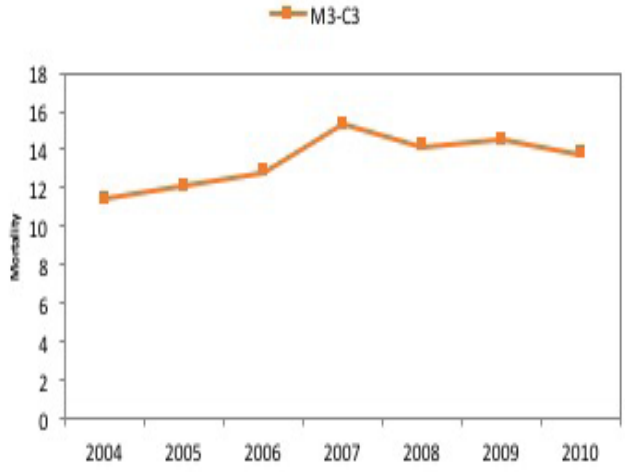

Figure 8. Mortality M3-C3.

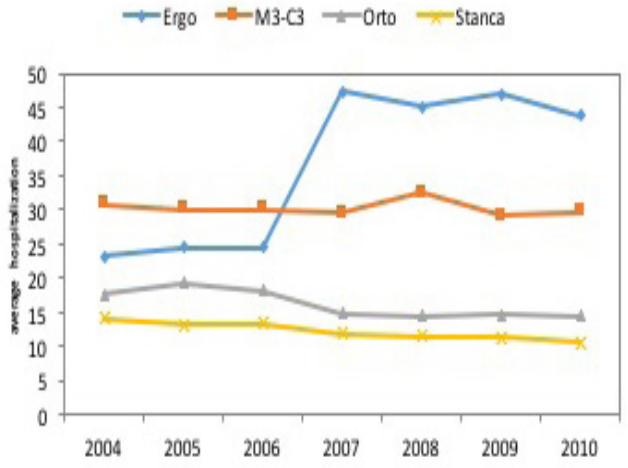

Figure 9. DMS.

Financial indicators

Twenty-one financial indicators were investigated. Heterogeneity between different years was observed for the continuous hospitalization indicator (Figure 10) and the wage budget indicator (Figure 11). The highest variability was observed between the budget and expenses indicators (Figure 12), while a smaller variability was observed at the average costs per patient (Figure 13).

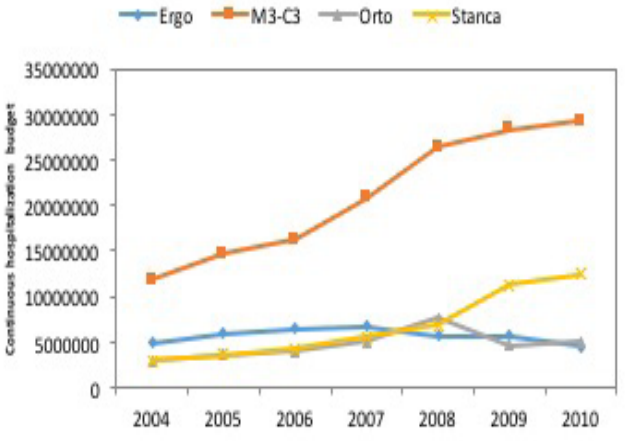

Figure 10. Continuous hospitalization budget.

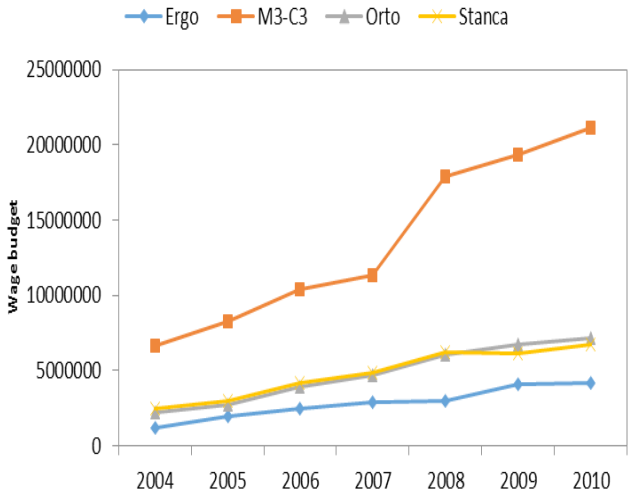

Figure 11. Wage budget.

The continuous hospitalization budget for M3-C3 was almost triple for 2010 (29,244,529 RON) compared to 2004 (11,726,246 RON). Similarly, the continuous hospitalization budget for Stanca for 2010 was almost four times higher than the 2004 budget (2,906,982 RON compared 12,400,112 RON). While the same budget increase was observed for Orto pavilion as for Stanca until 2008, this budget dropped until 2010, being similar to the Ergo budget (4,978,232 RON for Orto and 4,459,000 RON for ERGO).

An interesting phenomenon was observed at the budget vs expenses indicator. The budget-expenses rapport for M3-C3 has shown increased variability in the observed timeframe, varying between positive and negative from one year to another. The ERGO budget-expenses rapport showed a dropping tendency, from 3,201,208 RON in 2004 to minus 723,420 RON in 2010. The Orto budget-expenses rapport has also shown a dramatic drop tendency, being minus 962,754 RON in 2004, culminating with

minus 4,640,203 RON in 2010. The Stanca pavilion is the only one showing a positive rapport between budget and expenses, being minus 617,377 RON, increasing until 3,971,397 RON in 2010.

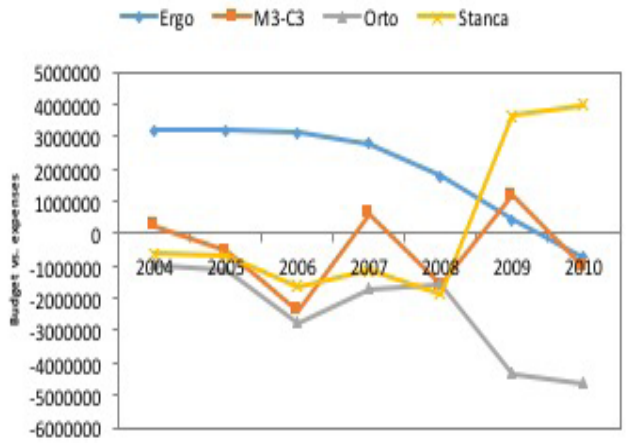

Figure 12. Budget vs expenses.

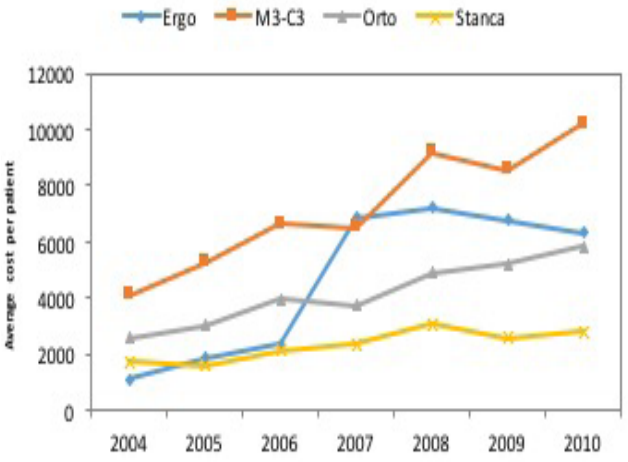

Figure 13. Average cost per patient.

The costs per patient have increased at all pavilions in the observed time frame, the higher costs being at M3-C3 (10203 RON in 2010). However, the most dramatic increase was for the ERGO pavilion, from 2006 (2368 RON) to 2007 (6838 RON). The lowest costs per patient were observed at Stanca pavilion (2792 RON).

Discussion

Efficient cost containment has been an important issue; hospitals and healthcare facilities in general have been trying to resolve, without impacting the quality of services offered to their patients. The aim of this study was to assess the efficiency in terms of costs of a multi-pavilion hospital from Cluj County, Romania. The Adults' Clinical Hospital Cluj-Napoca was comprised of four pavilions, each having a different addressability. After comparing the pavilions in terms of personnel, financial and statistical indicators, our study identified several differences across the pavilions.

Regarding personnel indicators, it was identified that the M3-C3 pavilion had the highest values in terms of number of filled MD positions, number of beds per filled MD positions and number of beds per filled nurses' positions. We believe this difference can be attributed to the higher number of beds the pavilion has, being thus able to capacitate a higher number of patients. Namely, M3-C3 pavilion had 341 beds in 2010, compared to 120, 126, and 133 beds for ERGO, Orto and Stanca respectively. Moreover, this is also a sign of the hospital's prestige in treating illnesses pertaining to internal medicine.

The higher Case Mix Index for the M3-C3, compared to the other three pavilions, can be attributed to the profile of each pavilion. While psychiatry, obstetrics-gynecology, orthopaedics-traumatology, and gastroenterology are more disease-specific, internal medicine and general surgery imply a wider range of diseases treated and of procedures performed. Moreover, the hospital is renowned at a regional level for its performance in diagnosing and treating gastroenterological diseases.

The mortality indicator showed a higher mortality for the M3-C3 pavilion, compared to the other three. We can speculate that this increased mortality rate can be associated with the higher Case Mix Index, as a higher Case Mix Index also implies more severe cases as well. On the other hand, a study found that a lower patient outcome can be correlated with lower staffing levels, especially for nurses, compared to the patient volume [10].

It was interesting to observe that while the continuous hospitalization budget for ERGO, Orto and Stanca had had a relatively slow or steady increase or even decrease during the observed period, the continuous hospitalization budget for M3-C3 had increased significantly from 2004 to 2010. Again, we can attribute this increased hospitalization to the more severe cases treated at the M3-C3, which required prolonged hospital stay post-procedures. Moreover, more complex cases also require more complex procedures pre- and post-surgery, having an impact on expenses as well. Thus, one hospitalization day at M3-C3 cost on average 1728 RON, compared to 593 RON for Stanca, 520 for Orto, and only 281 RON for ERGO. To further sustain this idea, the data also showed increased costs per patient for M3-C3 pavilion (10,203 RON), compared to 6308 RON for ERGO, 5841 RON for Orto, and 2792 RON for Stanca. Research shows that gastrointestinal diseases impose a great burden in the United States in terms of mortality and expenses; 32.4 billion dollars being spent in 2009 on endoscopy examinations [11]. Moreover, at a global level, World Health Organization data place digestive diseases as a third cause of death for middle-income countries [12].

The Budget vs Expenses indicator provided a good insight into the financial situation of each pavilion. According to the data gathered from 2004 until 2010, an interesting phenomenon occurred. Out of all pavilions,

Stanca was the only one whose budget was greater than its expenses. Contrarily, the Orto pavilion was the only one whose expenses increased relatively high compared to its available budget.

Few studies approached the issue of cost efficiency in healthcare, especially in the context of a multi-system hospital. In Romania, the cost efficiency was approached from the perspective of resource allocation to hospitals based on diagnosis-related groups. A study identified new models for researching costs based on the diagnosis-related group system in the Romanian health sector [13]. Another study approached the issue of efficiency in terms of analyzing hospital's utility costs [14].

Cost comparisons between hospitals, or, in this case, hospital pavilions, results in the identification of the most efficient hospitals, and their classification [15]. A precise definition of each service delivered and the identification every cost unit for delivering the service have been highlighted as essential in making comparisons across hospitals [15].

The Institute of Medicine has identified six dimensions important for a identifying a performing hospital: safety, effectiveness, patient-centeredness, timeliness, efficiency, and equity [16]. These dimensions are essential for determining if a hospital is providing quality care to its patients, and how efficient it is in cost-containment without jeopardizing care quality [17].

Hospital systems are associated with increases in hospital market concentration, as their services respond to a wide array of procedure demand [3]. Moreover, if these hospitals are located in the same area, they can rationalize care delivery more efficiently, as they can coordinate the procedures effectively. This coordination is essential for decreasing healthcare costs [18]. However, the link between quality increase and expense containment is difficult to assess, as one might have to discern whether they are complementary or in competition one with the other [19].

Conclusions

To the best of our knowledge, this study is the first to approach the issue of cost-efficiency in the context of a multi-pavilion hospital in Romania.

The pavilions included in the Adults' Clinical Hospital Cluj-Napoca have different expenses patterns, as each pavilion is focused on different specialties. Therefore, each pavilion serves different target groups, requiring different procedures. This in turn results in different expense patterns across each pavilion.

We must study this trend more in depth, in order to gain a more comprehensive understanding of the phenomenon, so that effective expenditure containment strategies could be implemented. Future research can also focus on comparing the 2004-2010 timeframe with present times, so that we could identify other expenditure patterns that might have occurred.

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