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Analysis of performance indicators of the St. Joasaph Belgorod Regional Clinical Hospital

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Abstract. One of the most important indicators of population health is its morbidity rate, and the goal of any healthcare system is to improve public health. Assessing the performance of a healthcare facility plays a key role in its management and can significantly impact its effectiveness and the achievement of better outcomes. The aim of our study was to analyze the performance indicators of the St. Joasaph Belgorod Regional Clinical Hospital for 2022-2024. The analysis of the facility's performance indicators was conducted using statistical forms No. 14 and No. 30.

Our study revealed a decrease in the number of patients admitted for emergency care and hospital bed utilization. Diseases of the circulatory system were the leading causes of hospitalizations and mortality. The number of surgeries using high medical technologies increased by 20.23%. The top five surgeries are: heart surgery (100%), kidney and ureter surgery (42.8%), nervous system surgery (35.04%), vascular surgery (27.9%), and musculoskeletal surgery (27.54%).

The study resulted in a breakdown of postoperative mortality rates, with the leading mortality rates following vascular surgery, abdominal surgery, and heart surgery.

Keywords: analysis, indicators, medical institution, morbidity, mortality, structure

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One of the most important indicators of population health is its morbidity rate [1], and the goal of the healthcare system is to improve [2] and ensure its health [3] by reducing mortality and increasing life expectancy [2]. Based on this, demands are growing for improving the quality of medical care, its coverage, and its results [4]. This is possible by providing all citizens, regardless of place of residence, with accessible primary [5], highly qualified [3], and high-tech medical care [4].

To achieve these goals, a comprehensive public health strategy has been developed, and a culture of health promotion and disease prevention has been developed [2]. Thus, Pogonin A.V. et al. [6] believe that at present, the most effective method of providing medical care to the population is its preferential provision in a hospital setting. According to Zakharova D.A. et al. [5], in the Russian Federation, medical care is provided to the population, regardless of place of residence, through a three-tier system, which ensures its timeliness.

It should also be noted that assessing the availability and effectiveness of a medical institution plays a key role in its management and can affect its performance [6].

The purpose of our study is to analyze the performance indicators of the Belgorod Regional Clinical Hospital of St. Joasaph for 2022-2024.

Materials and methods. To achieve this objective, we conducted a retrospective study using a continuous method. The data source was statistical forms No. 14, "Information on the Activities of Departments of a Medical Organization Providing Inpatient Care," and No. 30, "Information on the Medical Organization," for 2022-2024. The data was collected from the Belgorod Regional Clinical Hospital of St. Joasaph, a state-funded healthcare institution. Our study calculated bed performance indicators such as turnover, average annual occupancy, and average length of stay, as well as selected qualitative indicators such as mortality and patient care in surgical departments. Statistical hypotheses were not tested in the study, and the analysis was based on descriptive statistics.

The study is limited by the use of aggregated reporting data and the lack of individual clinical information, which limits the possibility of causal interpretation of the results obtained.

The Belgorod Regional Clinical Hospital of St. Joasaph was established in 1954 by order of the regional Council of People's Deputies. It began operations with 250 beds and 200 medical workers (75 doctors and 125 mid-level medical personnel).

Currently, this hospital provides highly qualified specialized, including high-tech medical care.

The Belgorod Regional Clinical Hospital of St. Joasaph, 2,129 medical workers are employed, including 648 doctors and 1,481 mid-level medical personnel. In turn, 511 doctors (78.85%) and 984 (66.44%) mid-level medical workers have qualification categories. The 24-hour hospital has 1,643 beds and provides medical care in surgical, therapeutic, and obstetric-gynecological directions.

At the first stage of our study, we examined the dynamics of patients discharge rates and the efficiency of hospital beds of the Belgorod Regional Clinical Hospital of St. Joasaph during the study period (Table 1).

As we can see from Table 1, the dynamics of indicators of discharged patients has a multidirectional value. Thus, in 2024, compared to 2023 and 2022, the number of discharged patients decreased by 1,485 and 209 people, respectively. Also, in 2024, the number of patients admitted for emergency purposes decreased by 33.62% and 33.81% (in absolute figures, 6,734 and 6,677 people) and the number of discharged patients decreased by 16,592 and 10,091 bed days, respectively. The death rate for the study

period at the Belgorod Regional Clinical Hospital of St. Joasaph had the lowest value in 2023, while in 2022 it exceeded it by 25.78%, and in 2024 by 12.89%. The hospital mortality rate reflects the quality and effectiveness of treatment. In 2022, this figure was 0.90%, in 2023 – 0.65%, and in 2024 – 0.77%, suggesting its effectiveness.

It should be noted that the highest number of patients transported by ambulance was observed in 2023, with a 4.26-fold decrease in 2022 and a 1.05-fold decrease in 2024, respectively. This increase is due to the creation of an extensive network of ambulance stations (substations) in the region, with a service radius within the city and rural areas of no more than 10 and 30 km, respectively [7].

The average number of days of bed occupancy in 2022 was 210.4, in 2023 – 214.4 and in 2024 – 204.3. Consequently, in 2024 the average bed occupancy is 2.89% lower than in 2022 and 4.71% lower than in 2023. For 2022-2024, bed turnover (persons) did not undergo significant changes, thus, it was 29.7, 30.5 and 29.6 beds/day, respectively.

The average length of stay provides an opportunity to assess both the organization and quality of inpatient care. In 2022, this indicator was 7.07 days, in 2023 – 7.02 days, and in 2024 – 6.9 days. Thus, in 2024, it decreased by 2.54% and 1.85%, respectively, compared to previous years in the study period. We hypothesize that the reduction in average length of stay is due to the introduction of effective

Table 1

Dynamics of indicators of discharged patients (18 years and older) of the Belgorod Regional Clinical Hospital of St. Joasaph

Year	Discharged patients (18 years and older)			Spent discharged bed days	Average annual number of beds	Died
	Total (people)	of which: delivered for emergency reasons	of which: delivered by ambulance			
2022	48882	19860	952	345793	1643	446
2023	50158	19917	4062	352294	1643	331
2024	48673	13183	3843	335702	1643	380

tive technologies for both diagnostics and treatment, including high-tech ones. Furthermore, to improve the quality of treatment, regular telemedicine consultations with leading specialists from federal medical centers are conducted. Consequently, the reduction in average length of stay contributes to a decrease in the average annual bed occupancy.

Since a comprehensive assessment of population health includes both the structure and incidence of disease, in the next step, we examined the quality of medical care indicator, namely, the structure of adult patients (aged 18 and over) hospitalized for illness at the Belgorod Regional Clinical Hospital of St. Joasaph (Fig. 1). These data provide information on the prevalence of specific diseases among the population.

When analyzing the structure of hospitalizations by disease, it is noteworthy that minor changes are observed in the top ten leaders. Thus, in 2022-2024, three classes of diseases consistently occupied the first place: pregnancy,

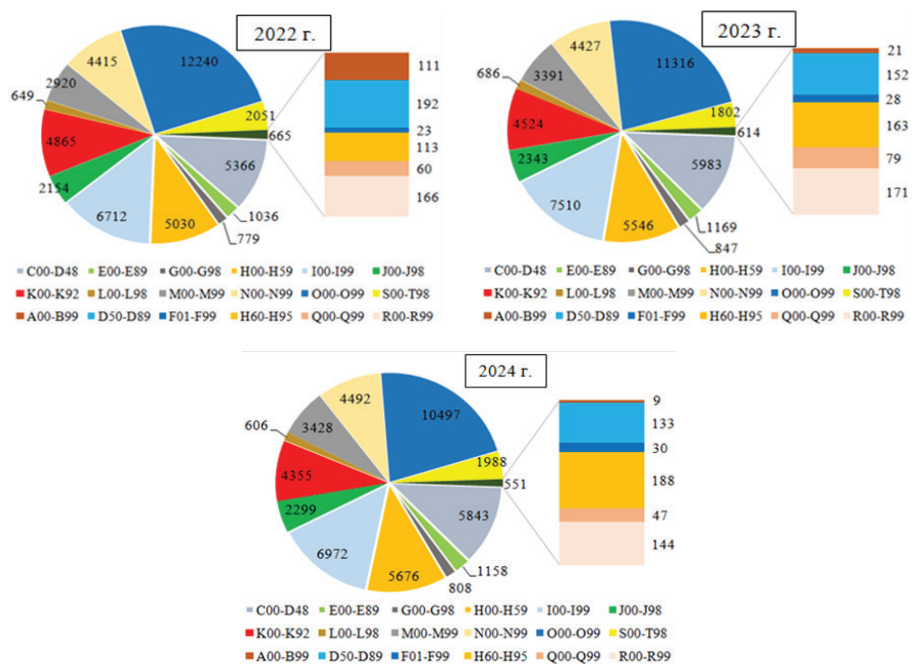


Fig. 1. Structure of adult patients (18 years and older) hospitalized due to illness at the Belgorod Regional Clinical Hospital of St. Joasaph (absolute number)

Table 2

Dynamics of the mortality rate for individual diseases (in absolute numbers and %)

Name of the disease	ICD-10 code	2022 г.		2023 г.		2024 г.	
		absolute number (people)	mortality (%)	absolute number (people)	mortality (%)	absolute number (people)	mortality (%)
some infectious and parasitic diseases	A00-B99	16	12.59	8	27.58	1	10
neoplasms	C00-D48	63	1.6	69	1.14	63	1.06
diseases of the blood. hematopoietic organs and certain disorders involving the immune mechanism	D50-D89	4	2.04	1	0.65		
endocrine system diseases. nutritional disorders and metabolic disorders	E00-E89	4	0.38	5	0.42	10	0.86
diseases of the nervous system	G00-G98	4	0.82			2	0.24
diseases of the eye and its adnexa	H00-H59					1	0.01
diseases of the ear and mastoid process	H60-H95	1	0.87			1	0.52
diseases of the circulatory system	I00-I99	213	3.07	156	2.03	191	2.66
respiratory diseases	J00-J98	7	0.32	4	0.17	10	0.43
diseases of the digestive system	K00-K92	83	1.67	52	1.13	49	1.11
diseases of the skin and subcutaneous tissue	(L00-L98)	2	0.30				
diseases of the musculoskeletal system and connective tissue	M00-M99	1	0.03	3	0.08	4	0.11
diseases of the genitourinary system	N00-N99	13	0.29	11	0.24	15	0.33
pregnancy. childbirth and the postpartum period	O00-O99	1	0.008				
congenital anomalies (developmental defects). deformations and chromosomal abnormalities	Q00-Q99			2	2.46		
injuries. poisoning and some other consequences of exposure to external causes	S00-T98	34	1.63	20	1.09	33	1.63

Table 3

Surgical work of the inpatient department of a medical organization

Name of operations	2024					2023					2022				
	Total (units)	HMT	% HMT	complications	died operated	Total (units)	HMT	% HMT	complications	died operated	Total (units)	HMT	% HMT	complications	died operated
Total, including	33786	6835	20,23	18	295	32675	5497	16,82	15	306	37729	5783	15,32	12	353
on the nervous system	953	334	35,04	1	23	886	293	33,06	3	11	913	287	31,43	2	22
on the endocrine system	151	4	2,64			196					204	7	3,43		
on the organ of vision	5647	996	17,63			5582	435	7,79			5105	856	16,76		
on the organs of the ear, throat, nose	1964	146	7,43		2	2310	151	6,53	1		2290	89	3,88		8
on the respiratory organs	218	4	1,83		14	189					239			1	21
on the heart	2440	2440	100		59	2267	2243	98,94	3	50	1970	1970	100	6	53
on vessels	1903	531	27,9	1	39	1974	446	22,59	2	121	4907	576	11,73	1	104
on the abdominal organs	5232	205	3,91	8	108	4262	228	5,34	3	75	5169	440	8,51		76
on the kidneys and ureters	1495	640	42,8		9	1231	484	39,31	2	6	1271	370	29,11	2	4
on the male genitals	739	133	17,99	1	2	582	47	8,07	1	1	512	3	0,58		4
on female genitals	3278	239	7,29			3305	233	7,04		2	3199	248	7,75		2
obstetric operations	3715					3891					5570				
on the musculoskeletal system	4190	1154	27,54	2	16	3978	928	23,32		8	4359	929	21,31		12
on the mammary gland	22					18					22				
on the skin and subcutaneous tissue	1450	1	0,06	5	18	1575				24	1517	2	0,13		45
on the mediastinum	54	8	14,81			18				1	28				2
on the esophagus	53				1	57				1	98				
on the lymphatic system	33				1	58					88	1	1,13		
other	249				1	296	9	3,04		6	267	5	1,87		

Note: HMT - surgeries using high medical technologies.

childbirth and the postpartum period (O00-O99) (25.03% - 2022, 22.56% - 2023 and 21.56% - 2024), diseases of the circulatory system (I00-I99) (10.97%, 11.92%, 12.0%), as well as diseases of the eye and its adnexa (H00-H59) (10.29%, 11.05%, 11.66%), respectively. The exception were the diseases that took fourth and fifth place. Thus, in fourth place in 2022 and 2023. In 2022 and 2023, diseases of the digestive system (K00-K92) were in fifth place (9.95%, 9.01%), and in 2024, diseases of the genitourinary system (N00-N99) were in fifth place (9.03%, 8.82%), and in 2024, diseases of the digestive system were in fifth place (8.84%, respectively).

Next, there were classes of diseases of the musculoskeletal system and connective tissue (M00-M99) (5.97%, 6.76%, 7.04%), respiratory organs (J00-J98) (4.4%, 4.67%, 4.72%), injuries, poisoning and some other consequences of exposure to external causes (S00-T98)

(4.19%, 3.59%, 4.08%), endocrine system, nutritional disorders and metabolic disorders (E00-E89) (2.11%, 2.33%, 2.37%) and nervous system (G00-G98) (1.59%, 1.68%, 1.66%), respectively.

When studying the dynamics of the mortality rate for individual diseases, it should be noted that diseases of the circulatory system lead in the structure by disease class (Table 2). This result is consistent with the data of studies by a number of authors [8, 9, 10]. In second place in 2023-2024 were neoplasms, which coincides with the data of the study by Valkov L.E. et al. [11], third place was occupied by diseases of the digestive system, fourth – by injuries, poisoning and some other consequences of exposure to external causes. Thus, diseases of the circulatory system are a factor that influences the structure of mortality in a hospital setting.

Next, as part of our study, we examined the indicators of the quality of med-

ical care provided to patients in surgical departments (Table 3).

As can be seen, over the entire study period, in 2024, there was a decrease in the number of operations in nine classes of diseases: endocrine system (2022 - 25.98%, 2023 - 22.95%), ear, throat, nose organs (14.23%, 14.97%), respiratory organs (8.78%, 15.34%), vessels (61.21%, 3.59%), obstetric operations (33.3%, 4.52%), musculoskeletal system (3.87%), skin and subcutaneous tissue (4.41%, 7.93%), esophagus (45.91%, 7.01%), lymphatic system (62.5%, 43.1%), respectively. At the same time, the number of operations in eight classes of diseases increased. Thus, on the nervous system (2022 - 4.38%, 2023 - 7.56%), the organ of vision (10.61%, 1.16%), the heart (23.85%, 7.63%), the abdominal organs (1.21%, 22.75%), the kidneys and ureters (17.62%, 21.44%), the male genital organs (44.33%, 26.97%), the mediastinum (92.85%, 300%), respectively.

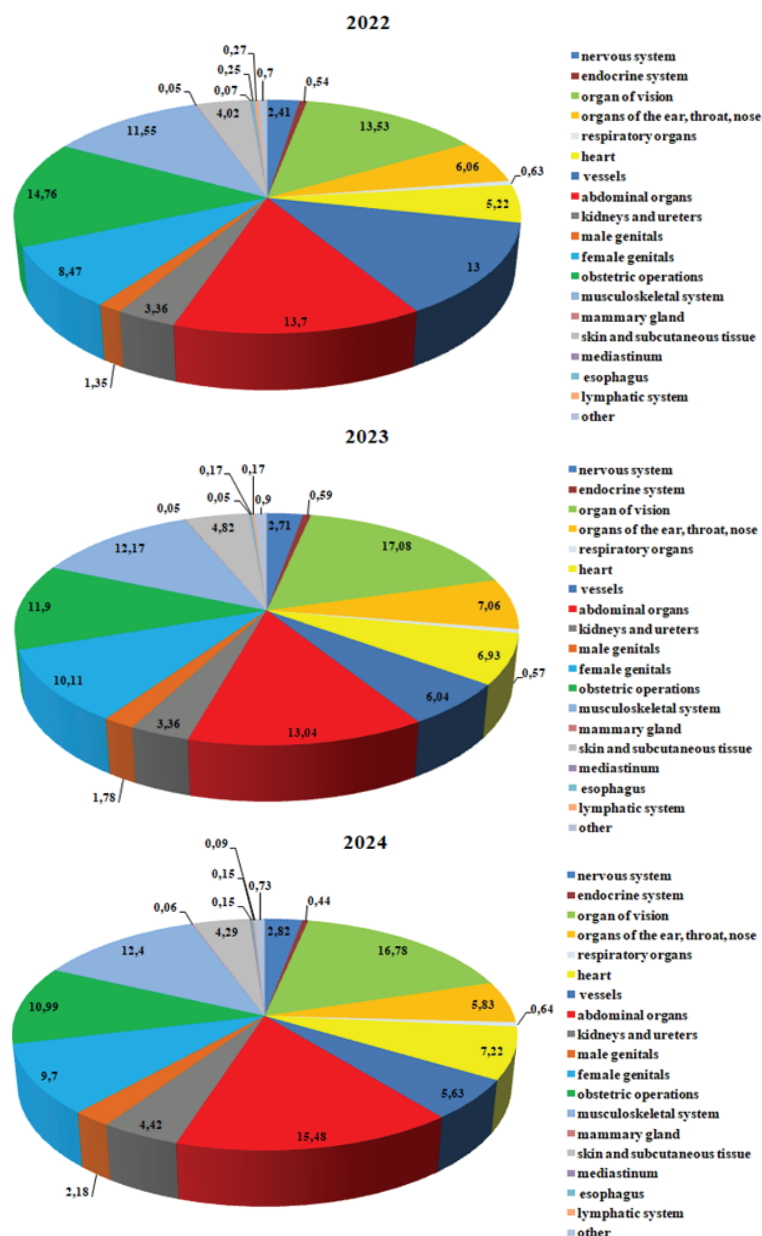


Fig. 2. The structure of surgical interventions for the analyzed period

It's worth noting that the number of surgeries using high medical technologies increased in 2024 to 20.23%, across 11 licensed specialties. The top five surgeries were: heart surgery (100%), kidney and ureter surgery (42.8%), nervous system surgery (35.04%), vascular surgery (27.9%), and musculoskeletal surgery (27.54%).

The top three surgical procedures by number of procedures are eye surgeries (in two departments of the medical ophthalmology center), followed by abdominal surgeries, and third place goes to musculoskeletal procedures, which include total joint replacements of large joints (knees and hips). We believe the increase in surgical procedures was made possible by the creation of a unified

registry of patients in the region requiring high-tech surgeries.

We next studied the incidence of postoperative complications. A slight negative trend was observed over the study period. Thus, postoperative complications were observed in 0.03% of cases in 2022, 2023 – 0.04%, and 2024 – 0.05%. Overall postoperative mortality was 0.93% in 2022, 2023 – 0.93%, and 2024 – 0.87%.

As a result of the study, the structure of postoperative mortality was formed. As can be seen from the data in table 3, the structure changed insignificantly in 2022–2024. The leading positions, both in 2022 and 2023, are occupied by mortality after vascular surgery (29.46% and 39.54%, respectively), and in 2024 – on abdominal organs (36.61%). Next in 2022 and

2023 are surgeries on abdominal organs (21.52% and 24.5%, respectively), and in 2024 on the heart – 20%. Mortality after heart surgery rounds out the top three in 2022 and 2023 (15.01% and 16.3%, respectively), and in 2024 on vessels – 13.35%.

The study's results suggest that the identified changes in the performance indicators of the Belgorod Regional Clinical Hospital of St. Joasaph are related to changes in patient routing and its strict adherence, as well as the introduction of effective medical and organizational measures in the treatment and diagnostic process, based on a three-tier system of providing care to the population.

Also, due to increased funding from the regional and federal budgets and the acquisition of additional equipment, it was possible to improve the performance of high-tech medical care.

Conclusion. The analysis revealed a decrease in the number of patients admitted for emergency treatment. Diseases of the circulatory system led the way in hospitalizations and mortality. The number of high-tech surgeries increased by 20.23%. The top five surgeries were: heart surgery (100%), kidney and ureter surgery (42.8%), nervous system surgery (35.04%), vascular surgery (27.9%), and musculoskeletal surgery (27.54%).

The study also established a breakdown of postoperative mortality, with the leading mortality rates following vascular, abdominal, and cardiac surgery.

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