ANALYSIS OF CLINICAL AND ORGANIZATIONAL ACTIVITIES IN THE N.V. SKLIFOSOVSKY RESEARCH INSTITUTE FOR EMERGENCY MEDICINE IN 2005–2015

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ABSTRACT	The article summarizes changes in the structure of the N.V. Sklifosovsky Research Institute for Emergency Medicine. The analysis of major indicators of therapeutic practice showed the effectiveness of measures for the foundation of new departments and reorganization of existing ones, which greatly improved treatment outcomes and resulted in more efficient use of hospital beds.
Keywords:	organization, reorganization, intensive care availability, bedspace.

INTRODUCTION

The Federal Law dated November 21, 2011 № 323-FZ "On the basis of public health protection in the Russian Federation" provides for the development of the primary sector specialized medical care provision — multidisciplinary hospitals [1].

As part of this program, relevant regulations of the Moscow Government were adopted [2, 3]. One of the cornerstones of the Moscow program was to improve the equipment of hospitals, which should expand the use of advanced specialized, including high-tech methods of diagnosis and treatment among population. Implementation of the Moscow campaign involves the review of hospital beds effectivenesss, i.e. the importance lies not in the number of beds but its effectiveness, the achievement of certain performance-intensity treatment (bed turnover, the average time of hospital stay [4, 5]. The program sets the task of intensive development in contrast to the previously practiced extensive way. Recently, more attention has been given to the increasing influence of resuscitation and intensive care units on quality indicators of hospital care. Improving the availability of resuscitation is one of the main conditions for advanced quality of emergency medical care and decreased hospital mortality [7, 8, 10, 11].

MATERIAL AND METHODS

The study analyzes ways and results of the Institute development over the past 11 years. The objects of study: data of the N.V. Sklifosovsky Research Institute for Emergency Medicine for 11 years (2005-2015), from Forms no. 7 and Annual Reports of Health Statistics Department. We investigated the following parameters (hospital and resuscitation): number of treated patients, number of deaths, hospital stay, bed turnover, number of beds and mortality.

Along the above-mentioned official statistics, we included additional calculated parameters: resuscitation availability of a hospital, which is determined by the ratio of the number of intensive care beds (an extraordinary number of beds) to the total number of beds in the hospital (estimated beds) in percent, and the index of intensive care admissions, determined by the ratio of the number of intensive care admissions to the total number of patients treated in a medical facility, as a percentage.

RESULTS AND DISCUSSION

CHANGES IN THE SYSTEM OF HOSPITAL BEDS

The total number of beds from 2005 to the present time (late 2015) changed from 918 (2005) with a maximum of 998 beds (2012), and at the end of 2015 it amounts to 944 beds.

Clinical depatments were cut from 828 to 812 beds on the average from 2005 to the end of 2015. At the same time, high-tech departments were established:

- Department of Heart Transplantation and Artificial Circulation (20 beds) (2007);
- Diagnostic Unit for 6 beds in the Central Emergency Department (2007);
- Emergency Department of Cardiology for Patients with Myocardial Infarction (34 beds) with the resuscitation and intensive care unit (6 beds) (2010);
- Department of Neurology for Patients with Acute Ischemic Stroke (30 beds) with the the resuscitation and intensive care unit (6 beds) (2012).
- Department of Kidney and Pancreas Transplantation (30 beds) (2011).

Reorganized:

- Department for Psychosomatic Patients , 25 beds reduced (2007).
- Trauma Department, 60 beds reduced (2011).
- hospital departments of the Center for Treatment of Acute Poisoning, 30 beds reduced (2015);
- 1st and 2nd Cardiology Department (20 beds each) merged into the single department (40 beds) (2015)

INTENSIVE CARE UNITS

Over the past 11 years the total number of intensive care beds has increased from 90 to 132.

Established:

- Resuscitation and Intensive Care Unit for Emergency Patients (9 beds) (2007);
- Awakening Unit (6 beds) (2007);
- Intensive Care Unit for Patients with Myocardial Infarction (6 beds) (2010);
- Resuscitation and Intensive Care Unit with Dialysis Techniques for Patients after Organ Transplantation (6 beds) (2011);
- ICUs for neurological patients (6 beds) (2012 g).

Reorganized:

- Resuscitation and Intensive Care Unit for Cardiac Patients, the number of beds increased from 6 to 12 beds (2007), and in 2013 reduced to 9 beds;
- Resuscitation and Intensive Care Unit, the number of beds reduced from 18 to 12 beds (2007);
- Resuscitation and Intensive Care Unit for Neurosurgical Patients, the number of beds increased from 9 to 18 beds (2007);
- Resuscitation and Intensive Care Unit with a small operating room for emergency detoxification (toxicology), the bed capacity increased from 12 to 15 beds (2013).

Changes in the number of beds for the analyzed period are given in the Table 2.

Table 1

The bed capacity and the number of patients treated at the Institute, 2005-2015.

Indicators	Year										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
	Institute										
Beds	918	918	922	922	922	962	998	974	974	974	944
Treated	24,122	24,277	23,635	23,803	22,635	22,627	23,411	23,531	28,304	33,324	37,077
	Clinic										
Beds	828	828	814	808	808	842	872	842	842	842	812
Treated	23,011	23,176	22,554	22,705	21,711	21,718	22,314	22,437	27,129	32,089	35,575

Table 2

The bed capacity and the number of patients treated in emergency departments, 2005-2015.

Indicator	Year										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Beds	90	90	108	114	114	120	126	132	132	132	132
Treated	8,189	8,560	10,012	10,425	9,832	9,873	10,740	10,849	12,718	13,789	15,641

The incidence of visits increased from 48,900 to 68,000 people (39%). Visits increased by specialties: surgery — from 8,000 to 10,000; angiosurgery — from 2,500 to 5,000; neurosurgery — from 7,000 to 12,000; neurology since the opening — from 1,000 to 2,000; gynecology — from 2,000 to 4,000; cardiology — from 2,000 to 9,000; cardiac surgery — from 200 to 1,500; transplantation — from 300 to 1,300 people.

Visits decreased by specialties: traumatology — from 13,000 to 11,000; toxicology — from 7,000 to 5,000; combustiology — from 2,000 to 1,400 and somatopsychiatry — from 2,300 to 1,600.

Changes in the urgent admissions the Institute are presented in the Table 3. As shown on the Table, EMS admissions fell by 2014 from 27,000 to 21,600 and grew to 25,500 in 2015. Admissions from "branches" decreased from 6,500 to 4,500; transfers from other hospitals decreased from 1,400 to 1,000. Also, the Institute is one of the basic hospital emergency services (emergency medical service) in Moscow. According to CEMC, it accounts for 19-20% of all admissions in emergencies. [6]

Table 3

Changes in emergency admissions to the Institute (2007-2015).

Type of emergency admission	Year								
	2007	2008	2009	2010	2011	2012	2013	2014	2015
EMS	26,866	26,857	23,435	22,935	22,856	21,899	22,365	21,617	25,490
Without medical order	14,138	13,669	16,635	14,771	16,213	17,984	17,441	15,151	16,490
Branches	6,541	6,524	6,841	5,852	6,921	6,992	5,383	4,453	4,458
Transfer	1,430	1,419	1,342	1,504	1,545	1,292	1,402	1,106	1,001

HOSPITALIZATION

The number of hospitalized patients increased from 24,000 in 2005 to 37,000 in 2015 due to a significant growth in visits, and increased percentage of hospitalization from 44 to 55, which corresponds to the Russian trends in metropolitan areas [9]. The hospitalization data is shown in the Table 4. Hospitalization by EMS is increased from 55 to 80%, and hospitalizations from "branches" grew from 35 to 73%.

Table 4

Types of emergency hospitalization

Type	Year								
	2007	2008	2009	2010	2011	2012	2013	2014	2015
EMS	14,851	14,708	13,098	12,800	13,035	13,043	15,391	17,884	20,285
Without medical order	3,445	3,450	4,033	4,159	4,268	4,537	6,349	8,038	8,993
Branches	2,916	3,031	2,636	2,463	2,618	2,445	2,805	3,364	3,255
Transfer	1,299	1,366	1,276	1,447	1,464	1,225	1,346	1,073	974

The more efficient use of hospital beds was reflected in a significant increase in the bed turnover index from 27.8 to 43.7% (Fig. 1). The average hospital stay fell from 13.3 to 9.3 (total) and from 12.7 to 8.2 (clinic) (Fig. 2).

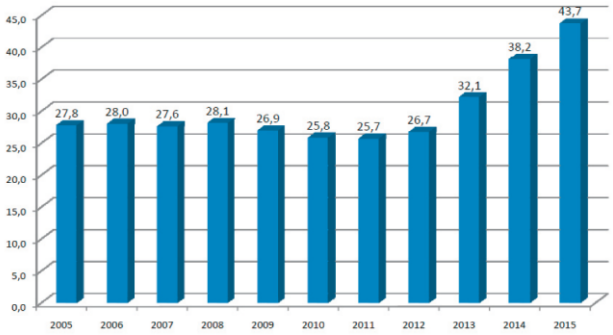

Fig. 1. Changes of the bed turnover in the clinic (2005-2015)

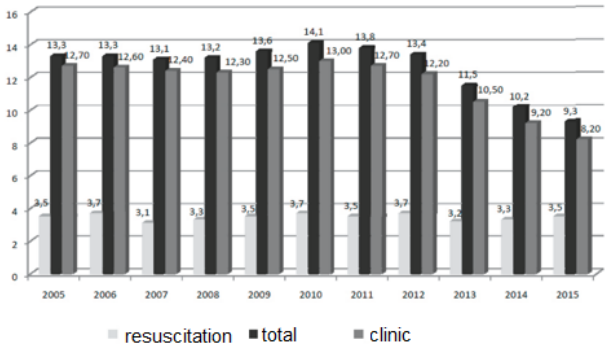

Fig. 2. Changes of an average bed-day (2005-2015)

As shown in the Table 5, 90-95% of patients were hospitalized for emergency indications while 5-10% of them were hospitalized routinely.

Table 5

Indicators of planned hospitalization

Type of hospitalization	Year								
	2007	2008	2009	2010	2011	2012	2013	2014	2015
Sought medical assistance	1,477	1,378	1,770	2,247	3,257	4,038	7,382	10,533	16,573
Admitted	1,140	1,173	1,581	1,763	2,138	2,285	2,251	2,966	3,541
Planned hospitalization, %	4.8	4.9	7.0	7.8	9.1	9.7	8.0	8.9	9.6

RESUSCITATION INDICATORS

The number of intensive care beds in the Institute has grown from 90 to 132 by establishing new departments and reorganization of the existing ones (see above). The number of patients hospitalized immediately in the intensive care unit increased from 6,000 in 2005 to 7,600 in 2015. As the number of intensive care beds grew, the rate of resuscitation availability increased from 9.8 to 14.0.

Expansion of intensive care capacity has significantly increased (more than 4 times, from 2,100 to 8,000) the number of patients transferred to intensive care from other departments (mainly from the operating ones). The total number of intensive care admissions increased from 8,200 to 15,600. The percentage of intensive care admissions in 2005 was 33.8 and in 2015 it was 42.2.

Against the background of expansion and restructuring of intensive care hospital beds system and increasing number of intensive care hospitalization, the mortality rate in the studied period decreased from 12.2 to 8.0%. The bed turnover in resuscitation and intensive care units increased from 89.9% to 117%. The average bed day has changed from 3.5 to 3.7 for 11 years.

Changes of major indicators of intensive care units are given in the Table 6 and 7.

Table 6

The flow of patients and resuscitation availability

Year	Admitted to resuscitation units	Transferred from other hospitals	Transferred from other departments	Total	Resuscitation availability
2005	6,059	421	2,132	8,191	9.8
2006	6,144	473	2,430	8,570	9.8
2007	6,404	521	3,732	10,136	12.28
2008	6,303	468	4,118	10,421	12.36
2009	5,535	404	4,284	9,819	12.36
2010	5,589	618	4,299	9,888	12.47
2011	5,952	631	4,799	10,751	12.63
2012	6,224	478	4,636	10,860	13.55
2013	7,111	562	5,595	12,706	13.55
2014	7,206	418	6,602	13,808	13.55
2015	7,678	407	7,965	15,643	13.98

Table 7

The effectiveness of resuscitation units

Year	% resuscitation admissions	Beds	Admissions	Died under resuscitation	Resuscitation mortality
2005	33.87	90	24,187	996	12.16
2006	35.34	90	24,262	969	11.3
2007	42.86	114	23,651	957	9.44
2008	43.92	114	23,728	933	8.95
2009	43.4	114	22,624	798	8.13
2010	43.69	120	22,632	786	7.95

2011	45.7	126	23,523	888	8.26
2012	46.16	132	23,525	909	8.37
2013	45.06	132	28,200	975	7.67
2014	41.41	132	33,341	1,027	7.44
2015	42.22	132	37,054	1,254	8.02

As shown in the Table 6 and 7, organizational measures have greatly improved resuscitation availability along with a significant reduction in mortality.

TRANSFER PATIENTS

Serious patients, usually with the main complications and co-morbidities are normally transferrd to the Institute from other hospitals. The number of transferred patients in the studied period maximally grew from 881 to 1451 in 2011, and in 2015 amounted to 1016 people. At the same time, 407-631 people were directly transferred to resuscitation units. In this group, the mortality reached 19%, which gives an average increase of 0.5% to the overall annual mortality (Table 8).

Table 8

Treatment outcomes in transferred patients

Indicators	Year										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Admitted	881	1,139	1,172	1,157	1,162	1,391	1,451	1,215	1,394	1,134	1,016
Died	145	182	175	208	170	171	196	167	198	173	192
Mortality rate	16.46	15.98	14.93	17.98	14.63	12.29	13.51	13.74	14.2	15.26	18.9

ANALYSIS OF MORTALITY

The above mentioned arrangements significantly improved mortality rates. The resuscitation mortality decreased from 12.2 to 8% (more than 1.5 times), total — from 4.5 to 3.3-3.6% (2014-2015). The mortality in hospital fell by half — from 0.4 to 0.2%. With the exclusion of the deceased, transferred from other hospitals, the overall mortality rate at the Institute declined from 4.1 to 3.1% (Fig. 3).

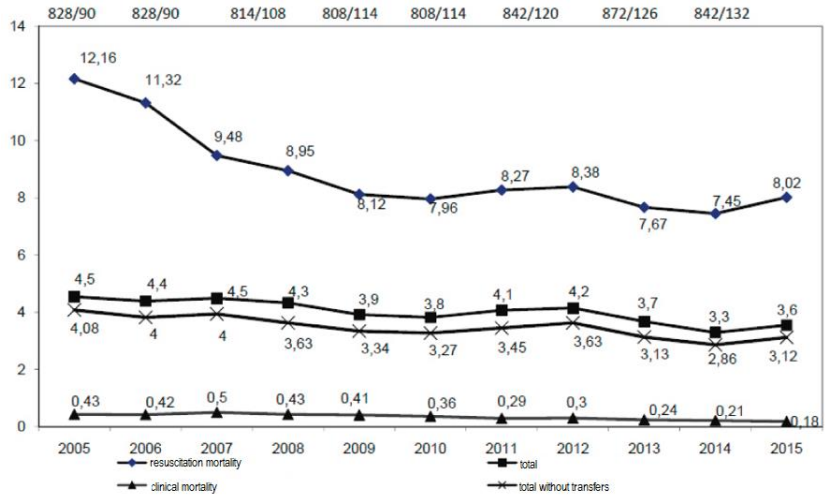

Fig. 3. Changes of mortality indicators (2005-2015)

CONCLUSION

Arrangements for the establishment of new departments and reorganization of existing ones, and more accurate control over admission and flow of patients in clinics and intensive care units of the Institute have greatly increased the number of hospitalizations and reduced the overall, resuscitation and clinical mortality due to the reduced average bed-day.

REFERENCES

1. *Ob osnovakh okhrany zdorov'ya grazhdan v Rossiyskoy Federatsii. Federal'nyy zakon № 323-FZ 21.11.2011* [About the fundamentals of health protection of citizens in the Russian Federation. RF Federal Law No. 323-FZ of November 21, 2011]. (In Russian).
2. *O programme modernizatsii zdravookhraneniya goroda Moskvy na 2011– 2012 gody.* Postanovlenie Pravitel'stva Moskvy №114-PP ot 07.04.2011. [On the modernization program of health of the city of Moscow for 2011—2012. Moscow Government Resolution No. 114-RR dated April 7, 2011]. (In Russian).

3. *Gosudarstvennaya programma goroda Moskvy na srednesrochnyy period (2012–2016 gg.). Razvitie zdravookhraneniya goroda Moskvy (Stolichnoe zdravookhranenie): Postanovlenie Pravitel'stva Moskvy № 461-PP ot 04.10.2011.* [The state program of Moscow for the medium term (2012–2016). The development of health of the city of Moscow (Capital health). Moscow Government Resolution № 461-RR dated October 10, 2011]. (In Russian).
4. Pechatnikov L.M. Zadacha formuliruetsya predel'no prosto — zhit' nuzhno priuchat'sya po sredstvam [The task is formulated very simply — you need to get used to live within our means]. *Moskovskaya meditsina*. 2014; 1: 5–10. (In Russian).
5. Pechatnikov L.M. Neobkhodimo obespechit' lyudyam dostupnost' meditsinskoy pomoshchi [We have to give people access to medical care]. *Moskovskaya meditsina*. 2015; 1: 5–9. (In Russian).
6. Fedotov S.A., Potapov V.I., Buk T.N. Itogi raboty Sluzhby ekstrennoy meditsinskoy pomoshchi Moskvy za 2013 god [The results of the work of the Service of emergency medical aid of Moscow in 2013]. *TsIEMINFORM*. 2015; 1: 3–10. (In Russian).
7. Khubutiya M.Sh., Karasev N.A., Kurilin B.L., et al. Razvitie reanimatsionnogo koechnogo fonda v mnogoprofil'nykh statsionarakh Moskvy i ego vliyanie na rezul'taty lechebnoy deyatel'nosti [Enhancement of ICU bed capacity in multidisciplinary hospitals of Moscow and its influence on treatment outcomes]. *Skoraya meditsinskaya pomoshch'*. 2012; 3:45–50. (In Russian).
8. Karasev N.A., Kurilin B.L., Kiselevskaya-Babinina I.V., Kislukhina E.V. Sovremennye tendentsii razvitiya reanimatsionnogo koechnogo fonda v mnogoprofil'nykh statsionarakh g. Moskvy i ego vliyanie na rezul'taty lechebnoy deyatel'nosti [The current trends in the critical care bed availability and allocation in multidisciplinary hospitals of Moscow and its influence on treatment outcomes]. *Zhurnal im N V Sklifosovskogo Neotlozhnaya meditsinskaya pomoshch'*. 2012; 1: 27–31. (In Russian).
9. Stozharov V.V., Penyugina E.N., Razumnyy N.V., et al. Sovremennye problemy organizatsii ekstrennoy gospitalizatsii bol'nykh v statsionary Sankt-Peterburga[The modern problems of the organization emergency hospitalization patients in the hospitals of St.-Petersburg]. *Skoraya meditsinskaya pomoshch'*. 2013; 1: 28–33. (In Russian).
10. Bey T.A., Hahn S.A., Moecke H. The current state of hospital-based emergency medicine in Germany. *Int J Emerg Med*. 2008; 1 (4): 273–277.
11. Rodigin, A. An update on emergency care and emergency medicine in Russia. *Int J Emerg Med*. 2015; 8 (1): 42.

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