

EFFICIENCY MEASUREMENT IN HEALTHCARE WORK MANAGEMENT USING MALMQUIST INDICES

Stefko R., Gavurova B., Korony S. *

Abstract: Healthcare management is a very complex problem in each country. There are different conditions as well as economic, health and social bonds in the countries, while a constant emphasis on healthcare system efficiency is the common feature in each country. Specific and current field of healthcare is day surgery. It is less costly and its savings are in the most of rationally functioning economic systems used for financing more complex surgeries. The paper reflects on the above-mentioned aspects and its primary aim is to evaluate the day surgery efficiency during 2009 – 2013 by applying Malmquist indices. So the object of our case study is group of day surgery facilities in Slovak regions. The subject is dynamic data envelopment analysis on basis of Malmquist indices. Results of our case study offer valuable information for health and social policies' managers, and especially for setting up stabilization and regulation mechanisms in a process of healthcare system development in Slovakia.

Key words: healthcare management, day surgery, efficiency, data envelopment analysis, Malmquist indices

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Introduction

Healthcare systems can improve their efficiencies by many ways. An important role in this process is performed by information and communication technologies, as well as by complete computerization of health systems (Bakala and Michalski, 2015; Chluski and Ziora, 2015; Michalski et al., 2015, Starostka-Patyk et al., 2015). The quality of diagnosis and treatment of patients is also improved through this, as well as the management of healthcare (Gavurová et al., 2014). One of the ways of increasing the efficiency of healthcare was the introduction of day surgery (in Slovakia in 1998) what reduced the hospitalization time and eliminated the number of beds in hospitals (Gavurová and Hyránek, 2013). Intensity of the process was not the same, which may be observed by significant differences among the individual countries with regard to overall hospital resources and activities, average length of patient's stay at the hospitals, ratio of realized day surgery procedures on a total number of procedures, etc. Paediatric day surgery is especially used for a treatment of such illnesses that do not require hospitalization

* **Robert Stefko**, prof. Ph.D., University of Prešov in Prešov, Faculty of Management, Department of Marketing and International Trade; **Beata Gavurova**, Assoc. Prof. Ph.D., MBA, Faculty of Economics, Technical University of Košice, Nĕmcovej 32, 040 01 Košice, Slovakia; **Samuel Korony**, RNDr. Ph.D., Faculty of Economics, Matej Bel University, Cesta na amfiteáter 1, 974 01 Banská Bystrica, Slovakia
✉ Corresponding author: beata.gavurova@tuke.sk
✉ robert.stefko@unipo.sk; samuel.korony@umb.sk

for a few days. The fundamental principle lies on postoperative care which does not require more than 24 hours. It is convenient for both patients and health insurance companies. It is supported by a government program of the Ministry of Health of the Slovak Republic within a system of bed reduction in the hospitals and health care transfer into more effective ambulatory care. Paediatric day surgery has many supporters, but also opponents. It is perceived differently by health insurance companies that are trying to reach an effective use of available financial resources, and by indebted hospitals whose current situation is caused by lower payments for day surgery procedures in comparison to payments for inpatient surgery. Probably the main reason is an incorrect and economically de-motivated system that prevents our country to reach at least the European average in realization of day surgery procedures (7 – 10% of all surgical procedures).

The differences in day surgery use in different countries are of economic character. It means that the most important role plays the way reimbursement mechanism, economic motivational systems, and institutionalized framework for day surgery procedures' realization, etc. are set up. However, it is not possible to expect that any operational system would be realized by day surgery in 100% of the cases as it is not suitable for each patient. Many factors need to be considered in decision-making of day surgery appropriateness, especially patient's medical status (Soltes et al., 2010; Soltes and Radonak, 2014). Day surgery is less stressful for a patient than hospitalization as patient spends a minimum period in a hospital and consequently s/he recovers at home (Popa et al., 2015). The benefit is important for older paediatric patients who are not used to sudden changes. Thus, a stay at home environment has a positive effect on their psychological wellbeing. Economically active patients may return to working process after a short convalescence (Jarrett and Staniszewski, 2006; Bem et al., 2014).

Many authors agree that health care system has a significant influence on a development of day surgery (Castoro et al., 2007; Szabo and Sidor, 2014; Bem et al., 2014). Regulatory system of health care may be implemented by such economic motivational systems that would stimulate the health care providers to provide a wider range of day surgery (use of cost-efficient methods). Analytical platform formation is closely connected to these processes. The platform would reflect on all particularities of day surgery procedures' realizations, such as procedures' risk, their cost-efficiency, level of hospitalization after a procedure, procedure waiting time, calculating and alternative costs that are connected with a procedure, etc. Unfortunately, there has been an absence of such analyses in Slovakia. Therefore, our ambition was to solve the research issues in particular area of health system efficiency by means of specific day surgery analyses. The outputs of these analyses provide a valuable platform for health and social policies' creators as well as for a strategic framework concept of the Slovak health system.

The objective of our case study is to do dynamic data envelopment analysis (DEA) of available data of paediatric day surgery facilities by Malmquist indices for Slovak regions during 2009 – 2013.

Data and Research Methods

The data source for our DEA analysis of day surgery healthcare efficiency is online annual report "The Surgery and day healthcare in Slovak Republic (Day-care annual report)" published by the National Health Information Center of Slovakia (<http://www.nczisk.sk>). Slovak regions with day surgery facilities are our research objects. We analysed indicators of paediatric day surgery efficiency during the years 2009 - 2013. Number of day surgery paediatric day surgery patients was output. Corresponding numbers of paediatric beds were used as input. Besides descriptive statistics we used CCR (constant returns to scale) input oriented Malmquist DEA non-radial models (Cooper et al., 2007). The first DEA model was static CCR DEA model with constant returns to scale (Charnes et al., 1978). Linear combination of units (in our case units are Slovak regions in corresponding years) is used to compute optimum values of inputs and outputs in DEA models. DEA is a non-parametric approach for frontier estimation. Basic models are discussed in works of many authors, and they are applied in many areas. In Slovak Republic, DEA models have been used to measure the efficiency of financial institutions (Kocisova, 2012), or the efficiency of agricultural sector (Kocisova, 2015). Here we mention only briefly the principle of dynamic DEA analysis based on Malmquist indices (Malmquist, 1953). The Malmquist index evaluates the productivity change of a DMU (decision making unit) between two time periods and is an example in "comparative statics" analysis (Cooper et al., 2007). It is defined as the product of Catch-up and Frontier-shift terms. The catch-up (or recovery) term relates to the degree to which a DMU changes (improves or worsens) its efficiency relatively to efficient frontier. It is the change of relative efficiency. The frontier-shift (or innovation) term reflects the change in the efficient frontiers (production frontiers) between two time periods. The Malmquist total factor productivity is then simply computed by the product of catch-up and frontier shift. Interpretation of all three terms is simple and similar to common indices: value >1 indicates progress, value = 1 and value < 1 respectively indicate no change (status quo, stagnation) and regress. For statistical and graphical analyses we used statistical system SPSS version 19. Software DEA Solver Pro version 10 was used for DEA analyses (Cooper et al., 2007). In next part we present briefly statistical parameters of analysed variables (day surgery indicators) and then results of Malmquist indices analyses.

Results

a) Descriptive statistics results

In Slovakia there are eight self-government regions at NUTS III level. In our paper we use their abbreviations from National Health Information Center of Slovakia: Banska Bystrica (BC), Bratislava (BL), Kosice (KI), Nitra (NI), Presov (PV), Trnava (TA), Trencin (TC) and Zilina (ZI). Basic statistical parameters of examined available variables (number of day surgery paediatric patients, number

of day surgery paediatric beds), are in Table 1. We used them in dynamic DEA analyses of Slovak regions during five years interval (2009 – 2013) (Mean = arithmetic mean, Std. Dev = standard deviation).

Table 1. Statistical parameters of paediatric day surgery in the Slovak regions during the years 2009 – 2013

Variable	Mean	Std. dev.	Minimum	Maximum
Paediatric patients	1,317	895.0	201	3,374
Paediatric beds	39	23.4	5	115

Number of cases is 40 (eight Slovak regions during five years interval). Mean number of day surgery paediatric patients is 1,317. Minimum number (201) was in 2009 in Trenčín region, maximum number was 3,374 (Prešov region in 2013). Mean number of day surgery paediatric beds is 39 with range from minimum value 5 again in Trnava region in 2009 to maximum value 115 (Nitra region in 2013).

b) DEA analyses results

We have got production dependence with one input (number of paediatric day surgery beds) and one output (number of paediatric day surgery patients) during five years (2009 -2013). Firstly, we present the results for change of relative efficiency of regions with regard to efficient frontier (the first decomposition term of Malmquist index). The lines present Slovak regions and the columns provide the year-on-year development indices of their relative efficiency in using beds' fund. The Table 2 also contains average values in lines and columns. The column "Average" provides arithmetic mean of year-on-year indices. The column "Ranks" refers to the order of a region on the basis of an average development index of a relative efficiency of beds' fund use.

Table 2 provides the following facts for a development of relative efficiency of beds' fund in regions:

- **BC:** The relative efficiency of beds' fund use with regard to other regions during the first three years 2009 – 2011 was increasing (2010/2009 by 30.4%, 2011/2010 by 15.4%). However, it decreased by 18.1% between 2012 and 2011. In the end it increased by 90.8% in the last pair of years (2013/2012). The average relative change of efficiency with regard to other regions represented an increase of 29.6%. It is the highest rank within all regions.
- **BL:** The year-on-year relative efficiency with regard to other regions during the first two years 2009 - 2010 increased by 5.2%. However, it decreased by 43.0% and by 58.8% between 2010 and 2012. On the other hand, it again increased by 38.2% in period 2013-2012. The average relative change of efficiency with regard to other regions indicates decrease of 14.6%. It is the worst rank within all regions.

Table 2. Malmquist indices of relative efficiency change in using beds' fund for paediatric day surgery in the Slovak regions and during 2009 – 2013

Catch-up	2009=>2010	2010=>2011	2011=>2012	2012=>2013	Average	Rank
BC	1.304	1.154	0.819	1.908	1.296	1
BL	1.052	0.570	0.412	1.382	0.854	8
KI	1.077	1.726	1.440	0.371	1.154	4
NI	1.866	1.153	0.629	0.429	1.019	6
PV	0.730	1.756	0.907	1.316	1.177	3
TA	0.664	1.950	0.655	0.561	0.957	7
TC	1.660	1.495	1.064	0.815	1.258	2
ZI	0.785	2.075	0.786	0.933	1.145	5
Average	1.142	1.485	0.839	0.964	1.107	-
Max	1.866	2.075	1.440	1.908	1.296	-
Min	0.664	0.570	0.412	0.371	0.854	-
SD	0.440	0.500	0.312	0.536	0.152	-

- **KI:** The relative efficiency of beds' fund use with regard to other regions during the first four years 2009 – 2012 increased (2010/2009 by 7.7%; 2011/2010 by 72.6%; 2012/2011 by 44.0%). Then it decreased by 62.9% in 2013/2012. The average relative change of efficiency with regard to other regions represented an increase of 15.4%.
- **NI:** The relative efficiency of beds' fund use during the first three years 2009 - 2011 was increasing (2010/2009 by 86.6%; in 2011/2010 by 15.3%). It decreased by 37.1% and 57.1% between 2011 and 2013. The average relative change of efficiency was an increase of 1.9%.
- **PV:** Year-on-year relative efficiency has got alternating increase and decrease. Firstly, there was a decrease (2010/2009 by 27.0%), then an increase (2011/2010 by 75.6%). Then, there was a decrease (2012/2011 by 9.3%) and increase of 31.6%. The average relative change of efficiency indicated an increase of 17.7% in the region.
- **TA:** Relative efficiency indicates more frequent decrease than increase in the region. Firstly, there was a decrease (2010/2009 by 33.6%), then increase (2011/2010 by 95.0%). Then, the relative efficiency decreased (2012/2011 by 34.5%; 2013/2012 by 43.9%). The average relative change of efficiency was a decrease of 4.3%.
- **TC:** Relative efficiency has got similar development as in KI. Firstly, there was an increase (2010/2009 by 66.0%; 2011/2010 by 49.5%; 2012/2011 by 6.4%); in the end there was a decrease (2013/2012 by 18.5%). The average relative change of efficiency represented an increase of 25.8%. It is the second best rank.

- **ZI:** Relative efficiency has a similar development as TA. There was a decrease (2010/2009 by 21.5%) and then an increase of 107.5% that changed with a decrease during the next years (2012/2011 by 21.4%; 2013/2012 by 6.7%). The average relative change of efficiency represented an increase of 14.5%

Table 2 provides the following facts for year-on-year indices of relative efficiency development:

The first two consecutive indices indicated an average increase. In 2009 – 2010, there was an average increase of relative efficiency development of 14.2%. The lowest value of increase was in TA (decrease of 33.6%). The highest increase was in NI (increase of 86.6%). In 2010 – 2011, the average increase of relative efficiency development was 48.5%. It was the highest during whole analysed period. ZI presented the maximum of 107.5%. BL represented the minimum (decrease of 43.0%). Decrease has been observed in two other indices. In 2011 – 2012, there was an average decrease of relative efficiency development of 16.1%. The lowest index was in BL (decrease of 58.8%). The highest index was in KI (increase of 44.0%). The last research period, 2012 – 2013, had an average index of relative efficiency development of 3.6%. The lowest increase index was in KI (decrease of 62.9%) and the highest was in BC (increase of 90.8%).

The second term of Malmquist index takes into account time change of efficient frontiers that is caused by new technologies (innovations). The differences of terms among regions are minimal because of constant returns to scale model. Possible differences are caused by a presence, of so-called slacks (principle of Malmquist index and its decomposition is simple, but the numerical computation is complex in case of non-radial model).

Table 3. Malmquist indices of efficient frontier change in beds' fund use of paediatric day surgery in the Slovak regions and during 2009 – 2013

Frontier	2009=>2010	2010=>2011	2011=>2012	2012=>2013	Average
BC	1.139	0.940	1.241	0.869	1.047
BL	1.111	1.095	1.241	1.001	1.112
KI	1.139	0.940	1.035	1.200	1.079
NI	1.139	0.940	1.242	1.001	1.081
PV	1.139	0.940	1.241	1.001	1.080
TA	1.139	0.939	1.242	1.001	1.080
TC	1.139	0.940	1.241	1.001	1.080
ZI	1.139	0.940	1.241	1.001	1.080
Average	1.136	0.959	1.216	1.010	1.080
Max	1.139	1.095	1.242	1.200	1.112
Min	1.111	0.939	1.035	0.869	1.047
SD	0.010	0.055	0.073	0.090	0.017

Table 3 provides the following facts for development indices of efficient frontiers change in beds' fund use:

In 2009 – 2010 period was an average increase of efficient frontier change by 13.6%. Lower increase was in BL (of 11.1%). Other regions had the same increase (of 13.9%). In 2010 – 2011, the average decrease of efficient frontier change was 4.1%. Higher value (increase of 9.5%) was in BL. Lower values were in other regions (decrease of 6.0%). There was an increase in the next two year-on-year indices. In 2011 – 2012, an average increase of efficient frontier change was 21.6%. It was the highest for the whole period. Lower increase was in KI (increase of 3.5%). Higher index was in all other regions (increase of 24.0%). In the last evaluated period, 2012 – 2013, an average increase of a development of efficient frontier change was 1.0%. The lowest increase was in Banska Bystrica region (decrease of 13.1%). The highest index was in KI (increase of 20.0%). The other regions stagnated in the development of examined values (increase of 0.1%).

The results of total efficiency (productivity) development of beds' fund use for paediatric day surgery in the Slovak regions and during 2009 – 2013 on the basis of Malmquist indices are presented in the next part. Situation is very similar to relative efficiency indices due to small variance of the efficient frontiers indices values.

Table 4. Malmquist indices of total efficiency change of beds' fund use for paediatric day surgery in the Slovak regions and during 2009 – 2013

	2009=>2010	2010=>2011	2011=>2012	2012=>2013	Average	Rank
BC	1.485	1.085	1.016	1.658	1.311	2
BL	1.168	0.625	0.512	1.384	0.922	8
KI	1.227	1.622	1.491	0.446	1.196	4
NI	2.126	1.083	0.781	0.430	1.105	6
PV	0.831	1.650	1.125	1.318	1.231	3
TA	0.756	1.831	0.813	0.561	0.990	7
TC	1.891	1.405	1.320	0.816	1.358	1
ZI	0.894	1.950	0.976	0.934	1.189	5
Average	1.297	1.406	1.004	0.943	1.163	-
Max	2.126	1.950	1.491	1.658	1.358	-
Min	0.756	0.625	0.512	0.430	0.922	-
SD	0.502	0.447	0.312	0.466	0.150	-

Table 4 proposes the following facts for a development of Malmquist total efficiency (productivity) indices of total beds' fund use according to the regions:

- **BC:** Year-on-year total efficiency of beds' fund use increased during the whole analysed period 2009 – 2013 (of 48.5%; of 8.5%; of 1.6%; of 65.8%). The average Malmquist index of total efficiency indicates increase of 31.1%. It is the second best rank within all regions.
- **BL:** Total efficiency increased by 16.8% during the first two years, 2009 - 2010. However, it decreased by 37.5%, or 48.8% during 2010 – 2012. Then,

- it again increased by 38.4% during 2013/2012. The average Malmquist index of total efficiency indicates decrease of 7.8%. It is the worst rank of all regions.
- **KI:** Total efficiency of beds' fund use increased during the first four years 2009 – 2012 (of 22.7%; of 62.2%; of 49.1%). However, it rapidly decreased by 55.4% during 2013/2012. The average Malmquist index of total efficiency indicates increase of 19.6%.
 - **NI:** Total efficiency increased during the first three years, 2009 -2011 (of 112.6%; of 8.3%). However, it decreased by 21.9% and by 57.0% during 2011 – 2013. Average Malmquist index increased by 10.5%.
 - **PV:** Firstly, total efficiency decreased by 16.9%. However, it increased in other year-on-year indices (65.0%; 12.5%; and 31.8%). The average Malmquist index of total efficiency indicates increase of 23.1%.
 - **TA:** Total efficiency has more frequent decrease than increase. Firstly, there was decrease of 24.4%, then increase of 83.1%. This increase was followed by a decrease (of 18.7%; of 43.9%). The average Malmquist index of total efficiency indicated a decrease of 10%.
 - **TC:** Total efficiency had firstly similar development than in KI. Firstly, there was an increase for three times (of 89.1%; of 40.5%; of 32.0%), subsequently, there was a decrease (18.4%). The average Malmquist index of total efficiency had an increase value of 35.8%. It is the best within all regions.
 - **ZI:** Total efficiency had similar trend than in TA. Firstly, there was a decrease (10.6%). It was followed by an increase of 95.0%, and then decrease appeared again (of 2.4%; of 6.6%). The average Malmquist index of total efficiency represented an increase of 18.9%.

Table 4 provides the following facts for year-on-year Malmquist indices of total efficiency development:

Increase was during first two consecutive indices. An average increase of total efficiency development was 29.7% during 2009 – 2010. The lowest index was in TA (decrease of 24.4%). The highest index was in NI (increase of 112.6%). The average increase of total efficiency development was 40.6% during 2010 – 2011. Its index was the highest one for a whole period. The maximum increase of 95.0% was noticed in ZI, while the minimum was in BL (decrease of 37.5%). The third index (2011 -2012) provides information of stagnation in the development (increase of 0.4%). The lowest increase index was in BL (decrease of 48.8%), while the highest index was in KI (increase of 49.1%). The average decrease of total efficiency development was 5.7% during 2012 – 2013. The lowest index was in NI (decrease of 57.0%), the highest index was in BC (increase of 65.8%).

Malmquist indices represent the most detailed and the most variable assessment of total efficiency development and its factors related to relative efficiency change as well as to efficient frontier change for two consecutive years. However, it is also important to compare the first and the last analysed periods on the basis of Malmquist indices. In our case, it is related to index of 2013/2009. This comparison analyses a long-term trend in efficiency development.

Table 5. Malmquist indices of total efficiency development in beds' fund use for paediatric day surgery in the Slovak regions during 2009 and 2013

Region	Catch-up	Rank	Frontier	Malmquist	Rank
BC	2.350	1	1.155	2.714	2
BL	0.342	8	1.512	0.517	8
KI	0.994	5	1.331	1.322	5
NI	0.580	6	1.331	0.772	6
PV	1.528	3	1.331	2.034	3
TA	0.475	7	1.331	0.632	7
TC	2.151	2	1.331	2.862	1
ZI	1.195	4	1.331	1.590	4
Average	1.202	-	1.331	1.555	-
Max	2.350	-	1.512	2.862	-
Min	0.342	-	1.155	0.517	-
SD	0.758	-	0.095	0.917	-

Table 5 provides the following facts for Malmquist indices of efficiency development and its terms (2013/2009):

- **BC:** Relative efficiency of beds' fund use increased with regard to other regions (of 135.0%). Its increase is the highest index within all regions. Change in total efficiency of beds' fund use that is measured by Malmquist index indicates an increase of 171.4%. It is the second best change that is caused by a smaller shift in efficient frontier.
- **BL:** Relative efficiency of beds' fund use decreased with regard to other regions (of 65.8%). Its change was the worst of all the regions. Total efficiency (measured by Malmquist index) decreased by 48.3%. Similarly, its change was the worst of all the regions.
- **KI:** Relative efficiency decreased by 0.6%. It is symptom of stagnation. Total efficiency increased by 32.2%.
- **NI:** Relative efficiency decreased by 42.0%. Total efficiency also decreased by 22.8%.
- **PV:** Relative efficiency increased by 52.8%. Total efficiency increased by 103.4%.
- **TA:** Relative efficiency decreased by 52.5%. Total efficiency decreased by 36.8%. TA is the second worst region.
- **TC:** Relative efficiency increased by 115.1%. Its increase was the second highest within all regions. Total efficiency increased by 186.2%. TC region is the best within all the regions.
- **ZI:** Relative efficiency increase is 19.5%. Total efficiency increase is 59.0%. The Malmquist total efficiency change for all Slovak regions between 2013 and 2009 has got average increase of 55.5%. Relative efficiency change term has

got average increase of 20.2% while efficient frontier change term has got average increase of 33.1%. We can conclude that positive total efficiency (productivity) change (increase) is caused by growth of both of Malmquist composition terms: relative efficiency change and efficient frontier change. Influence of latter is by 12.9% larger.

Our analysis showed the differences in efficiency of paediatric day surgery in different regions of Slovakia. These partial analytical results require further analysis in multidimensional views and confrontation with experts involved in the field of day surgery. There are several identified reasons of regional disparities that are significantly related to the settings of healthcare system in the country. The efficiency of day surgery can be increased if it becomes the part of a set of important processes related not only to health management, but also to the activities of health insurance companies, law, etc. Further development of day surgery in Slovakia requires:

1. Regulation of the pricing strategies of health insurance companies by legislative changes in a way that a deliberate transformation of surgical operations has not occur from the group of overnight operations in to the group of separately reimbursable operations (72 hour hospital stay) in order to obtain a more favourable consideration of their performance (it is essential to standardize the price of day surgery operation).
2. Establishment of clear rules and conditions for all stakeholders of day surgery system. Precise definition of patients who are suitable/unsuitable for treatment of day surgery with a high regard on the type of the required day surgery operation. It is also necessary to determine well-defined requirements for the staff and equipment of the day surgery facilities.
3. Change the type of patient facilities for day surgery facilities. It is necessary to ensure parallel treatment of bed capacities in the hospitals with the development of day surgery. It also requires an active implementation of day surgery into the project of integrated health care centres (Strategic Framework for health care for 2014-2030).
4. A necessary change in reporting (through the National Health Information Center) in order to implement the default parameters by type of health care in the developed countries and the gain of relevant outcomes of the analyses with the possibility of benchmarking (performance and strategic ones) are required.

Conclusion

Results of our analyses provide information of a high level of variability in day surgery procedures' efficiency in the individual years and regions in Slovakia. From larger sense provide valuable information in a process of reviewing the healthcare system strategic management and also in national and international benchmarking. Our analyses does not include a factor of health facilities' ownership (state vs. private), as our primary ambition was to present procedural aspects of day surgery management that are consequently related to financial

aspects. At present, the financial aspects are very important in a process of day surgery development. The activities of some private clinics lead to deliberate lowering of demand in order to obtain a higher financial benefit of healthcare provider (lower waiting time for a procedure per higher remuneration, etc.) that is not regulated by a state. Similarly, many health facilities use their own methods of data reports of surgical procedures, which are modified by present price strategies of health insurance companies. Motivation of health facilities, indication experiences, surgeon's qualification, technical and pharmacological possibilities of anaesthesiologist, patient's motivation and his/her social background are very important for day surgery development irrespective of clinic's type. At present, more than half of all surgical procedures may be realized by day surgery. It would be adequate to focus day surgery clinics and hospitals for chosen types of procedures in the individual specialized fields in order to increase efficiency with regard to given regional differences in number and structure of realized day surgery procedures. Some small hospitals should be transformed into day surgery units, which would reduce their costs and they would provide the same range of operations with exception of complex and rare operations. Many clinics in Europe and the U.S. function in such a way. Development of day surgery in Slovakia is significantly obstructed by geographical conditions and social situation. Geographical conditions and social situation in Slovakia currently prevent the development of day surgery. What is important is the continuous active awareness to promote day surgery by the public health authorities, as well as medical facilities and specialized health care centres. In Slovakia, an intensive process of day surgery development will need more effective legal support with regard to some restrictive elements in terms of financial and non-financial areas. The process would lead to higher intensification of healthcare process. We plan to continue in our day surgery analyses by other suitable research methods and economic viewpoints.

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POMIAR EFEKTYWNOŚCI W ZARZĄDZANIU PRACĄ W OPIECE ZDROWOTNEJ PRZY UŻYCIU INDEKSU PRODUKTYWNOŚCI MALMQUISTA

Streszczenie: Zarządzanie opieką zdrowotną jest bardzo złożonym problemem w każdym kraju. Istnieją różne warunki, zarówno ekonomicznych, zdrowotnych jak i społecznych więzi w krajach, podczas gdy stały nacisk na wydajność systemu opieki zdrowotnej jest wspólnym elementem w każdym kraju. Specyficznym i aktualnym obszarem opieki zdrowotnej jest chirurgia jednego dnia. Jest to mniej kosztowne, a oszczędności są w większości racjonalnie funkcjonujących systemów gospodarczych wykorzystywane do finansowania bardziej złożonych operacji. Artykuł odnosi się do wyżej wymienionych aspektów, a jego głównym celem jest ocena efektywności chirurgii jednego dnia w latach 2009 - 2013 przy zastosowaniu indeksu MALMQUISTA. Przedmiotem niniejszego studium przypadku jest grupa placówek chirurgii jednego dnia w regionach Słowacji. Tematem jest dynamiczna metoda data envelopment analysis na podstawie indeksu MALMQUISTA. Wyniki naszego studium przypadku dostarczają cennych informacji dla

menedżerów zdrowia i polityki społecznej, w szczególności do tworzenia mechanizmów stabilizacji i regulacji w procesie rozwoju systemu opieki zdrowotnej na Słowacji.

Słowa kluczowe: zarządzanie opieką zdrowotną, chirurgia jednego dnia, wydajność, metoda data envelopment analysis, indeks Malmquista

效率測量保健工作管理使用馬爾奎斯特指數

摘要：醫療保健管理是在每個國家一個非常複雜的問題。有不同的條件以及經濟，衛生和在各國家的社會聯繫，而以恆定強調衛生保健系統的效率是在每個國家的共同特徵。醫療保健的具體和當前域是日間手術。這是成本更低，儲蓄是用於融資更為複雜的手術是最合理的經濟運行系統。本文反映了上述問題，其主要目的是評估2009年在日間手術效率通過應用馬爾奎斯特指數2013。因此，我們的案例研究的對象是在斯洛伐克地區的日間手術設施群。主題是對的Malmquist指數的基礎上動態數據包絡分析。我們的案例研究結果提供衛生和社會政策“的經理，尤其是在醫療系統的發展在斯洛伐克的過程建立穩定和調控機制的有價值的信息。

關鍵詞：醫療管理，日間手術，效率，數據包絡分析，馬爾奎斯特指數