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ASSESSMENT AND ANALYSIS OF MANAGEMENT EFFICIENCY OF HEALTHCARE ORGANIZATIONS

[1]D.N. Kelesbayev✉, [1]A.A. Kuralbayev, [1]B.Zh. Keneshbayev, [1]G.R. Mombekova, [2]A.A. Mutaliyeva

[1]Akhmet Yassawi University, Turkestan, Kazakhstan,
[2]Regional Innovation University, Shymkent, Kazakhstan
✉Correspondent-author: dinmukhamed.kelesbayev@ayu.edu.kz

This research paper, prepared in this direction, considers the problems of efficient use of resources in hospitals in order to increase the efficiency of health care organizations. Increasing competition and rising costs in the healthcare industry are forcing hospitals to optimize their operations. DEA (Data Envelopment Analysis) method is used to measure the efficiency level of hospitals, this method helps hospital managers to identify inefficient departments and learn how to use resources more efficiently. The main goal of the research work is to conduct a comparative efficiency analysis in 11 departments with inpatient services based on the data of the Turkestan City Central Hospital in 2023. As a result of the study, effective and ineffective departments were identified, and recommendations for resource optimization were developed. The information obtained during the research allows the hospital management to effectively use the resources allocated by the state and provide quality medical services. The results of the study recommend that hospital management take concrete steps to improve the efficiency of their departments, which will contribute to increasing the productivity of the overall health care system.

Keywords: healthcare organizations, management, efficiency, use of resources, competition, costs, DEA method, comparative efficiency analysis, medical services.

ДЕНСАУЛЫҚ САҚТАУ ҰЙЫМДАРЫНЫҢ БАСҚАРУ ТИІМДІЛІГІН БАҒАЛАУ ЖӘНЕ ТАЛДАУ

[1]Д.Н. Келесбаев✉, [1]А.А. Құралбаев, [1]Б.Ж. Кенешбаев, [1]Г.Р. Момбекова, [2]А.А. Муталиева

[1]Ахмет Ясауи университеті, Түркістан, Қазақстан,
[2]Аймақтық инновациялық университеті, Шымкент, Қазақстан,
e-mail: dinmukhamed.kelesbayev@ayu.edu.kz

Бұл зерттеу жұмысы денсаулық сақтау ұйымдарының тиімділігін арттыру мақсатында ауруханалардағы ресурстарды тиімді пайдалану мәселелерін қарастырады. Денсаулық сақтау саласындағы бәсекелестіктің артуы мен шығындардың өсуі ауруханаларды өз қызметін оңтайландыруға мәжбүрлейді. Ауруханалардың тиімділік деңгейін өлшеу үшін DEA (Data Envelopment Analysis) әдісі қолданылады, бұл әдіс аурухана басшыларына тиімсіз бөлімдерді анықтап, ресурстарды қалай тиімді пайдалануға болатынын білуге көмектеседі. Зерттеу жұмысының негізі мақсаты Түркістан қалалық орталық ауруханасының 2023 жылғы мәліметтеріне сүйеніп, стационарлық қызметі бар 11 бөлімде салыстырмалы тиімділік анализін жүргізу болып табылады. Зерттеу нәтижесінде тиімді және тиімсіз бөлімдер анықталып, ресурстарды оңтайландыру бойынша ұсыныстар әзірленді. Зерттеу барысында алынған ақпараттар аурухана басшылығына мемлекет бөлетін ресурстарды тиімді пайдалану мен медициналық қызметтерді сапалы көрсетуге мүмкіндік береді. Зерттеу нәтижелері аурухана басшылығына өз бөлімдерінің тиімділігін арттыру үшін нақты қадамдар жасауды ұсынады, бұл жалпы денсаулық сақтау жүйесінің өнімділігін жоғарылатуға септігін тигізеді.

Түйін сөздер: денсаулық сақтау ұйымдары, менеджмент, тиімділік, ресурстарды пайдалану, бәсекелестік, шығындар, DEA әдісі, салыстырмалы тиімділік анализі, медициналық қызметтер.

ОЦЕНКА И АНАЛИЗ ЭФФЕКТИВНОСТИ УПРАВЛЕНИЯ ОРГАНИЗАЦИЯМИ ЗДРАВООХРАНЕНИЯ

[1]Д.Н. Келесбаев✉, [1]А.А. Құралбаев, [1]Б.Ж. Кенешбаев, [1]Г.Р. Момбекова, [2]А.А. Муталиева

[1]Университет Ахмеда Ясави, Туркестан, Казахстан,
[2]Региональный инновационный университет, Шымкент, Казахстан,
e-mail: dinmukhamed.kelesbayev@ayu.edu.kz

В данной научной работе, подготовленной в этом направлении, рассмотрены проблемы эффективного использования ресурсов больниц с целью повышения эффективности деятельности организаций здравоохранения. Растущая конкуренция и рост затрат в сфере здравоохранения вынуждают больницы оптимизировать свою деятельность. Метод DEA (анализ оболочки данных) используется для измерения уровня эффективности больниц. Этот метод помогает руководителям больниц выявлять неэффективные отделения и учиться более эффективно использовать ресурсы. Основная цель научно-исследовательской работы – провести сравнительный анализ эффективности в 11 отделениях стационарной помощи на основе данных Туркестанской городской центральной больницы за 2023 год. В результате исследования были выявлены эффективные и неэффективные подразделения, а также разработаны рекомендации по оптимизации ресурсов. Информация, полученная в ходе исследования, позволяет руководству больницы эффективно использовать ресурсы, выделяемые государством, и предоставлять качественные медицинские услуги. Результаты исследования рекомендуют руководству больниц предпринять конкретные шаги по повышению эффективности работы своих отделений, что будет способствовать повышению продуктивности всей системы здравоохранения.

Ключевые слова: организации здравоохранения, менеджмент, эффективность, использование ресурсов, конкуренция, затраты, метод DEA, сравнительный анализ эффективности, медицинские услуги.

Introduction. Today, hospitals, which are considered healthcare organizations, are the most important providers of healthcare services. The continuous continuation of private hospitals depends, first of all, on the provision of treatment and other necessary services at low costs and with maximum efficiency, while public hospitals depend on the efficient use of resources, without wasting public resources. Therefore, the efficient use of resources directly affects the productivity and success of hospitals, as in any enterprise. In this context, concepts such as efficiency and productivity play a very important role in the work of healthcare organizations. Measuring the concept of efficiency provides important information for the organizations in question in terms of their situation in their sectors, as well as for preparing reports on the current state, status and what issues need to be worked on more. For all these reasons, conducting an analysis of efficiency and productivity in healthcare organizations over a certain period of time will undoubtedly bring various advantages and important information.

The effectiveness of healthcare management is largely determined by ensuring consistency in management [1]. The new conditions of the healthcare system impose different requirements on the management capacity, its functions and responsibilities should be significantly expanded. In addition, it is important to note that the activity of the management mechanism should be achieved by providing a set of measures that contribute to the formation, use and development of human resources [2]. Since competition in the provision of medical services is increasing day by day, and the costs of the industry are rapidly increasing, healthcare organizations, which are the core of this industry, are directing their resources to more efficient and effective use. For these reasons, all hospitals should measure their efficiency levels, identify and determine what needs to be done to increase or decrease resources to the most effective level.

However, efficiency and productivity measurement methods provide important information that determines how well inputs are used to achieve target outcomes. Data Envelopment Analysis (DEA) offers many possibilities when methods such as parametric methods and relational analysis are not sufficient, especially when measuring multiple inputs and outputs [3]. DEA allows for the analysis of the relationship between different inputs and

outputs and is very useful in cases where this relationship cannot be explained functionally [4].

The purpose of the work prepared in this context is to determine the efficiency of management of healthcare organizations with inpatient services in the city of Turkestan using the DEA method and conduct a comparative efficiency analysis. The results of the analysis obtained are intended to identify effective and ineffective healthcare organizations, indicate which resources should be increased or decreased for ineffective healthcare organizations, and share recommendations with the organization' s management to improve their efficiency.

Materials and methods. When considering the effectiveness of healthcare organizations, it is important to distinguish between public and private organizations in terms of the consistency of the results obtained. Since public healthcare organizations are non-profit organizations, they should be evaluated in terms of the quality and efficiency of the services they provide, while private healthcare organizations should be evaluated in the context of the efficient and productive use of profits and financial resources to ensure the continuity of their work [5]. When assessing at the organizational level, the management of healthcare organizations, that is, management, is the main department responsible for the results. Since the management defines the policies, goals, strategies of the institution, implements them and evaluates the results, the success of the organization is directly proportional to the quality of their performance [6]. Performance management is the collection of timely and forward-looking information about the organization in order to guide the organization towards its goals and the implementation of necessary measures aimed at improving performance in the light of the information collected [7].

Nowadays, the increasing competition in the provision of healthcare services and the rapid increase in costs are pushing hospitals, which are considered the main organizations in the healthcare sector, to use their resources more efficiently and productively [8]. For these reasons, hospitals need to measure their efficiency levels, identify inefficient departments, determine the amount of income/expenditure that needs to be increased or decreased, and know what to do to achieve the most efficient level.

Most of the health services in our country are provided by hospitals. Therefore, various factors affect the efficiency or inefficiency of hospitals, which are the locomotives of health services. Analyzing data using the DEA method and thereby determining the level of efficiency of hospitals provides important indicators for hospital managers [9]. Hospital managers can focus on low-efficiency departments based on the indicators of the analysis results. The reason for the failure to take various measures aimed at maximizing the output from existing revenues is that organizations providing health services are not managed by modern management methods [10]. From this point of view, it can be assumed that the failure of hospitals to achieve the intended level of efficiency is due to the insufficient functioning of the control mechanism. Therefore, it is necessary to identify the factors that reduce the qualitative and quantitative values of health services through various methodologies and analyzes, and develop various measures to increase efficiency. Thus, it is possible to provide high-quality medical services to the public by ensuring efficiency and productivity.

In this regard, the purpose of this research work is to conduct a comparative efficiency analysis with the DEA method in 11 departments of the Turkestan City Central Hospital, which, according to 2023 data, have inpatient services and can provide the necessary data for the DEA method, which was determined as a research method. The DEAP 2.1. program was used during the analysis. The research work prepared in this direction is a written study of the retrospective research type. Therefore, during this study, an approbation was conducted in the Turkestan City Central Hospital and 11 departments affiliated to it and the data for 2023 were taken as a basis. The capacity of the hospital, which was the basis for this study, is 403 beds; 159 of the beds are used for surgery, 202 for therapy, and 42 for life support services. The hospital employs 178 doctors,

including 14 general practitioners, 36 assistant physicians, 128 specialist physicians, and a total of 397 healthcare workers, including 64 midwives, 309 nurses, and 24 laboratory technicians.

In this regard, the set and sample of the research work are determined as follows:

The Turkestan City Central Hospital is the set (base mass) of the research work. As a sample (sample group) of the research work, 11 departments (DMD-Decision-making departments) of this hospital that have inpatient services and produce similar results using similar inputs were taken. They are:

- Neurosurgery
- Pediatric Surgery
- General Surgery
- Ophthalmology
- Obstetrics and Gynecology
- Thoracic Surgery
- Cardiac Surgery
- Otorhinolaryngology
- Orthopedics and Traumatology
- Plastic Surgery
- Urology

Table 1 - Technical efficiency results based on a constant income assumption according to the measurement scale

N	Name of the department	Technical efficiency result
1	Neurosurgery	0,773
2	Pediatric Surgery	0,653
3	General Surgery	0,723
4	Ophthalmology	1,000
5	Obstetrics and Gynecology	1,000
6	Thoracic Surgery	0,355
7	Cardiac Surgery	0,602
8	Otorhinolaryngology	1,000
9	Orthopedics and Traumatology	0643
10	Plastic Surgery	1,000
11	Urology	0,895
Average value		0,786

Note – Compiled by the authors

According to the DEA method, which is defined as a research method, if the number of inputs is determined as m and the number of outputs is determined as p, the number of DMDs must be at least m + p + 1 for the analysis to yield results. The study of the work and services provided by healthcare organizations is mainly focused on the use of hospital resources. This research work is also aimed at the efficient use of resources. Therefore, in this study, 2 inputs and 3 outputs were selected according to the nature of the HSEs and the available data. They are:

- 2 inputs:
- Number of doctors.
- Number of beds.
- 3 outputs:
- Number of treatments.
- Number of surgeries.
- Number of discharges.

The annual average of the analyzed inputs was taken and the total of the outputs was estimated. In short, managers (leaders) in hospitals and similar healthcare organizations have the

competence and authority to manage and control not only the organization' s outputs (products), but also its revenues. Within this logic, the model created during the research work is income-oriented (minimum income-maximum expenditure) and is designed in such a way that it provides a fixed and variable income result according to the measurement scale.

Results and discussion. Managers in hospitals and similar healthcare organizations have the authority to manage, direct, and control not only the organization' s output but also its revenues. Within this logic, the model in this study is designed to be revenue-oriented (minimum revenue, maximum expense), with fixed and variable revenue outcomes according to the measurement scale. First, the tables and their explanations are presented based on the fixed revenue forecast according to the measurement scale, and then on the variable revenue forecast according to the measurement scale.

As shown in Table 1, out of 11 departments identified as DMD, only 4 (ophthalmology, obstetrics and gynecology, otorhinolaryngology, plastic surgery) were found to be fully efficient. Based on this result, it can be said that this hospital is not operating with high efficiency. On the other hand, it can be seen that the efficiency level of the remaining departments, except for urology and the 4 fully efficient departments, is lower than the average efficiency value.

When examining the departments one by one, the differences between the input and output components and the target values and the departments that are exemplary for them are shown in Table 2.

Table 2 – Consistent income according to the measurement scale: exemplary departments

Neurosurgery	Exemplary section	Plastic Surgery	Ophthalmology	Obstetrics and gynecology	
	Lambda value	1,439	0,139	0,087	
Pediatric Surgery	Exemplary section	Ophthalmology	Obstetrics and gynecology		
	Lambda value	0,060	0,044		
General Surgery	Exemplary section	Plastic Surgery	Obstetrics and gynecology		
	Lambda value	1,377	0,466		
Ophthalmology	Exemplary section	Ophthalmology			
	Lambda value	1,000			
Obstetrics and gynecology	Exemplary section	Obstetrics and gynecology			
	Lambda value	1,000			
Breast surgery	Exemplary section	Obstetrics and gynecology			
	Lambda value	0,036			
Otorhinolaryn-gology	Exemplary section	Obstetrics and gynecology			
	Lambda value	0,219			

Orthopedics and Traumatology	Exemplary section	Plastic Surgery	Otorhinolaryn-gology	Obstetrics and gynecology	Ophthalmology
	Lambda value	0,388	0,345	0,288	0,270
Plastic Surgery	Exemplary section	Plastic Surgery			
	Lambda value	1,000			
Urology	Exemplary section	Obstetrics and gynecology	Plastic Surgery	Otorhinolaryn-gology	
	Lambda value	0,171	0,381	0,400	
Cardiac surgery	Exemplary section	Obstetrics and gynecology			
	Lambda value	0,219			

Note – Compiled by the authors

Table 3 - Comparative results of fixed, variable income and overall efficiency according to the measurement scale

N	Name of the department	CRS: Constant Income According to the Measurement Scale	VRS: Variable Remuneration Scale	Overall measurement efficiency
1	Neurosurgery	0,773	0,786	0,983(drs)
2	Pediatric Surgery	0,653	1,000	0,653(irs)
3	General Surgery	0,723	0,874	0,827(drs)
4	Ophthalmology	1,000	1,000	1,000
5	Obstetrics and Gynecology	1,000	1,000	1,000
6	Thoracic Surgery	0,355	1,000	0,355(irs)
7	Cardiac Surgery	0,602	0,632	0,952(irs)
8	Otorhinolaryngology	1,000	1,000	1,000
9	Orthopedics and Traumatology	0643	0,664	0,968(drs)
10	Plastic Surgery	1,000	1,000	1,000
11	Urology	0,895	0,899	0,996(irs)
Average value		0,786	0,896	0,885

Note – Compiled by the authors

As shown in Table 2, the departments of ophthalmology, obstetrics and gynecology, otorhinolaryngology, and plastic surgery are exemplary departments for inefficient departments. Since the 4 departments with the highest overall efficiency have a lambda value of 1, no exemplary departments have been identified for them. To give an example here, according to the data in the table, the departments that are exemplary for the neurosurgery department are: the plastic surgery department with the first lambda value of 1.439, ophthalmology with the second lambda

value of 0.139, and obstetrics and gynecology with the third lambda value of 0.087. Based on these exemplary departments and their lambda values, a formula indicating what revenues the neurosurgery department should have to be efficient was determined using the number of revenues in the departments and lambda values, and is shown below.

- Target income = [(5; 1) x 1.439] + [(20; 11) x 0.087] + [(8; 5) x 0.139] = (10.046; 3.091).

As mentioned in the "Materials and methods" section of the study, overall efficiency is the sum of technical efficiency and measurement efficiency. For this reason, it is necessary to consider technical and measurement efficiency separately in the analysis. Table 3 shows the CRS score for overall efficiency, the VRS score for technical efficiency and the measurement efficiency scores for the departments together.

When Table 3 above is examined in detail, the CRS values of the 11 departments whose efficiency was analyzed are the same as the CRS values presented in Table 1. As mentioned earlier, CRS values are a measure of overall efficiency for departments. However, the VRS values presented in Table 3 provide technical efficiency results based on variable success predictions according to the measurement scale. According to these results, the departments of ophthalmology, obstetrics and gynecology, otorhinolaryngology, and plastic surgery were also determined to be technically efficient as determined by CRS values. In addition, the departments of thoracic surgery and pediatric surgery, although having the lowest overall efficiency, had the highest score in technical efficiency. When these departments were evaluated in terms of measurement efficiency, while the departments of neurosurgery, general surgery, orthopedics, and traumatology had decreasing success according to the measurement scale, the departments of pediatric surgery, thoracic surgery, cardiac surgery, and urology had increasing success according to the measurement scale.

Table 4 - Variable income according to the measurement scale: sample sections

Neurosurgery	Exemplary section	Plastic Surgery	Ophthalmology	Obstetrics and gynecology	
	Lambda value	0,661	0,208	0,131	
Pediatric Surgery	Exemplary section	Pediatric Surgery			
	Lambda value	1,000			
General Surgery	Exemplary section	Plastic Surgery	Obstetrics and gynecology	Otorhinolaryn-gology	
	Lambda value	0,290	0,473	0,237	
Ophthalmology	Exemplary section	Ophthalmology			
	Lambda value	1,000			
Obstetrics and gynecology	Exemplary section	Obstetrics and gynecology			
	Lambda value	1,000			
Breast surgery	Exemplary section	Obstetrics and gynecology			
	Lambda value	1,000			

Otorhinolaryn-gology	Exemplary section	Obstetrics and gynecology			
	Lambda value	1,000			
Orthopedics and Traumatology	Exemplary section	Plastic Surgery	Otorhinolaryn-gology	Obstetrics and gynecology	Ophthalmology
	Lambda value	0,066	0,416	0,303	0,215
Plastic Surgery	Exemplary section	Plastic Surgery			
	Lambda value	1,000			
Urology	Exemplary section	Obstetrics and gynecology	Plastic Surgery	Otorhinolaryn-gology	Pediatric Surgery
	Lambda value	0,169	0,391	0,395	0,045
Cardiac surgery	Exemplary section	Obstetrics and gynecology	Plastic Surgery		
	Lambda value	0,153	0,847		

Note – Compiled by the authors

As shown in Table 4, the departments of plastic surgery, obstetrics and gynecology, ophthalmology, otorhinolaryngology, pediatrics, and thoracic surgery are exemplary departments for inefficient departments. Since the 6 departments with the highest overall efficiency have a lambda value of 1, no exemplary departments have been identified for them. To give an example here, according to the data in the table, the departments that are exemplary for the neurosurgery department are: plastic surgery with a lambda value of 0.661 in the first place, ophthalmology with a lambda value of 0.208 in the second place, and obstetrics and gynecology with a lambda value of 0.131 in the third place. It is important to note here that the study is input-oriented and cannot participate in output.

Conclusions. In general, this study conducted an efficiency analysis of 11 departments of the Turkestan City Central Hospital and evaluated their conditions, with varying results. While there are many studies in the literature that use DEA to analyze groups of private and public hospitals and their health centers, there are very few studies that analyze and evaluate departments and clinics within a single hospital. In addition, there are few studies that use similar inputs and outputs to those used in this study.

According to the results of the analysis of the 11 departments considered in this study, the departments of ophthalmology, obstetrics and gynecology, otorhinolaryngology, and plastic surgery were found to be fully inefficient based on the CRS forecast. And according to the fixed income forecast according to the measurement scale, only about 36% of these departments were recognized as fully efficient. Based on the VRS forecast, the departments of pediatric surgery, ophthalmology, obstetrics and gynecology, otorhinolaryngology, and plastic surgery were technically efficient. And according to the variable income forecast according to the measurement scale, about 55% of these departments were considered technically efficient. The greater efficiency of departments according to the VRS forecast compared to the results obtained under the CRS forecast is due to the greater flexibility of the VRS forecast and the positive effect on efficiency through the use of variable income. An important point to note in the analysis results is the need to reduce the number of doctors and beds in all departments recognized as inefficient. This situation indicates that inefficient departments use human

resources and physical capabilities inefficiently and unproductively.

In this regard, based on the data obtained from the study, the following recommendations are made on improving efficiency in relation to low efficiency and highlighting the importance of efficiency:

- Since the results of the DEA method show the relative efficiency between departments, inefficient departments should be taken as a basis for model departments.

- The excess and empty number of doctors and beds in all inefficient departments should be reorganized, human resources and physical capabilities should be reorganized.

- In order to effectively use human resources and physical capabilities, the relevant department needs excellent managers who can measure and evaluate efficiency and effectiveness.

- Inefficient departments should work directly with departments that need excess and empty resources and share these resources.

- The principles of efficiency and productivity should be given special importance in the management of healthcare organizations.

- Hospitals that use the bulk of the allocated resources in the healthcare sector should conduct more efficiency and productivity analyses.

- Hospital management should use the results of the efficiency and productivity analysis as a roadmap and allocate resources in accordance with these analyses.

- In the course of efficiency analyses, it is necessary to achieve a wide range of results by using various inputs and outputs.

In conclusion, all these recommendations indicate ways to effectively use scarce resources. Therefore, we believe that this research work conducted at the Turkestan City Central Hospital will be useful in terms of effective use of resources, consistent quality provision of health services, and most importantly, ”doing the right thing well.”

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Information about the authors

Kelesbayev D.N. - PhD, Professor, Akhmet Yassawi University, Turkestan, Kazakhstan, e-mail: dinmukhamed.kelesbayev@ayu.edu.kz;

Kuralbayev A.A. - PhD, Senior Lecturer, Akhmet Yassawi University, Turkestan, Kazakhstan, e-mail: almas.kuralbayev@ayu.edu.kz;

Keneshbayev B.Zh. - PhD, Senior Lecturer, Akhmet Yassawi University, Turkestan, Kazakhstan, e-mail: keneshbayev_bektur@ayu.edu.kz;

Mombekova G.R. - PhD, Associate Professor, Akhmet Yassawi University, Turkestan, Kazakhstan, e-mail: gulmira.mombekova@ayu.edu.kz;

Mutaliyeva A.A. - PhD, Senior Lecturer, Regional Innovation University, Shymkent, Kazakhstan, e-mail: Alua012@mail.ru.

Сведения об авторах

Келесбаев Д.Н. - PhD, профессор, Университет Ахмеда Ясави, Туркестан, Казахстан, e-mail: dinmukhamed.kelesbayev@ayu.edu.kz;

Куралбаев А.А. - PhD, Старший преподаватель, Университет Ахмеда Ясави, Туркестан, Казахстан, e-mail: almas.kuralbayev@ayu.edu.kz;

Кенешбаев Б.Ж. - PhD, Старший преподаватель, Университет Ахмеда Ясави, Туркестан, Казахстан, e-mail: keneshbayev_bektur@ayu.edu.k;

Момбекова Г.Р. - PhD, доцент, Университет Ахмеда Ясави, Туркестан, Казахстан, e-mail: gulmira.mombekova@ayu.edu.kz;

Муталиева А.А. - PhD, Старший преподаватель, Региональный инновационный университет, Шымкент, Казахстан, e-mail: Alua012@mail.ru.