IMPORTANT BIOINDICATORS FOR HEALTH MANAGEMENT IN ROMANIA

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Abstract - Performance measurement is a coherent, robust, integrated, purposeful, comprehensive, efficient and transparent system. The evaluation of healthcare performance in Romania is based on four categories of bioindicators: human resources, use of services, economic and financial aspects, as well as quality. In this work, we were mainly interested in analyzing and describing these parameters. In order to illustrate the applicability of the hospital performance indicators, we considered the results obtained for these indices from the managers of three hospitals of the same level from Romania, the "Filişanilor" Hospital from Filiaşi, the Rovinari City Hospital and the Şegarcea City Hospital, and herein present them.

Key words: Evaluation, measuring performances, health, bioindicators

INTRODUCTION

The indicators for healthcare performance measurement can be categorized into two main classes: health expectancies and health gaps (Mihaila, 2006).

The first class includes indicators such as disability-free life expectancy (DFLE), active life expectancy (ALE), as well as the disability-adjusted life expectancy (DALE). The indicators in this group, represented by the hopes of health, mainly estimate the average number of years a person is expected to live in a certain state of health.

Among the health gap indicators, we found the disability-adjusted life years (DALY) or health adjusted life expectancy (HALE). For a better understanding of this group of indicators, the concept of "years of potential life lost" has been introduced to quantify the burden of mortality from various causes of death. This index estimates the period of "lost"

years in a person's life between the real age at death and an age, arbitrarily chosen as a standard age, before which death is considered premature (usually the age of 65 or 75 years) (Pineault et al., 2005). In other words, the concept of years of potential life lost (YPLL) describes the average time a person would have lived had he or she not died prematurely.

Health gap (losses of health) extends the notion of losses due to premature mortality in order to include losses occurring as a result of time lived in different states of health other than very good health (Khaliq et al., 2007).

In order to monitor human development, the UNDP (United Nations Development Program) developed the Index of Human Development (HDI) that classifies countries according to the rank they occupy in this classification/statistic system (Roberts et al., 2006). This indicator takes into account three dimensions of human development: long and

healthy life, which has been changed since 2010 to Life Expectancy Index, educated population, as well as decent standard of living.

In order to illustrate the applicability of the hospital performance indicators, we considered the results obtained for these indices from the managers of three hospitals of the same level from Romania, the "Filişanilor" Hospital from Filiaşi, the Rovinari City Hospital and the Şegarcea City Hospital.

METHODS

Hospital performance indicators

Hospital performance was measured using the "hospital management performance indicators" established by the Ministry of Health Order No. 922/2006, on approval of the public hospital management contract. According to this order, the performance indicators of hospital management have been classified into four main classes. The indicators are grouped in four main categories: human resources indicators, indicators of resource utilization, economic-financial indicators and quality indicators (for the management performance).

The group of human resources indicators includes seven indicators: the average number of patients discharged per physician, the average number of patients discharged per nurse, the proportion of doctors from total hospital staff, the proportion of medical staff from total hospital staff, the proportion of higher educated medical staff from all medical personnel, the average number of outpatient visits per physician and the average number of emergency room visits per physician.

The indicators of resource utilization include the following: the overall number of patients discharged from hospital, the average length of stay in hospital, the percentage of admitted patients from the total number of patients in the emergency room (%), the emergency ratio of the total number of admitted patients (%), the complexity index of clinical cases, the percentage of patients with surgery from all patients

discharged from surgical sections, the percentage of patients with complications and comorbidities from the total number of discharged patients, the number of outpatient consultations, the utilization rate of hospital beds (in days) and the utilization rate of hospital beds (%).

The financial and economic indicators are budgetary execution against approved expenditure budget (%), the proportion (%) of expenditures on laboratory services, emergency services, continuous hospital stay services, daycare services, specialist assistance services from total expenditures, the percentage of own incomes from total hospital income, the percentage of hospital personnel costs, costs for goods and services, drugs costs from the total hospital spendings, the percentage of drugs expenditure provisions from the goods and services total provisions spendings, the percentage of capital expenditures in relation to total expenditures and the average daily cost of hospitalization.

The indicators regarding quality of care are the following: hospital mortality rate, proportion of deceased patients within 48 hours after surgery, nosocomial infection rate on the entire hospital and in each section, rate of readmitted patients without appointment within 30 days of discharge, index of concordance between the diagnosis code at admission and the diagnosis code at discharge, percentage of hospitalized patients transferred to other hospitals and the number of patient complaints.

RESULTS

Indicators of human resources

Proportion of doctors from total hospital staff

The proportion of doctors from total hospital staff was calculated as the percentage ratio between the numbers of doctors employed in the hospital and all the persons employed in the hospital. The number of doctors employed in hospitals concerns all the doctors involved in the hospital beds healthcare, as well as from other medical structures serving these beds,
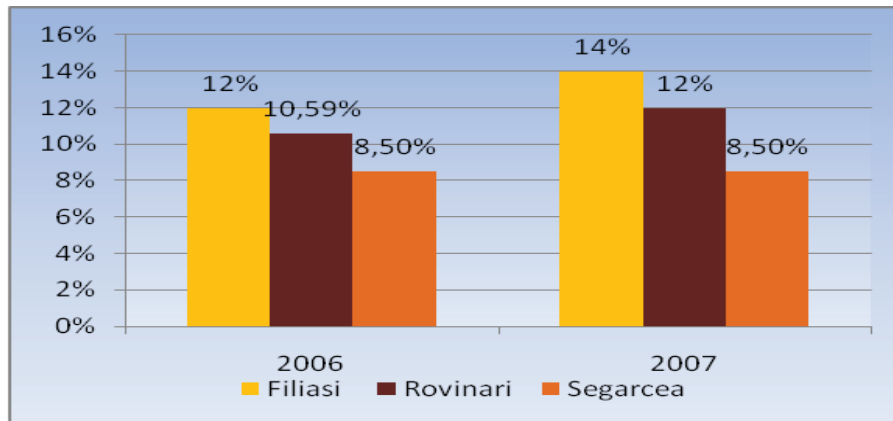
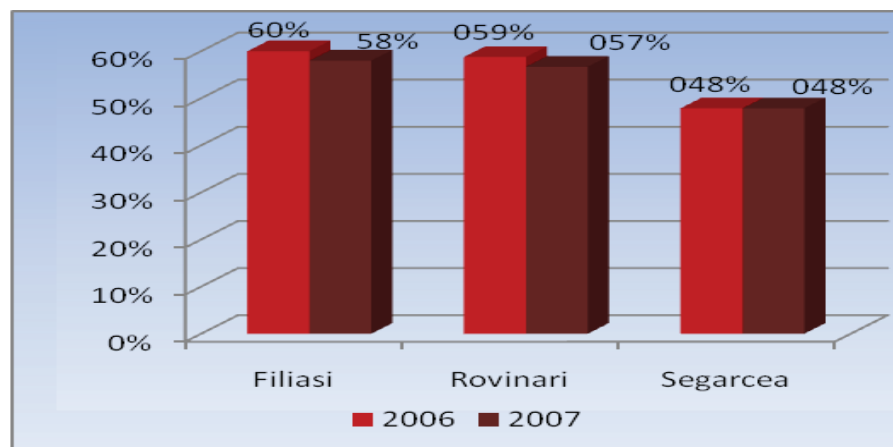**Fig. 1.** The proportion of doctors from total hospital staff.

Fig. 2. The proportion of medical staff from total hospital staff.

according to the status of functions, such as positions held, while the hospital employed personnel comprises of the total number of posts occupied on labor contracts concluded for an indefinite or for a definite period. The proportion of doctors from total hospital staff for the three reviewed hospitals is increasing, as shown in Fig. 1.

Proportion of medical staff from total hospital staff

The proportion of medical staff from total hospital staff is the percentage ratio between medical staff and the total number of persons employed in the hospital. The medical personnel includes doctors, pharmacists, superior health personnel, physiokinetic therapists, medical bioengineers, biologists, biochemists, chemists, physicists, medical physics specialists, psychologists, speech therapists, sociologists, physiotherapists, social workers, graduate nurses and midwives, medical equipment technicians, dental technicians, nurses, health officials, medical registrars and medical statisticians.

Regarding the three institutions we considered for our study, the indicator registered a 2% decrease in 2007 compared with 2006 for two of the hospitals and no modifications were registered for the third.
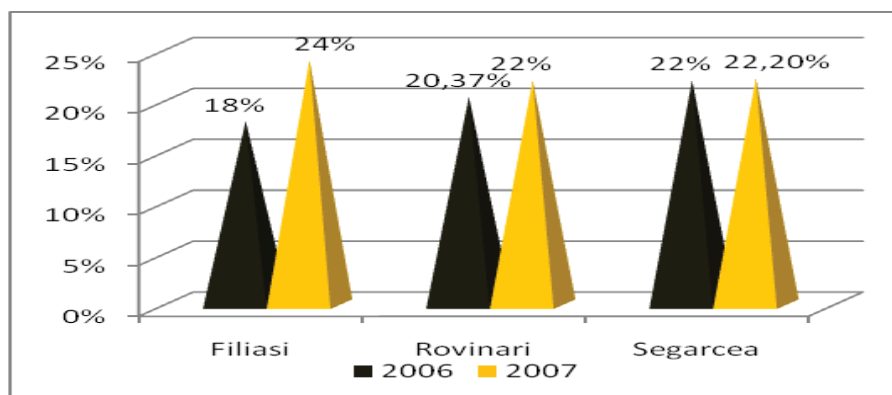
Fig. 3. The proportion of higher educated medical staff from all medical personnel
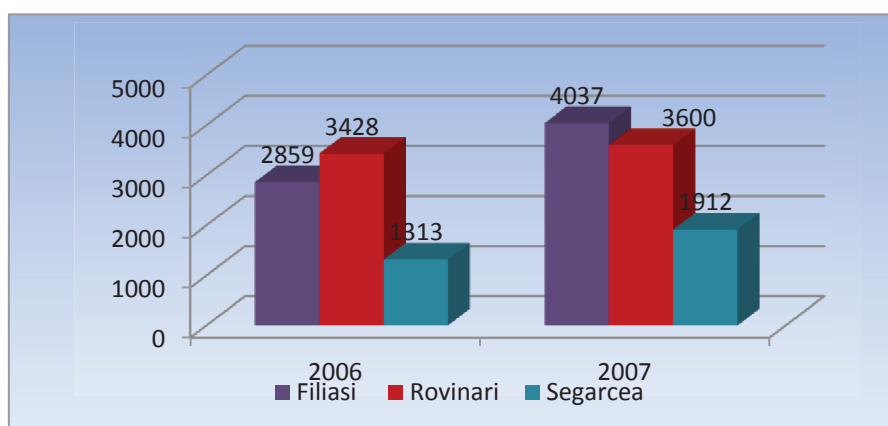

Fig. 4. The average number of visits in outpatient per physician.

Proportion of higher educated medical staff from all medical personnel

The proportion of higher educated medical staff from all medical personnel is the percentage ratio between higher educated medical staff and the total number of hospital staff. The medical personnel with higher education include doctors, pharmacists, superior health personnel, physiokinetic therapists, medical bioengineers, biologists, biochemists, chemists, physicists, medical physics specialists, psychologists, speech therapists, sociologists, physiotherapists, social workers, graduate nurses and higher studies midwives.

The indicator registered an increasing trend for all three hospitals: 6% for Filiaşi Hospital, 1.63% for Rovinari Hospital and 0.2% for Şegarcea Hospital (Fig. 3).

Average number of visits in outpatients per physician

The physicians providing consultations in integrated departments for outpatients are doctors employed in the wards and departments with beds who provide consultations in the departments, as well as doctors from the integrated outpatient *specialist departments*. The indicator is calculated as the ratio between the average number of visits to the outpatient department and the number of physicians providing consultations there.

A significant increase of over 1 000 cases per year was registered for the Filiaşi Hospital and over 600
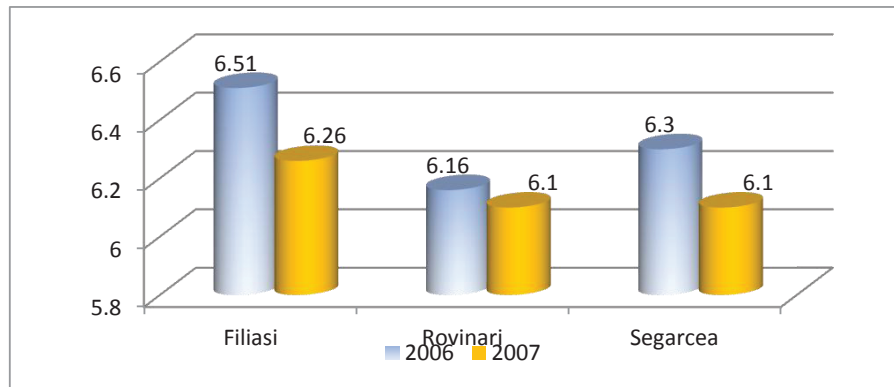
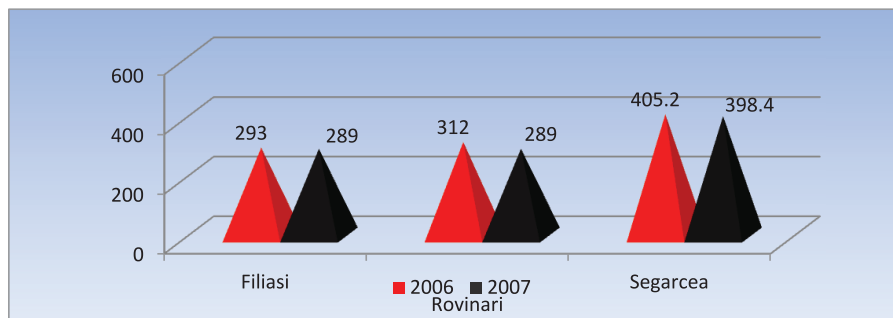**Fig. 5.** The average length of stay on hospital.

Fig. 6. The utilization rate of hospital beds

cases for Şegarcea Hospital, while for the Rovinari Hospital only 200 cases in 2007 compared to 2006 were recorded. The growth of the number of diseases from one year to another is very noticeable, despite the small size of the considered hospitals, which indicates that the Romanian population is increasingly ill (Fig. 4).

Indicators of resource utilization

Average length of stay in the hospital and in each department

This is the ratio between the number of patient hospitalization days and the number of patients hospitalized at the beginning of the period and the number of patients between the periods.

As illustrated in Fig. 5, the average length of stay in the hospital decreases, but exceeds 6 days, the effect being a constant level of costs for health care,

accommodation and food services. Hospitals would rather extend the hospitalization days in order to ensure the budget, but this also greatly increases costs.

Utilization rate of hospital beds

The average number of utilized beds is calculated by the ratio of beds used during a period of one year (or sometimes a quarter or semester).

The utilization rate of beds in the aforementioned hospitals is considered acceptable for the Filiaşi and Rovinari Hospitals because, in percentage terms, it does not exceed 100%. The situation is different for Şegarcea Hospital, where the index values exceed 110% (Fig. 6). Given the fact that, according to existent legislative measures, there has to be a period of disinfection, the situation at Segarcea Hospital is alarming. The cause could be either the small number of beds in the hospital wards or a large number of patients.
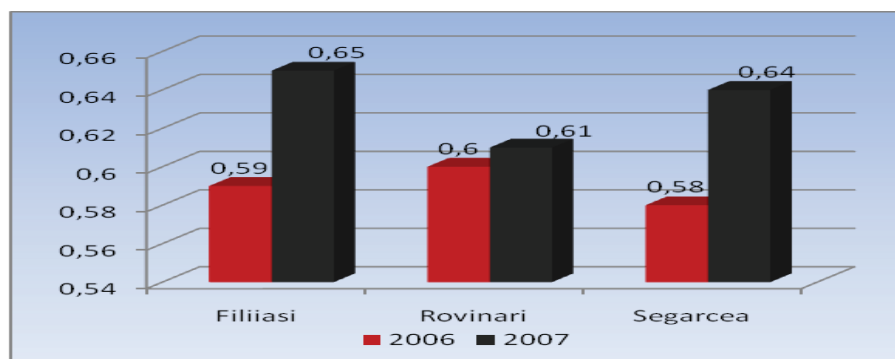
Fig. 7. Comparison of complexity indices for clinical cases – case-mix

The complexity index of clinical cases CASE-MIX (MCI)

The complexity index of cases is a number expressing necessary hospital resources according to the types of treated patients, taking into account diagnosis and severity. This index can be calculated as the ratio between the total number of weighted cases (CP) and the total number of cases resolved (CR), as shown below:

No. cases	DRG (diagnosis group)	VR (Relative value of diagnosis)
2	X	0.5
1	Y	1
2	Z	1.5

$$MCI = \frac{2 \times 0.5 + 1 \times 1 + 2 \times 1.5}{2 + 1 + 2} = \frac{1 + 1 + 3}{5} = \frac{5}{5} = 1$$

As seen in Fig. 7, the complexity index of cases for the three hospitals is rather low. However, a certain increase can be noticed for the year 2007 compared to 2006, due to an increase in the number of diseases in the area.
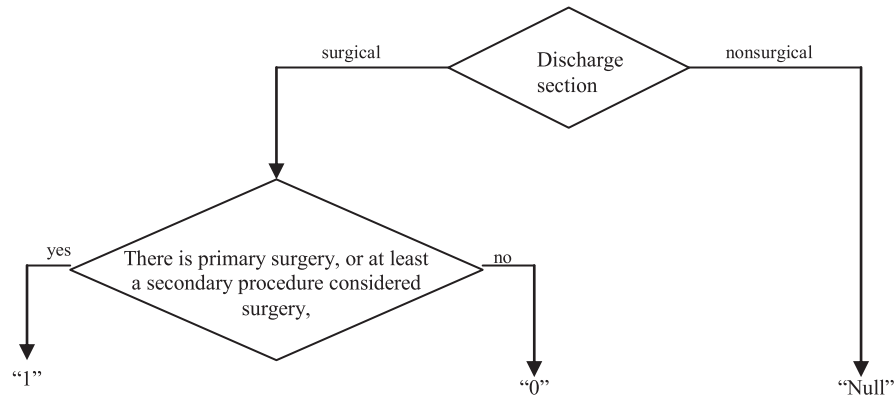
Percentage of patients with surgery of all patients discharged from surgical sections

The indicator is calculated as the percentage of surgery patients of all patients discharged from surgical wards.

Regarding the percentage of patients with surgical procedures from all patients discharged from surgical wards indicator (Fig. 8), the situation is different for one of the three health units analyzed. Thus, a decrease by approximately 34% occurs at the Filiaşi Hospital compared to Rovinari and Şegarcea Hospitals, where some increases have been registered. Due to the nature of the health unit and the values obtained for the case-mix indicator, the surgical interventions performed in these hospitals should be considered of simple category.

Financial and economic indicators

The spendings pattern by type of services according to the sources of income is calculated as the percentage ratio between the sum of the budgetary expenditure provisions related to services and the sum of revenue sources financing these expenditures. As a note, the value of this indicator is calculated as a percentage related to the following structures: emergency services – including expenditure on personal rights, medicines and medical supplies, and other expenses, laboratory services (including imaging), costs occasioned by these services, as well as continuous hospitalization services and consequent costs, including expenditure under the national health programs. Other indicators day hospitalization services, costs occasioned by these services, including the expenditure under national health programs, hospital integrated ambulatory services, including expenditure on personal rights, medicines and medical supplies

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                           ┌──────────────┐
             surgical      │  Discharge   │   nonsurgical
          ┌────────────────┤   section    ├────────────────┐
          │                └──────────────┘                │
          ▼                                                │
    ┌──────────────────────────────────┐                  │
  yes │ There is primary surgery, or at least │ no            │
  ┌───┤ a secondary procedure considered ├───┐              │
  │   │            surgery,               │   │              │
  │   └──────────────────────────────────┘   │              │
  ▼                                           ▼              ▼
 "1"                                         "0"          "Null"
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percentage of patients with
surgery $= \dfrac{1+0+1}{3} \times 100 = \dfrac{2}{3} \times 100$
of all patients discharged
from surgical section

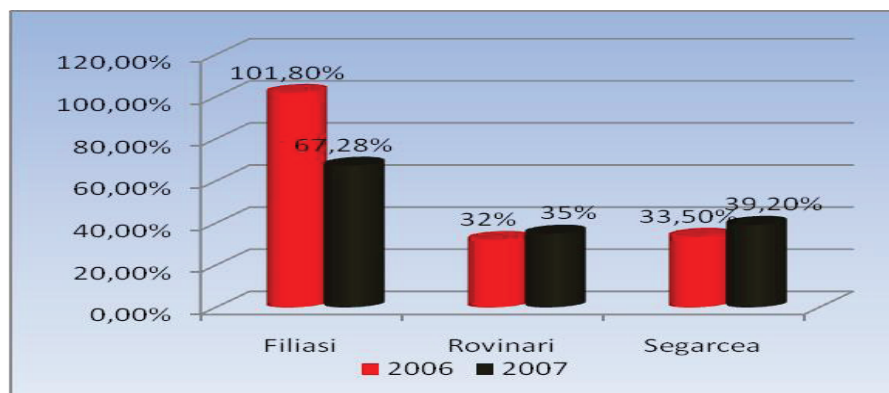| Patients	values for surgery indicator
P1	1
P2	0
P3	1
P4	null
P5	null
P6	null

Figure 8. The percentage of patients with surgery from all patients discharged from surgical sections

and other expenses, as well as the equivalent values of services reimbursed by the health insurance funds for ambulatory performed activity (which is to be reported separately from the first categories of expenditure).

Percentage of personnel costs from total hospital spendings

The percentage of wages should not exceed, according to current legislative measures, 60% of total hos-
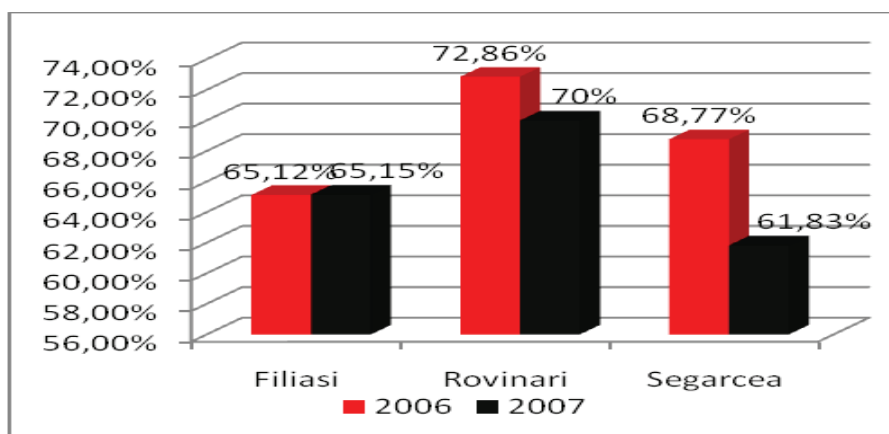
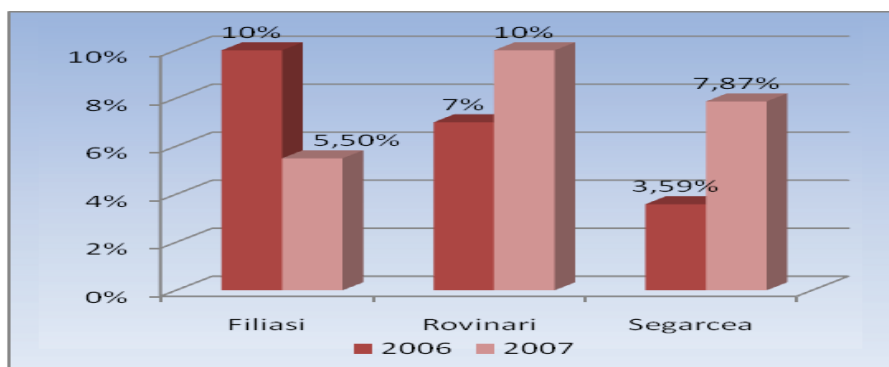**Fig. 9.** The percentage of the hospital personnel costs from the hospital total spendings.

Fig. 10. The percentage of drugs costs from the total hospital spendings.

pital costs. The data provided for 2006 and 2007 for the three analyzed hospitals were 5.15% for Filiaşi Hospital, 12.86% for Rovinari Hospital and 1.83% in 2007 for Şegarcea Hospital higher compared to 2006 (Fig. 9).

Percentage of drugs expenditures from the total hospital spendings

The indicator is calculated as the percentage ratio between drug spendings and total hospital spendings. In this case, the situation is different for the three hospitals. As can be seen in Fig. 10, drug expenditures at Filiaşi Hospital decreased in 2007 compared to 2006 by approximately 4.5%. At Şegarcea and Rovinari Hospitals, an increase in expenditure on medicines was registered from one year to another, by about 3% in the first case and 4.18% in the second.

Average daily cost of hospitalization

The data provided by the three hospitals regarding the average cost of hospitalization highlighted an increase in approximately 30 monetary units for Filiaşi Hospital, 3 monetary units for Rovinari Hospital, and 4.58 for Şegarcea Hospital (Fig. 11).

Index of concordance between diagnosis code at admission and at discharge

This indicator represents the sum of patients for whom the diagnosis at admission was consistent with the primary discharge diagnosis (the diagnosis at admission and the primary discharge diagnosis are found in one of the blocks on the "List of diagnostic blocks" or "Exceptions list for diagnoses admission/discharge considered concordant, although the di-
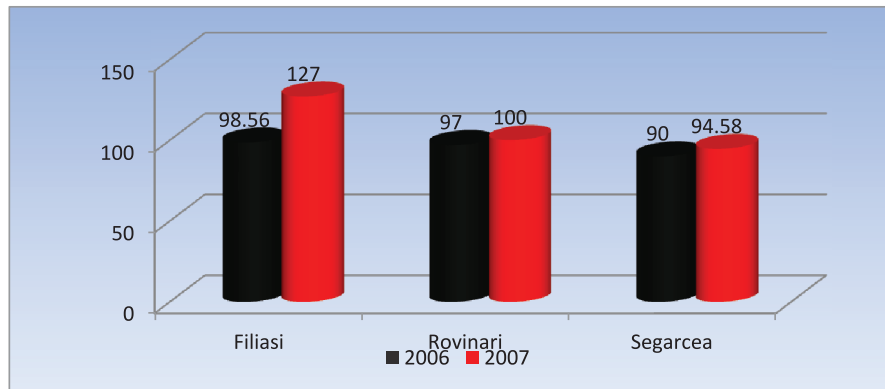
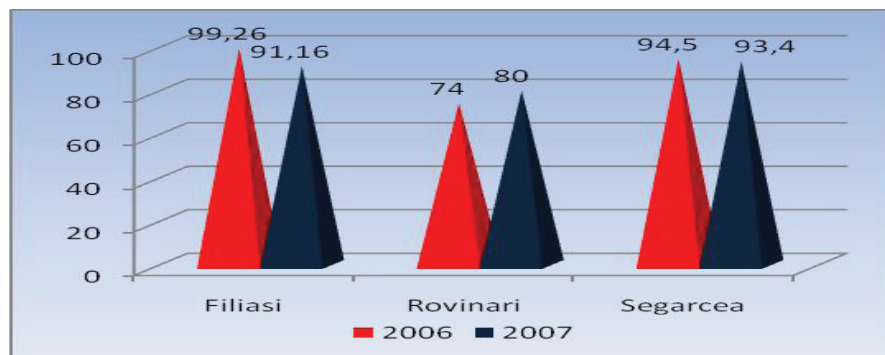**Fig. 11.** The average daily cost of hospitalization.

Fig. 12. The index of concordance between the diagnosis code at admission and the diagnosis code at discharge.

agnoses do not fit in the same block"). It is calculated as the percentage ratio between the number of consistent diagnoses and the number of discharged patients.

The concordance between diagnosis at admission and diagnosis at discharge in 2007, compared to 2006, decreased for Filiaşi Hospital, while for Şegarcea and Rovinari Hospital the situation was reversed. One of the reasons may be that doctors in Filiaşi face more complex cases and the state of health of the people in the area is worse (Fig. 12).

DISCUSSION AND CONCLUSION

The hospital managerial performance implies the taking on of roles and responsibilities; this is a continuous process that should rely on human resources development, the most precious resource in a hospital, to achieve the expectations of those who use health services and their satisfaction, as well as on active involvement, accurate knowledge, and good communication with collaborators (e.g. physicians, heads of clinical departments, coordinators of health programs) (Witter et al., 2000).

Our investigations presented here confirmed that hospital management performance accurately reflects the general hospital performance and that improving management efficiency is essential for better results.

The performance criteria underlying the evaluation of hospital managers contain an objective component, which we acknowledge here as one of its most important defining assets. Although these concepts are in their infancy and the evaluation system is lacking in some regards (Champangne et al., 2005), we appreciate their manner of conception as certain human resource indicators and the fulfillment of the degree

of achievement would require a certain independence of the manager in terms of human resources policy. At this point, hiring or restricting the number of employees is strictly regulated and decided by Health Ministry regulations (Radu et al., 2005). In addition, in the category of economic and financial indicators, budget execution against approved budget is a major risk factor, since funding is, in some cases, below the approved budget. Moreover, quality indicators should also be reviewed, since there are indicators, such as in-hospital mortality rate, that cannot be assumed.

REFERENCES

Khaliq, A.A., Walston, S.L. and *D.M. Thompson* (2007). Is chief executive officer turnover good for the hospital? *Health Care Manag (Frederick)* **26**, 341-346.

Mihaila, V. (2006). Diferențe în metodologia de calcul a unor indicatori de evaluare a sănătății populației. *Management în sănătate* **4**.

Pineault, R. and *C. Daveluy* (1995). La planification de la sante: concepts, methodes, strategies. Editions Nouvelles.

Radu, P. and *S. Haraga*(2005). L 'allocation de resources du systeme d'assurance maladie en Roumanie- le pacient est le vrais beneficier ? *ALASS, Montreal* **1**, 17-20.

Roberts, M.J. (2006). Advanced Flagship Course on Efficiency, Quality and Health Systems. *Health Services Management Training Center Semmelweis University*.

Witter, S., Ensor, T., Jowett, M. and *R. Thompson* (2000). Health Economics for Developing Countries. Macmillan, London.