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Evaluation of Utilization and Efficacy of General Hospitals in Serbia: Is There a Shift Forward?

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SUMMARY

Introduction In the Republic of Serbia the activity of general hospitals has not been sufficiently evaluated.

Objective The aim of this study was to evaluate, by analyzing the basic indicators of general hospitals condition and functioning, the network, utilization and efficacy of general hospitals for further improvement of their organization and work.

Methods The paper is a part of a retrospective-prospective analysis of hospital healthcare services which we performed in 2011. The research involved all 40 general hospitals in Serbia evaluated as a general hospitals system. We selected seven basic indicators of hospitals condition and functioning that we followed-up in the period 2000–2009. As the data source we used the Reports of the Office for Hospital Stationary Treatment of general hospitals and the Report of the Republican Institution for Statistics entitled Vital Events in the Republic of Serbia. Numerical data were analyzed using the methods of descriptive statistics and the program Microsoft Office Excel 2007 and SPSS for Windows. Statistical significance indicators of differences were determined by Student's t-test.

Results In general hospitals during the studied years, the number of beds decreased by 16.5% (p_t=0.057). The number of discharged patients was increased by 11.8% (p_t=0.035). The number of hospitalization days was reduced by 11.2% (p_t=0.038). The average length of treatment was reduced by 1.9 days (p_t=0.074). The average daily bed occupancy was increased by 4% (p_t=0.020). The utilization of beds was increased by 4.5% (p_t=0.019). Throughput capacity of beds increased by 8.5 patients per bed or by 27.8% (p_t=0.091).

Conclusion The most significant indicators of the utilization and efficacy of general hospitals were improved. Nevertheless, European and domestic guidelines were achieved only in the average length of treatment.

Keywords: general hospital; indicators; utilization; efficacy; Serbia

INTRODUCTION

Hospital healthcare is a mandatory, the oldest and most expensive segment of healthcare. A general hospital is the most universal part of hospital and healthcare service in general, and of healthcare system development worldwide. As a stationary healthcare institution, beside the stay and care of patients, it primarily implements and provides a short-term medical healthcare consisting of observation, diagnostic, therapeutic and rehabilitation services offered to individual health complaints or to those suspected of having a disease or injury, as well as to mothers and their newborns [1]. By providing, above all, standard healthcare services to the entire population and by implementing curative activities, a general hospital assumes the predominant role in most healthcare systems.

In our national state funded healthcare system offering healthcare services at the secondary level forms the first referral level. Here, in the most complex manner and when necessary, the procedure of healthcare involving patients of all ages with various diseases, is continued, which had been initiated by the chosen physician at the primary level, mostly in a primary healthcare centre. The general hospital also offers hospital healthcare, specialists and consultative activities, day-care hospitalization, other special organizational units for prolonged hospital care (geriatrics) and palliative healthcare of terminally ill patients. It can also perform educational activities [2].

The organization and functioning of general hospitals depend on the social, political, economical and technological development of the country, the size of hospital itself, its human resources and equipment, volume, quality and costs of its activities.

To analyze a hospital, it is usual to differentiate two groups of indicators, which are: indicators of condition (structure) referring to network, equipment, and personnel, that, as the basis of analysis, use hospital beds, and indicators of functioning (performance) used to analyze utilization, quality and service expenses and are focused on hospital-treated patients [3].

The indicator of hospital condition that is most frequently used is provision of the population with hospital beds. This is one of the most frequently used indicators of healthcare activity in general. Other indicators of hospital condition are the structure of hospital beds by assignment, indicators of employed personnel, such as the contribution of specialists, other physicians and healthcare providers with the highest (tertiary), high (secondary) and low (primary) level of education, the relationship

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between healthcare and non-healthcare personnel, the relationship between physicians and medical personnel with secondary and primary levels of education, healthcare providers' work-load, and indicators of hospital equipment.

Functioning of hospitals indicates the volume of work, its efficiency, efficacy and finances. The most frequently applied indicators of hospital functioning are the indicators of work volume, i.e. utilization of hospitals. They depend on the health status of the population and their healthcare needs, development and efficiency of primary healthcare, availability and accessibility of hospitals, as well as of the social, cultural and behavioral determinants of users. The indicators of hospital functioning (performance) involve the rate of hospitalization, average length of hospital treatment, occupancy of hospital beds, utilization of beds, hospital beds' throughput capacity or turn off that represents the average number of hospital episodes, i.e. treated patients per bed during a year, the number of hospitalization days and the number of discharged patients per physician or nurse, different and numerous indicators of work quality in hospitals, indicators of hospital work costs involving average annual costs per hospital episode, i.e. treated patient, average annual costs per patient's hospitalization day or participation of costs for ambulatory-polyclinic treatment in the total hospital expenditure [4].

Having in mind that their value depends on numerous and different environment-dependent specific factors, the hospital indicators should be studied, analyzed and evaluated on different levels; national, regional and a single hospital. Hospital indicators denote the condition of the healthcare system and, indirectly, to population's health condition.

OBJECTIVE

Based on the calculations, presentation and analysis of basic, most significant and available indicators of general hospitals' system condition and functioning, the objective of the paper was to assess and evaluate, on the national level, the network of general hospitals, work volume, hospital utilization and efficacy so as to further improve their organization and work.

METHODS

The paper is a part of a retrospective-prospective analysis of hospital healthcare services which we conducted in 2011. Our research involved all 40 state general hospitals from the Network Plan of Healthcare Institutions, which were under follow-up over a ten-year period 2000–2009, characterized by intensive socioeconomic events, but without data on Kosovo and Metohia and private practice. We selected seven basic indicators of general hospitals condition and functioning. Implying differences in rates of the indicators among each general hospital, the calculation, presentation and analysis of the selected healthcare indicators were performed at the national level and at the level of the general hospital system as a unity.

As the source of data we used the Reports of the Office for Hospital-Stationary Treatment (Form No. 3-21-60) covering the period 2000–2009, which are implemented in general hospitals according to the valid Program of Statistical Research in the Field of Healthcare [5, 6] and are collected, controlled, processed and analyzed at the level of the Republic by the Institute for Public Healthcare of Serbia „Dr Milan Jovanović Batut".

The best indicator values were implemented in 2009, and if not underlined otherwise, they refer to that year of study.

Demographic data were used from the Report of the Republican Institution for Statistics "Vital Events in the Republic of Serbia" for the corresponding year.

Numerical data were calculated and analyzed using the method of descriptive statistics (arithmetic mean, standard deviation) and programs Microsoft Office Excel 2007 and SPSS for Windows. The data for 2000 and 2009 were statistically analyzed by the Student's t-test as the most valid tests for the number, nature and quality of processed data. Having in mind the applied technology, methodology limitations of the study in the sense of lacking, inconsistent and false data did not exist.

RESULTS

As in most countries, in Serbia the "spine" of the hospital system is represented by general hospitals. During the studied 10-year period, the highest number of hospital beds was in general hospitals (about 40% of the total number of hospital beds of state funded healthcare facilities), which hospitalized the highest number of hospital treated patients (about 48% of total hospital treated patients), and they implemented the greatest number of all hospitalization days (about 33%). The rates of these indicators would have been higher if in Serbia there had also existed highly developed hospital capacities for providing highly specialized services at the tertiary level, primarily within four clinical centers. Adverse circumstances in the studies of healthcare functioning are absence of a specific level of healthcare provision and work division among healthcare institutions. By adhering to legislation on the level and type of healthcare facilities, per each bed at the secondary level of healthcare there are 0.6 beds secured in healthcare institutions of tertiary level (ratio 1:0.6). The number of occupied hospital beds at the level of healthcare and type of healthcare institutions in the Republic of Serbia in 2009 is presented on Table 1.

With the objective of more equalized accessibility, they are positioned so that a district is covered by one to four general hospitals, while the gravitating area or the size of the population of potential users ranges from about 22,400 to 331,900 inhabitants. On average about 116,510 inhabitants.

At the level of the Republic, in 2009 the calculated total provision of standard hospital beds (excepting beds

Table 1. Number of utilized hospital beds by levels of healthcare and types of healthcare institutions in Serbia in 2009

Type of healthcare institution	Number of beds				
	Level of healthcare				Total
	Primary	Secondary	Tertiary	Several levels	
Primary healthcare centers	323 (0.83%)	/	/	/	323 (0.83%)
Institutes	20 (0.05%)	/	/	30 (0.08%)	50 (0.13%)
General hospitals	/	15,002 (38.64%)	/	/	15,002 (38.64%)
Special hospitals	/	8,499 (21.88%)	/	/	8,499 (21.88%)
Institutes	/	/	3,908 (10.06%)	/	3,908 (10.06%)
Hospitals	/	/	982 (2.53%)	/	982 (2.53%)
Clinical – hospital centers	/	/	2,312 (5.95%)	/	2,312 (5.95%)
Clinical centers	/	/	7,259 (18.69%)	/	7,259 (18.69%)
Military Academy Hospital	/	/	500 (1.29%)	/	500 (1.29%)
Total	343 (0.88%)	23,501 (60.52%)	14,961 (38.52%)	30 (0.08%)	38,835 (100%)

of day-care hospitals, neonatology departments in obstetric hospitals and beds for accompanying persons) was 5.3 standard beds per 1000 inhabitants. Provision in general hospitals was 2.1 hospital beds per 1000 inhabitants.

The decreasing trend of hospital beds number in the healthcare system of Serbia was present in the period 2002-2008, and was above all the result of the decreased bed number in general hospitals. The number of beds in the general hospitals was decreased by 3134 beds (17.4%), mostly in the field of physical medicine and rehabilitation, ophthalmology, otorhinolaringology and pediatrics. However, due to the inconsistency of decreased bed number trend, in the period 2000-2009 the number of beds was decreased by 2956 (16.5%) beds (Graph 1).

Beside the number of beds, Table 2 also presents the most significant indicators of work volume and utilization of general hospitals in Serbia in the period 2000-2009. It can be noted that the number of discharged patients shows a regularity of change in term of a three-year increase and a decrease in the fourth year. The trend in the decrease of discharged patients stands out, which reached 53,336 patients (11.8%) over the 10-year studied period.

Over a seven-year period 2001-2007, the recorded number of treatment days showed a constant decrease, while being increased since 2008. Over the observed 10-year period the number of treatment days was decreased by 458,952 (11.2%) days.

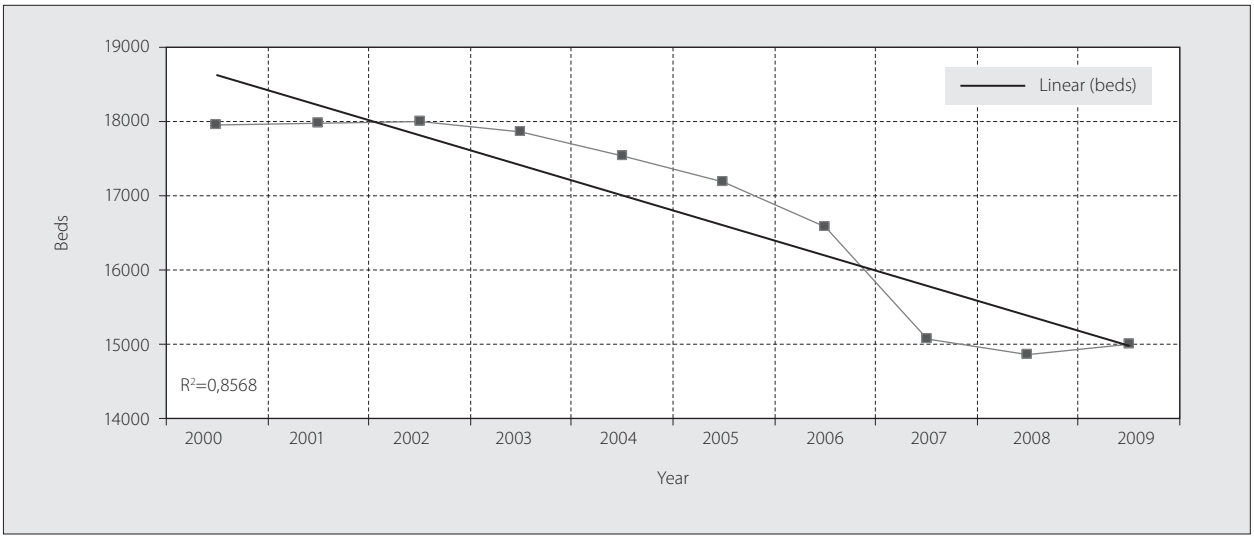
Table 3 shows the most significant indicators of work efficacy in general hospitals in Serbia in the period 2000-2009. Over the last ten years the average length of treatment was gradually and continually shortened by 1.9 days (20.9%) to reach 7.2 days in 2009, as compared to EU standards of average treatment length of 8 days [7] and the national guidelines of 8.5 days [8].

Graph 2 presents the trend of average treatment length in general hospitals in Serbia in the period 2000-2009.

The average daily bed occupancy at the Republican level was increased by 4%, which was 6.4% of the initial occupancy in 2000, to have reached a maximal rate in 2009 when it was 66.8%.

Table 2. Selected indicators of general hospitals utilization in Serbia in the period 2000–2009

Year	Number of beds	Number of discharged patients	Number of treatment days
2000	17,958	451,691	4,114,129
2001	17,987	467,204	4,225,361
2002	17,991	470,889	4,182,155
2003	17,849	468,248	3,997,748
2004	17,529	476,221	3,997,378
2005	17,184	481,186	3,910,153
2006	16,588	484,949	3,661,302
2007	15,069	470,378	3,520,574
2008	14,857	478,564	3,561,195
2009	15,002	505,027	3,655,177



Graph 1. Fluctuation trend of general hospitals number of beds in Serbia in the period 2000–2009

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Graph 3 shows the trend of the average daily bed occupancy in general hospitals in the Republic of Serbia in the period 2000–2009.

Bed utilization follows changes in their occupancy; showing fluctuations over the evaluated 10-year period, it increased by 3.4%, which was 4.6% of the initial utilization. The maximum of 78.6% was reached in 2009.

Since 2000 beds throughput capacity or hospital beds turn off has been showing an even and constant increase of 8.5 patients per bed, which was 27.8% of the initial throughput capacity recorded in 2000. In 2009 it was 33.7% of treated patient per bed.

The significance of changes of the selected indicators of utilization and work efficacy in general hospitals of Serbia

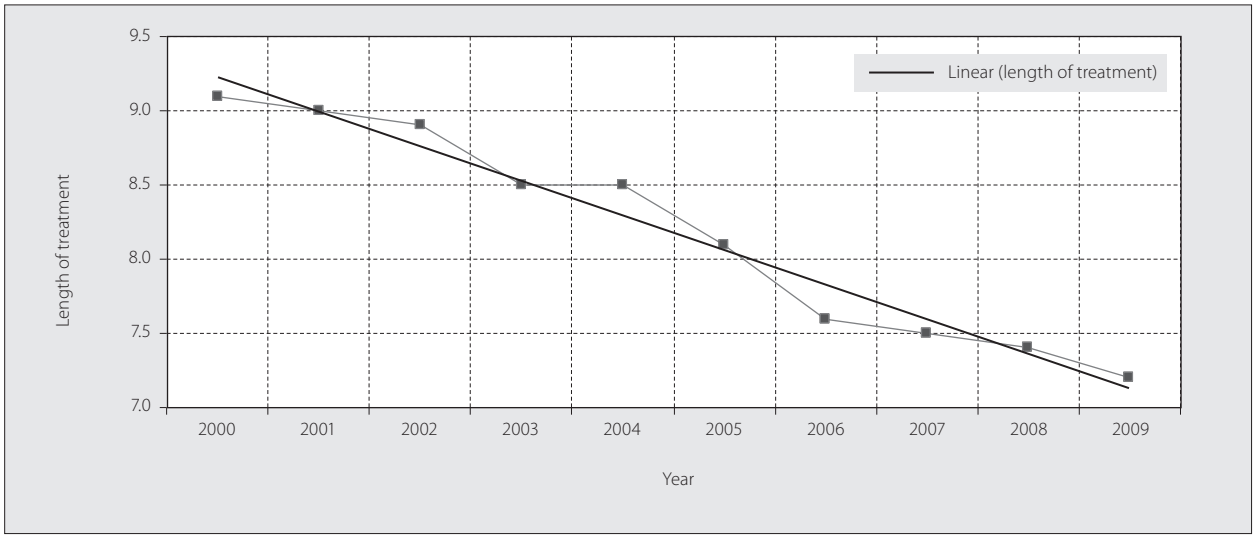
Table 3. Selected indicators of general hospital functioning in Serbia in the period 2000–2009

Year	Average length of treatment (days)	Average daily bed occupancy (%)	Beds utilization (%)	Beds throughput
2000	9.1	62.8	74.1	25.2
2001	9.0	64.4	76.0	26.0
2002	8.9	63.7	75.2	26.2
2003	8.5	61.4	73.6	26.2
2004	8.5	62.5	73.6	27.2
2005	8.1	62.3	73.5	28.0
2006	7.6	60.5	71.4	29.2
2007	7.5	64.0	75.5	31.2
2008	7.4	65.7	77.5	32.2
2009	7.2	66.8	78.6	33.7

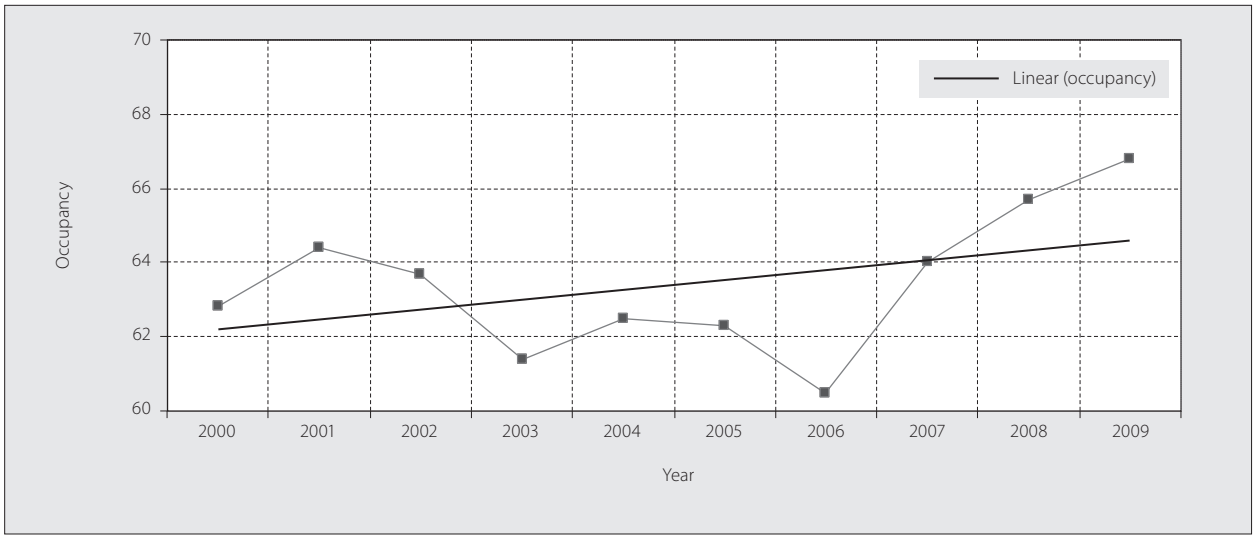
Table 4. Value of selected indicators of general hospitals utilization and efficacy in Serbia in 2009 in relation 2000 years

Indicators	$\bar{X}$	SD	p (t-test)
Number of beds	16480.00	2090.208	0.057 (NS)
Number of discharged patients	478359	37714.247	0.035*
Number of hospitalization days	3884653	324528.071	0.038*
Average length of treatment (days)	8.15	1.34350	0.074 (NS)
Average daily bed occupancy (%)	64.80	2.82843	0.020*
Bed utilization (%)	76.3500	3.18198	0.019*
Bed throughput	29.4500	6.01041	0.091 (NS)

$\bar{X}$ – mean value; SD – standard deviation; NS – non-significant statistically
* statistically significant difference (p≤0.05)



Graph 2. Fluctuation trend of general hospitals average length of treatment in Serbia in the period 2000–2009



Graph 3. Fluctuation trend of general hospitals average daily beds occupancy in Serbia in the period 2000–2009

2009 in relation to 2000 analyzed by the Student's t-test is shown on Table 4. The most significant achievements of shifts are the significantly increased utilization and average daily beds occupancy, increased number of patients and decreased number of hospitalization days.

DISCUSSION

Hospital activity, according to number and in organizational sense has formed a constant of the national healthcare system for decades. This particularly refers to the general hospitals system. Nevertheless, over the last 10 years the decrease of the number of beds in general hospital was significant. First we compared the network of general hospital system in Serbia with the organizationally identical system existing in the Republic of Croatia, a part of the former Yugoslav unified system. In Croatia there is one general hospital per each territorial unit, a county, with the average population of potential users of 150,545 inhabitants [9]. In Serbia there are maximally four general hospitals organized per district with the average population of potential users of 116,514 inhabitants. Based on the territorial division and the size of the gravitating territory and the population we can conclude that the total number of general hospitals is sufficient. However, due to the differences in the territorial distribution, there is a significant inequality in their territorial accessibility and availability.

According to the data of the World Health Organization, in most countries of the world there is a trend of decrease in hospital capacity. It is estimated that the number of hospital beds decreased by 25-30% worldwide in the period 1990–2006 [10]. From 1993 to 2009 the number of beds in Serbia was decreased by about 7%, which was more than legally approved 5.0 standard beds per 1000 inhabitants. During the same period the number of hospital beds in Croatia decreased by 26%; 7.4 in 1990 and 5.5 per 1000 inhabitants in 2007 [9]. Slovenia with 4.8 of hospital beds per 1000 inhabitants and Poland with 5.2 have a lower provision of hospital beds than Serbia. Most other studied countries have a higher provision of beds for acute hospitalization, such as EU with 5.8, Slovakia 6.8, Hungary 7.9 and Czech Republic 8.4 hospital beds per 1000 inhabitants. In 2009, the number of beds per 1000 inhabitants in general hospitals in Serbia was 2.1 and in Croatia it was 1.7 beds per 1000 inhabitants [9, 10].

Utilization of hospital services is above all determined by the course and nature of the disease. However, territorial, financial and cultural accessibility are also important, as well as the living and social standards, and healthcare information accessibility and education [4].

In most countries the number of hospital treated patients is increasing [10, 11, 12]. In the basis of this increase could be, above all, the increased accessibility of healthcare, insufficient care of the diseased and injured at the primary level, improved socioeconomic conditions, changed clinical features and the course of the disease, change of medical doctrine, the mode of financing healthcare and other. In Serbia, over the 10-year studied period, with some fluctuation but not to such an intensity as in other studied countries, the number of treated patients in general hospitals statistically significantly increased (p_t=0.035, p≤0.05).

With the number of discharged patients, the rate of hospitalization is also concurrently increased. Thus, in Croatia, in the period 1990-2008 the rate of hospitalization increased from 153 to 173.3 hospitals treated patients per 1000 inhabitants. In 2008, among the studied European countries the lowest rate of hospitalization was recorded in Azerbaijan with 63.1 and Georgia 71.7. The average hospitalization rate in the EU countries was 177.1, in Slovenia 183, and among the highest in Austria with 280.8 and Byelorussia with 293.7 hospitals treated per 1000 inhabitants [9, 13]. In Serbia the increase of hospitalization rate is potentiated, above all, by the decreased number of inhabitants.

At the same time, with the increase of hospital treated patients, the number of hospital treatment days is increased, except when the length of hospital treatment is considerably shortened. Thus, in general hospitals of Serbia, despite the increased number of hospital treated patients the number of their treatment days is considerably decreased (p_t=0.038, p≤0.05).

The crucial hospital indicator is the average length of treatment; it is not only a significant indicator of utilization, but also of effectiveness and efficacy of hospital activity. It is also the basis for financing of hospital activities, either of payment for implemented hospital days or payment by iso-resource categories, for example diagnostic related groups. The average length of treatment is primarily studied according to specific diseases and population groups. It is defined by multiple and different factors that always mutually supplement each other and should not be observed as isolated entities. The relevant literature points out four groups of these factors: patient's characteristics, applied technologies, healthcare organization and characteristics of hospital practice, which define the length of hospital treatment [14-25]. The patients' characteristics involve age, gender, race and ethnicity, marital status, severity of basic disease, presence of co-morbidity conditions and complications, type of health insurance and use of medications [15, 17, 20, 22]. Simpson et al. [25] underline the sensitivity of length of hospital stays on the influence of multiple factors, and that most recent technologies used by a smaller number of more severely ill patients, whose application leads to life prolongation and prolonged hospital treatment. New technologies, which are in mass usage and decrease complications, leading to more rapid diagnostics and therapy, and decrease the length of hospital stay. Hospital characteristics of the highest significance for the length of hospital treatment are the level of specialist orientation, size of hospital, number of treated patients, educational level of hospital, its profit orientation and geographic location, and the level of regional urbanization where the hospital is located [15-18]. The basic type of the organization of the entire healthcare, as well as accessibility and approachability to various types and levels of hospital treatment change their length [14-25]. Hospital practice determines the length of treatment,

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not only by the manner of its organization, but also by its effectiveness and quality (habits in the mode of diagnostics, therapy and rehabilitation, number of provided services, sophistication, and intensity of treatment) [15, 22]. Study results referring to how certain factors influence the average length of treatment are not consistent. However, most authors agree that the presence and severity of co-morbid conditions [14, 18, 22], as well as complications of basic disease [14, 22], older age [15], higher profit [15], but also mandatory health insurance based on solidarity [15, 18], more frequent consultations, larger hospitals and urbanized territory where it is located [15, 16, 18], longer laboratory investigations, increased prescription medications, and particularly medication side-effects [20], higher number of surgical procedures, higher specialization of hospital treatment [15], and additional educational activities in hospitals [15, 16] increase the length of treatment.

It has been noted that in most countries there is a constant shortening of hospital treatment [14]. In Serbia the shortened length of treatment in general hospitals is important on the level of p_t=0.074, p≤0.05. However, Serbia is still the country with the longest treatment in all types of stationary healthcare facilities.

Over the last 18 years, in the Republic of Croatia the average length of hospital treatment has been shortened from 12.3 days in 1990 to 7.3 days in 2008 [9]. Treatment in general hospitals is the longest in Azerbaijan, 11.5 days. In Czech Republic it is 7.4 days, and 6.5 days in the countries which became members of the European Union in the period 2004–2007. In 2008, the average length of treatment in general hospitals of Slovenia was 5.7 days, Austria 5.8 days, Finland, Israel and Turkey at least 4 days. In the USA it was 4.8 days in 2007 and in England in 2000 6.8 days, while in Kuwait hospitals it ranged from 3.3 to 7.8 days [10, 26].

A significant indicator of hospital work utilization and efficacy is also hospital beds occupancy [27]. The most recent data have indicated that in 2009 the general hospitals of Serbia had the daily average occupancy of 66.8%. The increase of average daily occupancy in general hospitals was significant rating p_t=0.020, p≤0.05.

In 2008, beds occupancy in general hospitals of Serbia was much lower than that of hospitals in Slovenia (71.5%) [13] and in the Republic of Croatia (84.9% daily) [9], Norway 89.8% or Ukraine 90.2% [10]. The countries which became members of the European Union in the period 2004-2007 with the average daily occupancy of 71.5% and Czech Republic 69.7% also had higher beds occupancy in general hospitals. General hospitals of Kuwait have the average occupancy ranging from 40.1% to 87.2% [22]. The lowest daily occupancy have general hospitals in Azerbaijan, i.e. 27.6% [10].

Occupancy of hospital beds indirectly speaks of their utilization. A higher occupancy, and thus also a higher beds utilization can be achieved by a longer hospital stay. By extensive investments into hospitals, their higher utilization is expected; however, their higher utilization does not necessarily mean a qualitative treatment outcome and decrease of mortality rate [26-29].

The suggested standard of daily beds occupancy of 80% corresponds to the utilization of 94% and the average utilization of general hospitals in Serbia rates 78.6%. Increased utilization of general hospitals is statistically significant p_t=0.019 with p≤0.05.

Increased throughput of general hospital beds (hospital beds turn off) is another basic indicator of utilization and efficacy of hospital work. In 2009, in general hospitals of Serbia it was 33.7. Increased throughput of general hospital beds is significant at the level p_t=0.091 with p≤0.05.

Finally, let us also say that in 2007 more patients per hospital bed was treated in Croatia than in Serbia, -44.5 patients per hospital bed [9].

CONCLUSION

The analysis of the utilization and efficacy of general hospitals, as one of the most significant segments of the healthcare and healthcare system, is mandatory and useful, but also a highly complex task. Services of general hospitals in different parts of Serbia are variously accessible. The size of the gravitating population and the number of hospital beds are the most significant nominators in the calculations of hospital indicators. In the specific 10-year period 2000–2009 the most significant changes in the utilization and efficacy of general hospital refer to a statistically highly significant increased utilization and occupancy of beds, with a statistically significant increase of the number of treated patients and decreased number of hospitalization days. The highest number of general hospitals in the Republic and the general hospitals system as a whole has achieved the suggested European and domestic standards regarding the length of treatment, however, other indicators of utilization and efficacy of general hospital work are far poorer. Along with other up-to-date demographic trends, a significant activity in achieving the European standards regarding other indicators and satisfying all healthcare needs of the population, involve the decrease of the number of hospital beds, their more adequate distribution and reassignment.

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Процена коришћења и ефикасности општих болница у Србији: има ли помака?

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КРАТАК САДРЖАЈ

Увод Рад општих болница у Републици Србији није довољно процењен.

Циљ рада Циљ истраживања је био да се анализом основних показатеља стања и функционисања општих болница процене мрежа, коришћење и ефикасност општеболничког система ради даљег унапређења његове организације и рада.

Методе рада Рад је део ретроспективно-проспективне анализе болничке здравствене службе рађене 2011. године. Истраживањем је обухваћено свих 40 општих болница у Србији, које су процењене као јединствен општеболнички систем. Одабрано је седам основних показатеља стања и рада болница који су посматрани од 2000. до 2009. године. Извори података били су „Извештаји Службе за болничко-стационарно лечење" општих болница и саопштења Републичког завода за статистику „Витални догађаји у Републици Србији". Нумерички подаци су анализирани методама дескриптивне статистике применом компјутерских програма *Microsoft Office Excel 2007* и *SPSS for Windows*. Статистичка значајност разлике показатеља испитана је Студентовим *t*-тестом.

Резултати У општим болницама током посматраног периода број постеља је смањен за 16,5% (p_t=0,057). Број исписаних болесника је повећан за 11,8% (p_t=0,035). Број дана лечења је смањен за 11,2% (p_t=0,038). Просечна дужина лечења је краћа за 1,9 дана (p_t=0,074). Просечна дневна заузетост је повећана за 4% (p_t=0,020). Искоришћеност постеља је већа за 4,5% (p_t=0,019). Тзв. пропусна моћ постеља повећала се за 8,5 болесника по постељи или за 27,8% (p_t=0,091).

Закључак Најзначајнији показатељи коришћења и ефикасности општих болница су побољшани, али су само у просечној дужини лечења достигнуте европске и домаће препоруке.

Кључне речи: општа болница; показатељи; коришћење; ефикасност; Србија

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