Research Article
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The Analysis of the Main Working Parameters of the Head Regional Vascular Center of N.V. Sklifosovsky Research Institute for Emergency Medicine

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INTRODUCTION The regional vascular centers (RVC) network was created throughout Russia to manage cardiovascular diseases. On the basis of N.V. Sklifosovsky Research Institute for Emergency Medicine in Moscow, a center was created, which received the status of the head RVC. A comprehensive analysis of its work has not yet been carried out.

AIM OF STUDY To assess the main performance indicators and development directions of the head RVC based on the analysis of data for 2012–2019.

RESULTS Analysis of the data obtained showed that by 2019 the flow of patient admissions increased 2.3-fold. At the same time, the use of the hospital bed fund does not exceed 100%, and the use of the intensive care bed fund has increased to 123%. A significant proportion of patients come with not field-specific diagnosis. The mortality, which is the main indicator of the quality of treatment in patients treated at the RVC, remained within 2.33–3%, which turned out to be 3 times lower in similar patients treated in other departments of the Institute.

DISCUSSION Against the background of a constant increase in the number of hospitalizations, resuscitation provision turned out to be insufficient when the number of hospital beds corre-sponded to the flow of admissions. The general lack of intensive care beds in the center and the lack of specialized intensive care for the department of vascular surgery forces the use of other intensive care units of the Institute. The admission of patients with other (not specific for RVC) diagnosis to the vascular center reduces the volume of highly specialized care for specialized patients.

CONCLUSION The analysis of the performance indicators of the head regional vascular center on the basis of N.V. Sklifosovsky Research Institute for Emergency Medicine, identified the need to expand the resuscitation bed fund in the existing departments of the center and organize specialized resuscitation for patients of the vascular surgery department. Also, the lack of intensive care beds is aggravated by a large flow of non-core admissions. Their reduction with the existing structure will provide significant savings in resources and will increase the number of treated profile patients and improve the quality of highly specialized care.

Keywords: regional vascular center, cardiovascular diseases, resuscitation provision

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ICD-10 – International Classification of Diseases, Tenth Revision
MPI – medical and prophylactic institution
PVD – primary vascular department
RVC – Regional Vascular Center
CVDs – cardiovascular diseases
EM – emergency medicine

INTRODUCTION

According to the World Health Organization, cardiovascular diseases (CVDs) remain the leading cause of death worldwide. According to Rosstat, 841,207 people died from circulatory system diseases in Russia in 2019, which amounted to 57.23% of the total number of deaths.

In the structure of hospital admissions to the N.V. Sklifosovsky Research Institute for Emergency Medicine (the Institute) CVDs are one of the main reasons both for seeking care and high mortality. In 2017, the share of CVDs from all the causes for hospitalization was 22% and the second most significant after isolated injuries (26%). Among all the deaths, the proportion of vascular pathologies was 48%, patients with concomitant injuries, poisoning and burns with the total of 19% constituted the second most important group.

Since the share of vascular pathology in the structure of morbidity and mortality of the population is high, in 2007 a program was developed to reduce cardiovascular mortality. Subsequently, by the Russian Federation Government Decree No. 1012 dated December 29, 2007, the first 12 constituent entities of the Russian Federation were designated, in which organizational structures were created and measures were taken to implement this program [1]. In the wake of the first successful attempts to reduce cardiovascular mortality as a result of the implementation of the program in the pilot regions [2], by the order of the Ministry of Health of the Russian Federation, the concepts of regional vascular centers (RVCs) and primary vascular departments (PVDs) were introduced, and the main goals and the procedure for their work were outlined [3]. By 2014, all the constituent entities of the Russian Federation entered the Program "Preventing mortality and disability from vascular diseases of the brain in the Russian Federation". By 2016, the number of RVCs increased to 130, and the number of PVDs - to 416 in the Russian Federation [4]. According to the Ministry of Health of the Russian Federation, the total number of RVCs and PVDs was 609 by the end of 2018 [5].

By 2018, 12 RVCs and 15 PVDs were created in Moscow. By the order of the Moscow Healthcare Department No. 582 dated June 27, 2012 the RVC created on the basis of the Institute was entrusted to perform the functions of the Head RVC and coordinate the work of all the other centers, introduce new methods of diagnosis and treatment, hold conferences, etc.

The RVC on the basis of the Institute was opened in 2012. It included:

1. Clinical departments:

— Department of Vascular Surgery (60 beds);

— Department of Cardiology No. 3 for patients with acute myocardial infarction (34 beds);

— Neurosurgical Department No.1 for patients with vascular diseases of the brain (60 beds);

— Department of Neurology for patients with acute cerebrovascular accidents (30 beds). It was officially organized in 2012, but patient admission began in 2014.

2. Resuscitation departments:

— Neurosurgical resuscitation (18 beds);

— Intensive care unit for patients with heart attacks (6 beds);

— Intensive care unit for neurological patients (6 beds). It was officially organized in 2012, but patient admission began in 2014.

Before the opening of the Department of Neurology in 2012, there were 154 general ward beds, 24 intensive care beds. After the Department of Neurology opened, there were 184 general ward beds, and 30 intensive care beds. Resuscitation provision of the Vascular Center increased from 15.58% to 16.67%.

The Head RVC at the Institute has existed for 8 years, but during these years, a comprehensive analysis of its performance indicators in all the professional specializations has not been carried out.

Purpose: establishing a strategy for the further development of the Head RVC and improving the quality and efficiency of medical services.

Tasks: analyzing of the main performance indicators of the Vascular Center from the moment of its opening in 2012 through December 2019 in order to:

1. Reveal the nature and medical specialties of patient admission for each RVC's department.
2. Study the distribution of diagnoses of patients treated at the RVC for each department.
3. Evaluate the effectiveness of the departmental structure and the specialized bed fund of the RVC.
4. Determine the factors influencing the mortality rates of patients with CVDs.
5. Compare the treatment of CVDs at the RVC and in similar departments for vascular diseases.

MATERIALS AND METHODS

In order to analyze the Head RVC's performance we took data from the General Hospital Information System which functioned until 2018. Data for 2019 had to be taken from the Unified Medical Information and Analytical System at the stage of its implementation, which could affect the completeness of the obtained results. Information regarding in-hospital transfers was taken from the daily Patient Transfer Sheet. Information regarding treated patients was taken from statistical cards of hospital discharges provided by the Department of Medical Statistics. We also analyzed data from annual statistical forms No. 7 and annual reports with additionally calculated indicators. The information obtained was processed by standard means of mathematical statistics using R - a free software environment for statistical computing, as well as MATLAB - software package for solving technical computing problems.

RESULTS

1. ANALYSIS OF ADMISSIONS

During the period under review, 37,991 people were hospitalized by all departments of the Vascular Center of the Institute, including 12,027 people (31.66%) via emergency medicine (EM) sources; 11 613 people (30.57%) without medical referrals; 2,289 people (6.03%) with referrals from polyclinics by the B-2 B-1 sources; 1997 people (5.26%) transferred from other medical and prophylactic institutions (MPIs); 10,065 people (26.49%) through planned sources. 11,437 people (30%) were admitted directly to intensive care beds, 26,554 people (70%) were admitted to general ward beds.

The number of annual admissions increased from 2,945 in 2012 to 6,638 in 2019. Emergency admissions increased from 2,295 in 2012 to 4,289 in 2018 and decreased to 3,994 people in 2019. Planned admissions increased from 650 in 2012 to 2, 644 in 2019. At the same time, there was a decrease in the share of emergency admissions from 80.66 to 60.17% (Table 1).

Table 1

The number of hospitalizations to the departments of the regional vascular center by years and sources of admission

Sources of Admission	2012	2013	2014	2015	2016	2017	2018	2019	Grand Total
High-tech medical care *	1	5	11	12	311	400	760	–	1500
Department of Healthcare *	191	14	9	1	3	2	4	–	224
Plan	421	518	626	820	664	466	917	2525	6957
Chief medical officer's permission	6	43	34	55	77	99	119	40	473
Chief medical officer's permission - paid medical services	31	43	139	204	126	125	164	79	911
Total for planned sources	650	623	819	1092	1181	1092	1964	2644	10065
Without medical referrals	717	899	1115	1510	1640	1876	2034	1822	11613
Emergency medicine	998	1022	1257	1479	1809	1629	1692	2141	12027
Branch -2 Branch-1	274	311	340	384	364	329	256	31	2289
Transfer from other medical and prophylactic institutions*	306	367	244	181	296	296	307	–	1997
Total for emergency sources	2295	2599	2956	3554	4109	4130	4289	3994	27926
Grand Total	2945	3222	3775	4646	5290	5222	6253	6638	37991
Percentage of planned admissions	22,07%	19,34%	21,70%	23,50%	22,33%	20,91%	31,41%	39,83%	26,49%
Percentage of emergency admissions	77,93%	80,66%	78,30%	76,50%	77,67%	79,09%	68,59%	60,17%	73,51%

Note: * – these sources ways canceled by Order of the Moscow Health Department No. 56 dated 02.02.2017 and in 2019 were excluded from the list of sources of the Unified Medical Information and Analytical System

At the beginning of the period, those hospitalized to the Department of Vascular Surgery prevailed in the total number of admissions - 1,063 people (36% of all admissions), despite the fact that in the absence of the specialized intensive care unit, vascular surgical patients in critical condition are not taken into account here, since they were admitted in intensive care units that are not part of the structure of the Center.

They are followed by the Cardiology Department (987 people, 34% of all admissions) and the Neurosurgical Department (895 people, 30% of all admissions), taking into account hospitalizations in the corresponding intensive care units.

In 2014, the admission ratio changed. The number of cardiac patients increased and amounted to 1,206 people (32%), they are followed by vascular surgical patients - 1,196 people (31.68%) and neurosurgical patients - 800 people (21.2%). In 2019, the largest number of patients were admitted to the Neurosurgical Department and the Neurosurgical Resuscitation - 2,351 people (35%), then to the Department of Vascular Surgery (2,030 people) and to the Cardiology Department (1,437 people) (Table 2).

Table 1

The number of hospitalizations in the departments of the regional vascular center by years

	2012	2013	2014	2015	2016	2017	2018	2019	Grand Total
Neurosurgery	895	902	800	906	1240	1215	1858	2351	10 167
General ward	860	860	756	847	1084	1135	1735	2155	9432
ICU	35	42	44	59	156	80	123	196	735

Cardiology	987	1140	1206	1414	1400	1435	1494	1437	10 513
General ward	316	410	421	496	547	591	737	798	4316
ICU	671	730	785	918	853	844	757	639	6197
Neurology	0	0	573	1019	1173	894	953	820	5432
General ward	0	0	235	406	108	40	47	91	927
ICU	0	0	338	613	1065	854	906	729	4505
Vascular Surgery	1063	1180	1196	1307	1477	1678	1948	2030	11 879
Grand Total	2945	3222	3775	4646	5290	5222	6253	6638	37 991

During this period, the admission ratio changed again: vascular surgical patients - 36% / 31%, neurosurgical patients - 30% / 35%, cardiac patients - 34% / 22%. The proportion of neurology patients in 2019 amounted to 12% of all admissions.

2. ANALYSIS OF BED UTILIZATION

37,991 patients were initially admitted to the Vascular Center. Due to in-hospital transfers to the Center, 11,209 people were additionally hospitalized. As a result, the number of those treated for the entire period amounted to 49,200 people. 47,181 were discharged from the general wards, including those who passed away, and 2019 were released from the intensive care units. 1,049 people were transferred to other hospitals, of which from the general wards - 925, from the intensive care units - 124.

The number of people treated in the general ward beds increased from 3779 in 2012 to 7685 in 2019, in the intensive care beds - from 1392 in 2012 to 3807 in 2019. Over the entire period, 1871 people (2.6%) died, of which 81 (0.17%) in the general wards, 1790 (7.3%) in the specialized intensive care units.

For the entire period, the total number of bed-days was 573,103, and the mean bed-days - 8. The total number of general ward bed-days was 478 658 (the mean bed-day - 10), the total number of intensive care bed-days was 94 445 (the mean bed-day - 3.8).

The mean bed-day in the Center decreased from 11.83 to 6.4; in the departments, mean general ward bed-day - from 14 to 7.8, mean intensive care bed-day - from 5.7 to 3.5. The largest decrease occurred among neurosurgical patients - mean general ward bed-day - from 18 to 7.8, mean intensive care bed-day - from 10 to 3.8.

In the general wards, the average underload was 20 patients, in intensive care units, there was an overload of 2.3 patients. The underload of general ward beds increased from 8 to 19.4, the use of resuscitation beds increased: the initial underload of 2 patients was replaced by the overload of 7 patients.

The general ward bed utilization decreased from 96 to 89%, intensive care bed utilization increased from 92 to 124.2%.

The average bed turnover increased from 24.16 in 2012 to 53.7 in 2019. In the general wards - from 24.5 to 41.7, in the intensive care units - from 58 to 126.9.

3. ANALYSIS OF MORTALITY

In the studied period, the average overall mortality rate was 2.6%, in the intensive care units - 7.3%, in the general wards - 0.17%. The overall mortality rate ranged from 2.33% in 2013 to 3% in 2016. Resuscitation mortality rate ranged from 6.3% (2015) to 8.05% (2012). In 2019, the resuscitation mortality rate was 7.22%. The general ward mortality rate ranged from 0.08% in 2015 to 0.32% in 2012. In 2019, it amounted to 0.16% (Fig. 1).

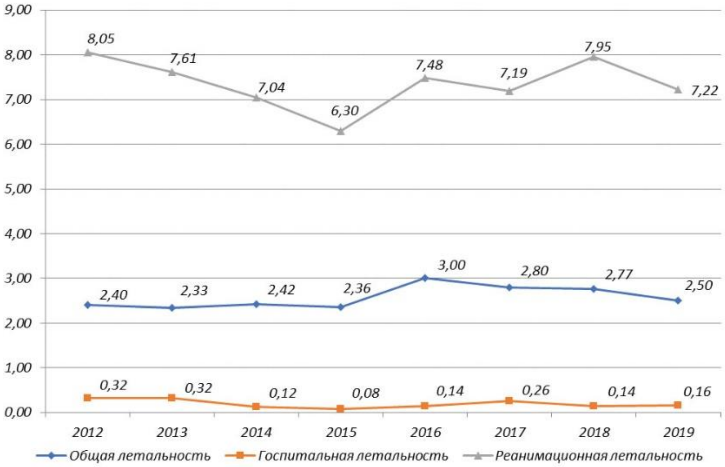

Fig. 1. Mortality rates of the Head Regional Vascular Center

Out of the total number of 1808 deaths, the share of those admitted through emergency medicine sources was 91%, and through planned sources - 9%.

The death rate in those hospitalized through the EM sources increased from 4.71 to 7.8%, in patients without medical referrals it decreased from 1.81 to 1.54%, in patients admitted through the "B-2 B-1" source it increased from 1, 09 to 1.56% by 2018. In general, among those admitted through emergency sources, the mortality rate decreased from 4.92 to 4.88%. Among those hospitalized through planned sources, the mortality rate decreased from 1.69% to 1.1%. As for the "plan" source, this indicator did not change - 0.95%, for the "Paid medical services" source it almost doubled - from 3.23 to 6.33% (Table 3).

Table 3

Deaths and lethality by hospitalization sources

Sources of Admission	2012	2013	2014	2015	2016	2017	2018	2019	Total
Emergency medicine	47 (4,71%)	43 (4,21%)	84 (6,68%)	114 (7,71%)	149 (8,24%)	150 (9,21%)	154 (9,1%)	167 (7,8%)	908 (7,38%)
Without medical referrals	13 (1,81%)	12 (1,33%)	19 (1,7%)	27 (1,79%)	38 (2,32%)	40 (2,13%)	58 (2,85%)	28 (1,54%)	235 (1,99%)
Transfer from other medical and prophylactic institutions*	50 (16,34%)	69 (18,8%)	47 (19,26%)	61 (33,7%)	91 (30,74%)	72 (24,32%)	89 (28,99%)	(0%) *	479 (22,54%)
Branch -2 Branch-1	3 (1,09%)	5 (1,61%)	4 (1,18%)	2 (0,52%)	4 (1,1%)	6 (1,82%)	4 (1,56%)	(0%) *	28 (1,18%)
Total for emergency sources	113 (4,92%)	129 (4,96%)	154 (5,21%)	204 (5,74%)	282 (6,86%)	268 (6,49%)	305 (7,11%)	195 (4,88%)	1650 (5,77%)
Department of Healthcare *	6 (3,14%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	(0%) *	6 (2%)
Plan	4 (0,95%)	6 (1,16%)	17 (2,72%)	11 (1,34%)	8 (1,2%)	5 (1,07%)	6 (0,65%)	24 (0,95%)	81 (1,14%)
Chief medical officer's permission - paid medical services	1 (3,23%)	2 (4,65%)	9 (6,47%)	12 (5,88%)	7 (5,56%)	9 (7,2%)	3 (1,83%)	5 (6,33%)	48 (5,21%)

Chief medical officer's permission	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1,3%)	2 (2,02%)	6 (5,04%)	(0%) *	9 (1,9%)
High-tech medical care *	0 (0%)	0 (0%)	0 (0%)	2 (16,67%)	9 (2,89%)	1 (0,25%)	2 (0,26%)	(0%) *	14 (0,93%)
Total for planned sources	11 (1,69%)	8 (1,28%)	26 (3,17%)	25 (2,29%)	25 (2,12%)	17 (1,56%)	17 (0,87%)	29 (1,1%)	158 (1,54%)
Grand Total	124 (4,21%)	137 (4,25%)	180 (4,77%)	229 (4,93%)	307 (5,8%)	285 (5,46%)	322 (5,15%)	224 (3,37%)	1808 (4,65%)

Note: * — these sources ways canceled by Order of the Moscow Health Department No. 56 dated 02.02.2017 and in 2019 were excluded from the list of sources of the Unified Medical Information and Analytical System

The highest mortality rate was noted among those transferred from other medical and prophylactic institutions, on average it was 22.54%. Thus, in 2012, the mortality rate among those transferred was 16.34%, while the general mortality rate was 4.21%. In 2018, while the general mortality rate was 5.15%, the mortality rate among those transferred was 28.99%. The highest mortality rate among transferred patients was in 2015 - 33.7% with the general mortality rate of 4.93%. The highest mortality rate was found in those transferred to neurosurgical intensive care unit - 90%. The mortality rate among those transferred and surgically treated at the Institute was 99%.

4. ANALYSIS OF DIAGNOSES

One of the 776 codes of the International Classification of Diseases of the 10th revision (ICD-10) was assigned for each patient treated at the Head RVC.

The most common diagnoses were as follows:

— I74.3 — embolism and thrombosis of arteries of the lower extremities: 12.61% (men 62.5%, women - 37.5%);

— I65.2 — occlusion and stenosis of carotid artery: 6.74% (men 65.7%, women - 34.3%);

— I80.2 — phlebitis and thrombophlebitis of other deep vessels of the lower extremities: 6.68% (women - 50.3%, men - 49.7%);

— I63.3 — cerebral infarction due to thrombosis of cerebral arteries - 6.11% (women - 51%, men - 49%).

During the whole period this ratio remained unchanged.

Department of Vascular Surgery

Over the entire period, 34% of all the patients admitted to the Vascular Center were treated.

— I74.3 — embolism and thrombosis of arteries of the lower extremities: 37,15%,

— I80.2 — phlebitis and thrombophlebitis of other deep vessels of the lower extremities: 19,67%,

— I65.2 — occlusion and stenosis of carotid artery: 9,13%.

Neurosurgical Department

For the entire period, 28% of all the patients admitted to the Vascular Center were treated.

— I65.2 — occlusion and stenosis of carotid artery: 12,12%;

— M51.1 — intervertebral disc disorders with radiculopathy: 11.39%;

— C79.3 — secondary malignant neoplasm of brain: 5.91%.

Department of Cardiology No. 3

Over the entire period, 21% of all those admitted to the Vascular Center were treated.

— I20.0 — unstable angina: 26.6%;

— I11.9 — hypertensive heart disease without heart failure: 17.28%;

— I20.8 — other forms of angina pectoris: 16,72%.

Department of Neurology

The Department was opened in 2014. 13% of all admitted patients were treated.

— I63.3 — cerebral infarction due to thrombosis of cerebral arteries: 43.1%;

— I67.4 — hypertensive encephalopathy: 14.35%;

— I63.4 — cerebral infarction due to embolism of cerebral arteries: 10.88%.

The number of other diagnoses is less than 1%.

The largest number of non-core patients was treated in the Neurosurgical Department. Over the entire period, the number of patients with CVDs decreased from 30% in 2012 to 14.7% in 2019 (mean: 22.6%). For

the whole period the proportion of patients with injuries was 30%, the share of patients with musculoskeletal diseases was 18.7%.

The largest increase was noted in the group of patients with cancer - from 11 to 39% (mean: 23.7%).

The highest rates of lethality (9.66%) were noted with the ICD-10 diagnosis code I63. 3: cerebral infarction due to thrombosis of cerebral arteries. In case of ICD-10 diagnosis code I60.2 - nontraumatic subarachnoid hemorrhage from anterior communicating artery – lethality was 7.88%, in case of nontraumatic intracerebral hemorrhage in hemisphere, subcortical (ICD-10 diagnosis code I61.0) lethality was 7.71%.

In total, for the entire period, the Center treated patients with diseases of the circulatory system - 75.45%, with injuries - 9.44%, with tumors - 7.11%, others - 8%. The number of diseases of the circulatory system decreased from 78.76 to 69.35%, the number of traumatic injuries - from 12.18 to 7.37%, the number of neoplasms increased from 3.36 to 13.35%, other diagnoses - from 5, 7 to 9.94%.

The proportion of deaths from diseases of the circulatory system decreased from 91.3 to 72.76%. The number of deaths from neoplasms increased from 4.35 to 9.31, from injuries - from 2.18 to 11.75, and the number of deaths from other causes also increased - from 2.17 to 6.21.

Among those transferred to other MPI, 69% were patients with the diagnosis of embolism and arterial thrombosis. While among the patients transferred to the Vascular Center with this diagnosis, 18% were re-transferred to other MPI. Among the patients initially admitted via emergency medicine, 10% were also transferred to other MPI.

5. COMPARISON OF PERFORMANCE INDICATORS OF THE HEAD REGIONAL VASCULAR CENTER AND THE OTHER DEPARTMENTS

Almost half of those hospitalized by the Institute patients with CVDs were admitted to the departments that are not part of the RVC. A comparative analysis of CVD treatment outcomes in the specialized departments of the Center and in the departments that are not part of the RVC was carried out.

We took into account ten blocks that make up the class of "circulatory system diseases" according to ICD-10, and analyzed the outcomes of patients with these diagnoses treated at the RVC and in other departments of the Institute.

In total, 65,075 people with CVDs were treated at the Institute, of which 37,701 (58%) - at the RVC, the rest - in other departments. This ratio was maintained throughout the entire study period. Patients with cerebrovascular diseases: 83% were treated in the departments of the RVC, 17% - in other departments; patients with ischemic heart disease: at the RVC - 38%, in other departments - 62%.

The analysis revealed that the proportion of patients with ischemic heart disease decreased from 24 to 19% in the non-core departments and at the RVC - from 14 to 10%.

The proportion of patients with high blood pressure increased from 5% to 9% and from 2% to 5%, respectively. At the RVC, the proportion of patients with cerebrovascular diseases increased from 10% in 2012 to 17% in 2019 (the largest percentage - 23% - was observed in 2015 and 2016). The proportion of those treated for diseases of arteries, arterioles and capillaries decreased from 21 to 12%, while the presence of diseases of the veins and lymphatic vessels, increased from 8 to 14%.

A comparative analysis of mortality rates at the Center and in the other departments was carried out. The overall mortality rate at the RVC is 4%, and in the other departments - 10%. The mortality rate of patients with ischemic heart disease is 3% for those treated at the Center and 6% for those treated in the other departments, with cerebrovascular diseases - 9% and 17%, respectively.

For other heart diseases, the mortality rate is the same both at the Center and in the other departments - 9%. C The highest difference in mortality was noted for diseases of the arteries, arterioles and capillaries - 1% at the RVC and 47% in the other departments; for pulmonary circulatory disorders - 2% at the RVC and 30% in the other departments. In the group of chronic rheumatic heart diseases, mortality was 2% at the RVC and 8% in the other departments, in the group of high blood pressure, mortality was 1% at the RVC and 3% in the other departments, in the group of venous and lymphatic vessel diseases, lethality was 0.1%. at the RVC and 5% in the other departments (Table 4).

Table 4

Comparison of mortality by groups of diseases of the circulatory system in patients treated in the Regional Vascular Center and in other departments

Department	Total treated, n	Died, n	Mortality, %	Transferred to other departments, *n*	Transfers, %
Acute rheumatic fever (I00 – I02)					
Regional Vascular Center	1	0	0,00	0	0,00
Other	3	0	0,00	0	0,00
Chronic rheumatic heart diseases (I05 – I09)					
Regional Vascular Center	54	1	1,85	0	0,00
Other	654	54	8,26	32	4,89
Rheumatic mitral valve diseases (I05)					
Regional Vascular Center	24	0	0,00	0	0,00
Other	347	19	5,48	17	4,90
Hypertensive diseases (I10-I15)					
Regional Vascular Center	2078	12	0,58	4	0,19
Other	4799	141	2,94	37	0,77
Ischemic heart diseases (I20 – I25)					
Regional Vascular Center	7981	230	2,88	103	1,29
Other	12814	741	5,78	146	1,14
Pulmonary heart disease and diseases of pulmonary circulation (*I26–I28*)					
Regional Vascular Center	54	1	1,85	8	14,81
Other	47	14	29,79	3	6,38
Other heart diseases (I30 – I52)					
Regional Vascular Center	216	19	8,80	4	1,85
Other	3247	301	9,27	154	4,74
Cerebrovascular diseases (I60 – I69)					
Regional Vascular Center	11170	1038	9,29	84	0,75
Other	2446	427	17,46	90	3,68
Diseases of the artery, arterioles and capillaries (I70 – I79)					
Regional Vascular Center	9842	80	0,81	754	7,66
Other	2068	980	47,39	145	7,01
Diseases of veins, lymphatic vessels and lymph nodes (I80 – I89)					
Regional Vascular Center	6305	4	0,06	129	2,05
Other	1291	58	4,49	58	4,49
Other diseases of the circulatory system (I95 – I99)					
Regional Vascular Center	0	0		0	
Other	5	1	20,00	0	0,00

DISCUSSION

The conducted study revealed a significant increase in the total number of hospitalizations (2.3 times). Moreover, the number of admissions increased in all specialties. There was a 2.2-fold increase in the admissions of intensive care patients in serious condition. The ratio of emergency and planned admissions has changed due to an increase in the share of planned hospitalizations from 22 to 40%. The number of neurosurgical primary hospitalizations exceeded that of the vascular ones.

The overall mortality rate at the RVC for the entire period did not practically change and remained in the range from 2.33 to 3%. However, since 2015, there was an increase in both ICU and general ward mortality. Most reviews of the performance of vascular centers in Russia are aimed at describing the experience in the treatment and rehabilitation of ischemic heart diseases and acute cerebrovascular accidents; in these studies, a decrease in mortality in these groups of diseases is noted [6-13]. At the same time, if we consider the RVC of the Institute, then the number of patients with these diseases for the entire period of its work did not exceed 35% of all the Center's admissions, therefore a direct comparison with the literature data is impossible.

Most patients (96%) died in intensive care beds. The highest mortality rate was noted in those transferred from other medical institutions (28.9%), especially in case of neurosurgical patients (90%).

The average bed-day in departments decreased 1.8 times, in intensive care units - 1.6 times. Bed turnover throughout the Center increased 1.9 times.

There exists an underload of patients in the general wards of the Vascular Center, while the intensive care units experience an overload. This is especially true for the neurological ICU, where, for its 6 beds, the overload in 2019 was 5.6, and the use of the bed capacity was 192.6 %.

As it was mentioned above, only 58% of all the patients with vascular pathologies were treated at the Vascular Center. At the same time, the number of non-core patients treated at the RVC has been recently increasing. In 2019, the proportion of specialized patients across the center decreased by 9%, the largest decrease was noted in the Neurosurgical Department - by 16%.

CONCLUSIONS

1. The analysis made it possible to reveal significantly better results of treatment of patients with cardiovascular diseases at the Regional Vascular Center in comparison with the other departments of the Institute (for the major specialties, the mortality rate is two times less).

2. The number of admissions to the Vascular Center for the period under consideration increased by 2 times. While due to a decrease in the average bed-day and an increase in bed turnover, the current load of the hospital bed fund remained practically unchanged.

3. At the same time, admission to the intensive care beds of the Regional Vascular Center doubled. But despite the reduction in the average ICU bed-day and an increase in bed turnover, the resuscitation bed fund of the Center as a whole in 2019 was overloaded by 23%, including 96% in the neurological ICU. In order to optimize performance, it is necessary to expand and reorganize the resuscitation bed fund of the existing departments of the Head Regional Vascular Center of the Institute, as well as to organize specialized ICU for patients treated at the Department of Vascular Surgery.

Moreover, the rational use of bed capacity can also be partially increased by reducing non-core hospitalizations, but at the moment the number of non-core patients does not exceed the number of patients with cardiovascular diseases treated at the other departments of the Institute.

A decrease in the Center's mortality rates is possible achieve by increased control during initial hospitalization, to a large extent - when organizing transfers from other medical institutions.

Further research should be directed to improving the structure and resource provision of the Vascular Center in order to achieve the best performance.

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