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ORGAN DONATION AND TRANSPLANTATION IN THE RUSSIAN FEDERATION IN 2018

11TH REPORT OF THE REGISTRY OF THE RUSSIAN TRANSPLANT SOCIETY

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Aim: to monitor current trends and developments in organ donation and transplantation in the Russian Federation based on the 2018 data. **Materials and methods.** Heads of organ transplant centers were surveyed. Data obtained over years from constituent entities of the Russian Federation (also called regions) and from organ transplant centers located in these regions was analyzed and compared. **Results.** According to data retrieved from the 2018 National Registry, only 49 kidney, 28 liver and 18 heart transplant centers were functional in Russia. As of the end of 2018, there were about 6,219 people on the kidney transplant waiting list. This is about 13.8% of the total number of the 45,000 patients receiving dialysis. Donation rate in 2018 was 4.3 donors per million population, while multi-organ procurement level stood at 67.3%. An average of 2.9 organs were procured from one effective donor. In 2018, there were 9.3 kidney transplants, 3.4 liver transplants and 1.9 heart transplants per million population. In the same year, the number of transplants performed in Russia in creased by 12.3% from the year 2017. In Moscow and Moscow Oblast alone, there are 15 functioning organ transplantation centers. These centers perform half of all kidney transplants and 70% of all liver and heart transplants in the country. The number of organ transplant recipients in Russia is approaching 16,000. **Conclusion.** Russia continues to witness a long-term trend of growing number of organ transplants – 10–15% per year. The geographical presence or organ transplant centers continues to expand. The number of transplant centers and their activity is increasing. Donor programs are becoming more effective and efficient. Extrarenal transplantation technologies are being deployed in Russian regions. The number of patients on the national waiting list for organ transplantation is increasing, while their mortality is decreasing. The number of patients with transplanted organs is increasing. Shortages in donor organs in Russia is still down to human causes – poor organization. The number of organ transplants in Russian regions depends on government funding. The quality and safety of transplant programs rely on the transplant activity of centers. In order to achieve the clinical and economic benefits of organ transplantation as a treatment method, monitoring and follow-up after transplant will be required.

Keywords: organ donation, kidney, liver, heart, lung, pancreas transplantation, transplant center, waiting list, registry.

INTRODUCTION

Current trends and developments in organ donation and transplantation in Russia are monitored via the National Registry under the auspices of the relevant organ transplant commission of the Russian Ministry of Health and the Russian Transplant Society. Previous reports have been published in 2009–2018 [1–9].

In 2017, the Shumakov National Medical Research Center of Transplantology and Artificial Organs (under Russia's Ministry of Health) was included (via order No. 622 of the Ministry of Health of Russia dated September 11, 2017) in the network of national medical research centers of the Ministry of Health of Russia as a leading transplantation institution. In this status, the Research Center is authorized to manage (organizational and methodological) medical organizations engaged in donation and transplantation of human organs and tissues, as well as organizations that engage in analytical activities, including monitoring developments in organs and tissue donation and transplantation in the country (order No. 125 of the Ministry of Health of Russia dated March 13, 2019).

Information contained in the registry is sent to the following international registries: International Registry of Organ Donation and Transplantation (IRODaT); Registry of the European Renal Association – European Dialysis and Transplant Association, ERA – EDTA Registry; Registries of the International Society for Heart and Lung Transplantation – ISHLT Registries.

Since 2016, the national registry has been used as a tool for ensuring quality control and data integrity in

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the information system used for recording donor organs, human tissues, and information about donors and recipients. The information system is existing in accordance with order No. 355n of the Ministry of Health of Russia dated June 8, 2016.

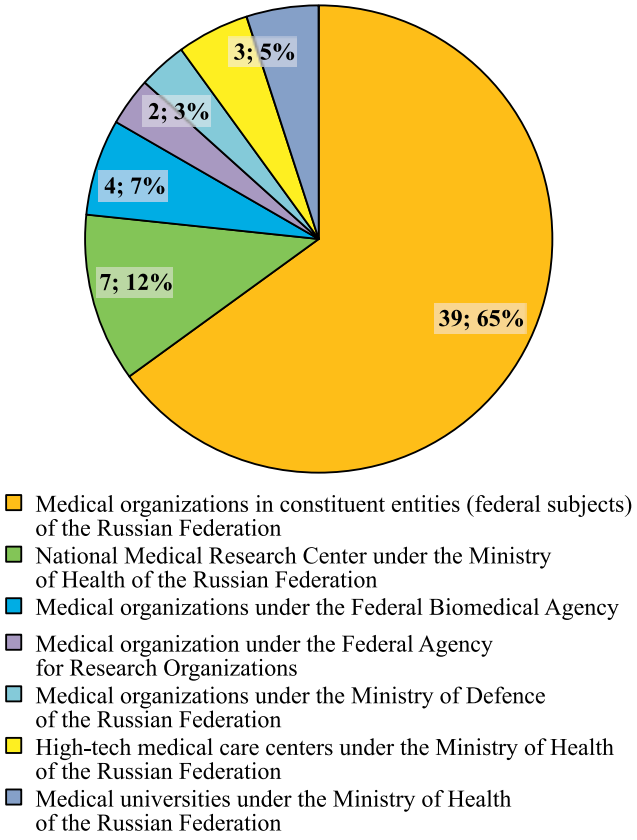

Fig. 1. Structure of the centers of organ transplantation in the Russian Federation in 2018 taking into account their departmental accessory

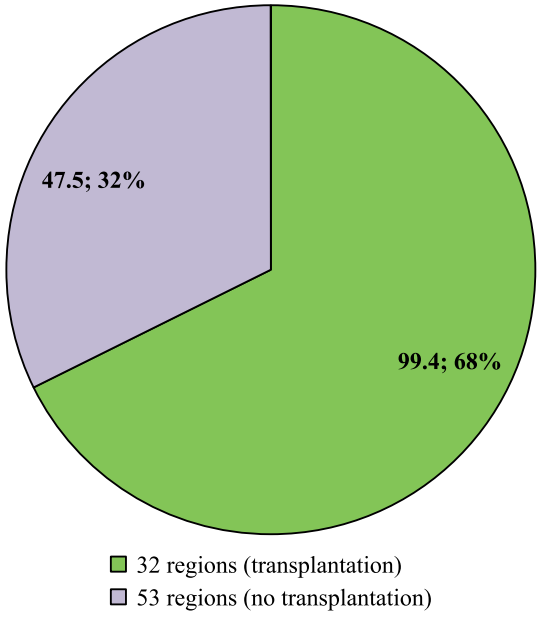

Fig. 2. Population of regions of the Russian Federation in which medical care on organ transplantation is provided (or not) in 2018

Data to be entered in the registry is collected by surveying the relevant officials at all transplant centers in Russia. Data obtained over years from Russian regions, from transplant centers located in these regions and from international registries was analyzed and compared.

The task team wishes to express its gratitude to all the regular and new participants in the registry who have provided data.

TRANSPLANT CENTERS AND WAITING LISTS

As of December 31, 2018, there were 60 organ transplantation centers functioning in Russia (52 in 2017). Kidney transplant was performed in 49 of these 60 centers, liver transplantation in 28, heart transplantation in 18, pancreatic transplantation in 6, and lung transplantation in 3.

The structure of organ transplant centers in Russia in 2018 is given in Fig. 1. Departmental affiliations of the centers were taken into account.

Of the 60 functioning organ transplant centers, 21 are federal institutions (13 institutions are under the Russian Ministry of Health, 2 institutions are under the Federal Agency for Scientific Organizations, 4 institutions are under the Federal Medical-Biological Agency and 2 institutions are under the Ministry of Defense of the Russian Federation), while 39 are institutions operating in Russia regions.

The increase in the number of organ transplant centers in the country in 2018 was mainly down to the fact that seven new transplant programs were launched at various institutions located in Russian regions, both in places where such programs were not yet available, and in areas already with functioning organ transplant programs. Another new transplant program was launched under the Russian Ministry of Defense.

Table 1 presents the number of potential recipients in organ transplant waiting lists.

The 60 transplantation centers operating in Russia are sited in 32 constituent entities of the Russian Federation. These entities are home to 99.4 million people. Of these 60 centres, 15 operate in Moscow and Moscow Oblast, while 7 centers are in St. Petersburg and Leningrad Oblast. See Fig. 2.

In 2018, some of the regions where organ transplants were performed for the first time included Ryazan Oblast (1.1 million inhabitants), Tula Oblast (1.5 million inhabitants) and Stavropol Krai (2.8 million inhabitants).

As the geographical spread of transplant programs in Russia expands, the vector of managerial decisions aimed at increasing availability and quality of transplant care for the population will likely shift from extensive replication of such programs in the constituent entities of Russia towards an increase in the efficiency of existing programs.

Moreover, 53 regions of the Russian Federation with a population of 47.5 million people do not have func-

Table 1

Transplantation centers in the Russian Federation, waiting lists

Federal district, region, population in 2018 (million people)* Kind of transplantation	**Russian Federation**	CFD					SFD			NCFD	NWFD		SbFD						UFD				VFD								FEFD
		Moscow and Moscow Oblast	Belgorod Oblast	Voronezh Oblast	Ryazan Oblast	Tula Oblast	Krasnodar Krai	Volgograd Oblast	Rostov Oblast	Stavropol Krai	St. Petersburg and Leningrad Oblast	Arkhangelsk Oblast without Nenets Autonomous Okrug	Novosibirsk Oblast	Kemerovo Oblast	Irkutsk Oblast	Omsk Oblast	Altai Krai	Krasnoyarsk Krai	Sverdlovsk Oblast	Tyumen Oblast without autonomous okrugs	Khanty-Mansi Autonomous Okrug – Yugra	Chelyabinsk Oblast	Samara Oblast	Saratov Oblast	Nizhny Novgorod Oblast	Republic of Tatarstan	Republic of Bashkortostan	Orenburg Oblast	Perm Krai	Ulyanovsk Oblast	Sakha Republic (Yakutia)
	146.9	**12.5**	**1.5**	**2.3**	**1.1**	**1.5**	**5.6**	**2.5**	**4.2**	**2.8**	**5.3**	**1.1**	**2.8**	**2.7**	**2.4**	**2.0**	**2.3**	**2.9**	**4.3**	**1.5**	**1.6**	**3.5**	**3.2**	**2.5**	**3.2**	**3.9**	**4.1**	**2.0**	**2.6**	**1.2**	**1.0**
		7.5									**1.8**																				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
KIDNEY																															
Number of Transplant Centers	**49**	14	1	1	1	1	1	1	1	1	5	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1
Number of patients waitlisted for the first time in 2018	**1728**	761	10	13	20	1	88	42	48	4	79	29	26	72	20	27	20	90	61	34	28	12	44	23	51	30	40	20	20	3	12
Total number of waitlist patients in 2018	**6219**	2229	57	119	3	1	352	131	110	4	208	64	120	173	64	70	108	165	270	119	121	148	255	118	458	243	238	104	95	3	69
Number of waitlist patients as of December 31, 2018	**4815**	1529	46	99	17	0	318	108	79	0	115	60	87	110	49	60	89	117	223	85	111	138	211	96	431	215	197	74	91	0	60
Number of waitlist patients who died in 2018	**57**	16	0	5	0	0	1	2	0	0	4	0	1	3	0	4	2	2	1	2	0	0	1	2	3	1	3	4	0	0	0
LIVER																															
Number of Transplant Centers	**26**	6	1	0	0	0	2	0	1	1	3	0	1	1	0	0	1	2	1	0	0	1	1	0	1	1	1	0	0	0	1
Number of patients waitlisted for the first time in 2018	**579**	231	5	0	0	0	32	0	51	1	60	0	23	6	0	0	17	31	32	0	0	3	10	0	39	14	10	0	0	0	14
Total number of waitlist patients in 2018	**1830**	610	73	0	0	0	85	0	123	1	248	0	87	60	0	0	39	39	123	0	0	28	10	0	177	15	90	0	0	0	22

End of table 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Number of waitlist patients as of December 31, 2018	**1171**	208	67	0	0	0	52	0	91	0	204	0	44	54	0	0	36	20	98	0	0	25	8	0	152	14	80	0	0	0	18
Number of waitlist patients who died in 2018	**154**	55	3	0	0	0	17	0	18	0	19	0	6	3	0	0	1	5	10	0	0	1	1	0	8	0	6	0	0	0	1
HEART																															
Number of Transplant Centers	**18**	3	1	0	0	0	1	0	1	0	1	0	1	1	0	0	1	2	1	0	0	1	0	0	1	1	1	0	0	0	1
Number of patients waitlisted for the first time in 2018	**397**	254	0	0	0	0	38	0	11	0	34	0	15	27	0	0	4	20	6	0	0	3	0	0	1	9	5	0	0	0	5
Total number of waitlist patients in 2018	**823**	403	12	0	0	0	73	0	21	0	57	0	41	65	0	0	4	45	49	0	0	11	0	0	1	9	27	0	0	0	5
Number of waitlist patients as of December 31, 2018	**490**	184	10	0	0	0	58	0	16	0	36	0	30	51	0	0	2	26	36	0	0	9	0	0	0	8	20	0	0	0	4
Number of waitlist patients who died in 2018	**48**	11	1	0	0	0	4	0	0	0	5	0	4	9	0	0	0	4	6	0	0	1	0	0	0	0	3	0	0	0	0
PANCREAS																															
Number of Transplant Centers	**6**	4	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Number of patients waitlisted for the first time in 2018	**33**	25	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0
Total number of waitlist patients in 2018	**153**	111	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41	0	0	0	0	0	0
Number of waitlist patients as of December 31, 2018	**132**	96	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36	0	0	0	0	0	0
Number of waitlist patients who died in 2018	**4**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0
LUNGS																															
Number of Transplant Centers	**3**	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of patients waitlisted for the first time in 2018	**35**	33	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total number of waitlist patients in 2018	**77**	75	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of waitlist patients as of December 31, 2018	**34**	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of waitlist patients who died in 2018	**15**	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* http://www.gks.ru/free_doc/new_site/population/demo/Popul2018.xls

Table 2

The indicators connected with the waiting list of organ transplantation in the Russian Federation during the period from 2012 to 2018

Indicator	2012	2013	2014	2015	2016	2017	2018
Number of patients on kidney transplant waiting list	3276	4172	4636	4167	4818	5401	6219
Average waiting time (years)	4.4	5.6	5.5	5.5	5.7	5.5	4.6
Waitlist mortality (%)	2.5	3.0	1.2	2.0	1.6	1.4	0.9
Number of patients on liver transplant waiting list	488	765	949	1062	1260	1535	1830
Average waiting time (years)	3.5	5.0	5.4	5.5	5.5	5.0	3.6
Waitlist mortality (%)	11.9	8.8	9.3	10.8	6.7	9.2	8.4
Number of patients on heart transplant waiting list	399	402	428	434	497	692	823
Average waiting time (years)	3.0	2.5	2.6	2.4	2.3	2.7	2.9
Waitlist mortality (%)	7.7	12.4	10.5	9.2	7.4	6.1	5.8

tioning transplant centers, despite the existing need for organ transplantation (mostly by patients receiving renal replacement therapy) and the unused donor organ resource [10].

Thus, the potential for extensive replication of transplant programs in the constituent entities of the Russian Federation has also not yet been exhausted.

The dynamics of indicators related to the organ transplant waiting list in Russia for the period between 2012 to 2018 is presented in Table 2.

In 2018, there were 6,219 potential recipients on the kidney transplant waiting list in Russia. This is 13.8% of the total number of patients (approximately 45,000 according to data from the Russian Dialysis Society) receiving hemodialysis and peritoneal dialysis. Of these, 1,728 were included in the waiting list in 2018 for the first time. In Moscow and Moscow Oblast, 2,229 potential recipients were also on the kidney transplant waiting list (35.8% of the waiting list in the country). The kidney transplant waiting list mortality in Russia was 0.9% (57 patients) in 2018.

In 2018, the liver transplant waiting list had 1,830 potential recipients. Of this number, 579 were included in the waiting list in 2018 for the first time. In Moscow and Moscow Oblast, 610 potential recipients (33.3% of the waiting list in the country) were on the liver transplant waiting list. The liver transplant waitlist mortality in Russia was 8.4% (154 patients) in 2018.

In 2018, the heart transplant waitlist had 823 potential recipients; 397 of them were included in the waiting list in 2018 for the first time. In Moscow, the heart transplantation waiting list featured 403 potential recipients (49.0% of the waiting list in the country). The heart transplant waitlist mortality in Russia was 5.8% (48 patients).

Based on available data, in the period from 2012–2018, the number of patients in the kidney transplant waiting list increased by almost twice in Russia, the liver transplant waiting list increased by 3.75 times, while that of heart transplant increased by 2 times. At the same time, the average waiting time for organ transplantation remained unchanged. On the contrary, mortality in organ transplantation waiting list fell by 64.0% for kidney, 29.4% for liver, and 24.7% for heart transplant waitlist.

In 2018, over 2000 (2193 to be precise) organ transplants were performed in Russia for the first time. This corresponds to 14.9 per million population. Out of this number, 233 were pediatric organ transplants (in 2017, it was 1896 transplants or 12.9 per million population). See Tables 3 and 4.

Based on data obtained from the Federal Registry for high-tech medical care, 1,732 (79.0%) organ transplants were performed in 2018 using funds from the compulsory medical insurance system. These funds were allocated for provision of high-tech medical care for organ transplant (in 2017, the figure was 1443, 76.1%). See Fig. 3.

Since 2010, when funding was included in the registry as an indicator, the number of organ transplants performed using high-tech medical care funds for transplant increased 2.2 times. At the same, the share of organ transplants performed using these funds increased by 35.7%.

In 2018, 53 (88.3%) of 60 transplant centers took part in government assignment to provide high-tech medical care for organ transplant.

The statutory ratios for financial costs per unit of volume of high-tech medical care for transplant in 2018 were as follows:

880,730 rubles for transplantation of kidney, pancreas, kidney & pancreas, small intestine, lungs;

1,117,900 rubles for heart and liver transplantation;

1,596,720 rubles for heart–lung transplants.

(Decree No. 1492 of the Government of the Russian Federation dated December 8, 2017).

ORGAN DONATION

In 2018, donor programs were implemented in 29 (out of 85) regions of Russia with a population of 94.2 million people. In another 3 regions – Tula Oblast, Perm Oblast, Ulyanovsk Oblast – only kidney transplants from a living related donor were performed.

The number of effective posthumous donors in 2018 was 639 (4.3 donors per million population), which is 75 more donors than in 2017 (564). See Tables 5 and 6.

Table 3

Organ donation and transplantation in the Russian Federation in 2018

Indicator	Absolute number	Indicator per million population*
Organ donation		
Total organ donors	1003	6.8
Posthumous donors	639	4.3
Living (related) donors	364	2.5
Organ transplantation		
Total transplanted organs, *including paediatric transplants*	2193 233	14.9 1.6
Kidney, including cadaveric from a living donor, *including paediatric transplants*	1361 1161 200 89	9.3 7.9 1.4 0.6
Liver, including cadaveric from a living donor, *including paediatric transplants*	505 341 164 133	3.4 2.3 1.1 0.9
Heart, including in the “heart-lungs” complex, *including paediatric transplants*	285 3 9	1.9 0.0 0.1
Pancreas	17	0.1
Lungs, including in the “heart-lungs” complex, *including paediatric transplants*	28 3 2	0.2 0.0 0.0

* Russia’s population in 2018 was 146.9 million people
(http://www.gks.ru/free_doc/new_site/population/demo/Popul2018.xls)

Table 4

Transplantation activity in the Russian Federation in 2018

S/N	Transplant Center, Region, Federal District	Total	Kidney (total)	Kidney (cadaveric)	Kidney (related)	Liver (total)	Liver (cadaveric)	Liver (related)	Heart	Pancreas	Lungs	Heart-lungs	Small intestine
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Shumakov National Medical Research Center of Transplantology and Artificial Organs, Moscow, Central Federal District	**618**	**224**	163	61	**176**	80	96	**194**	**4**	**17**	**3**	**0**
2	Lopatkin Research Institute of Urology and Interventional Radiology, Moscow, Central Federal District	**58**	**58**	47	11	**0**	0	0	**0**	**0**	**0**	**0**	**0**
3	Russian Children’s Clinical Hospital, Moscow, Central Federal District	**33**	**33**	33	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
4	Petrovsky National Research Centre of Surgery, Moscow, Central Federal District	**50**	**39**	16	23	**9**	1	8	**0**	**2**	**0**	**0**	**0**
5	Burnazyan Federal Medical and Biophysical Center, Moscow, Central Federal District	**59**	**13**	13	0	**45**	17	28	**0**	**1**	**0**	**0**	**0**
6	Bakulev National Medical Research Center for Cardiovascular Surgery, Moscow, Central Federal District	**6**	**0**	0	0	**0**	0	0	**6**	**0**	**0**	**0**	**0**
7	National Medical Research Center for Hematology, Moscow, Central Federal District	**15**	**15**	15	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
8	National Medical Research Center for Children’s Health, Moscow, Central Federal District	**4**	**4**	0	4	**0**	0	0	**0**	**0**	**0**	**0**	**0**

Continuation of table 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14
9	Morozov Children's City Clinical Hospital, Moscow, Central Federal District	**1**	**1**	0	1	**0**	0	0	**0**	**0**	**0**	**0**	**0**
10	Botkin City Clinical Hospital, Moscow, Central Federal District	**35**	**25**	25	0	**10**	10	0	**0**	**0**	**0**	**0**	**0**
11	Sklifosovsky Research Institute of Emergency Care, Moscow, Central Federal District	**296**	**187**	186	1	**90**	83	7	**5**	**8**	**6**	**0**	**0**
12	Research Institute of Emergency Pediatric Surgery and Traumatology, Moscow, Central Federal District	**1**	**1**	1	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
13	Vishnevsky 3rd Central Military Clinical Hospital, Moscow Oblast, Central Federal District	**1**	**1**	0	1	**0**	0	0	**0**	**0**	**0**	**0**	**0**
14	Vladimirsky Moscow Regional Research Clinical Institute, Moscow, Central Federal District	**76**	**59**	55	4	**17**	16	1	**0**	**0**	**0**	**0**	**0**
15	Federal Clinical Center for High Medical Technologies under the Federal Biomedical Agency (119), Moscow Oblast, Central Federal District	**25**	**25**	14	11	**0**	0	0	**0**	**0**	**0**	**0**	**0**
16	St. Joasaphus Belgorod Regional Clinical Hospital, Belgorod, Central Federal District	**12**	**8**	8	0	**3**	3	0	**1**	**0**	**0**	**0**	**0**
17	Voronezh Regional Clinical Hospital No. 1, Voronezh, Central Federal District	**15**	**15**	14	1	**0**	0	0	**0**	**0**	**0**	**0**	**0**
18	Tula Regional Clinical Hospital, Tula, Central Federal District	**1**	**1**	0	1	**0**	0	0	**0**	**0**	**0**	**0**	**0**
19	Ryazan Regional Clinical Hospital, Ryazan, Central Federal District	**3**	**3**	3	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
20	Stavropol Regional Clinical Hospital, Stavropol, North Caucasian Federal District	**5**	**4**	1	3	**1**	1	0	**0**	**0**	**0**	**0**	**0**
21	Ochapovsky Regional Clinical Hospital No. 1, Krasnodar, Southern Federal District	**57**	**33**	31	2	**13**	13	0	**11**	**0**	**0**	**0**	**0**
22	Regional Clinical Hospital No. 2, Krasnodar, Southern Federal District	**3**	**0**	0	0	**3**	3	0	**0**	**0**	**0**	**0**	**0**
23	Volzhsky Regional Urological Center, Volzhsky, Southern Federal District	**21**	**21**	16	5	**0**	0	0	**0**	**0**	**0**	**0**	**0**
24	Rostov Regional Clinical Hospital, Rostov-on-Don, Southern Federal District	**51**	**31**	31	0	**14**	12	2	**5**	**1**	**0**	**0**	**0**
25	Russian Research Center for Radiology and Surgical Technologies, St. Petersburg, Northwestern Federal District	**15**	**0**	0	0	**15**	15	0	**0**	**0**	**0**	**0**	**0**
26	Almazov National Medical Research Centre, St. Petersburg, Northwestern Federal District	**16**	**0**	0	0	**0**	0	0	**16**	**0**	**0**	**0**	**0**
27	Pavlov First St. Petersburg State Medical University, St. Petersburg, Northwestern Federal District	**50**	**43**	35	8	**5**	5	0	**0**	**0**	**2**	**0**	**0**
28	St. Petersburg Research Institute of Emergency Medicine, St. Petersburg, Northwestern Federal District	**20**	**20**	20	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
29	Leningrad Regional Clinical Hospital, St. Petersburg, Northwestern Federal District	**24**	**24**	24	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
30	Kirov Military Medical Academy, St. Petersburg, Northwestern Federal District	**6**	**1**	1	0	**5**	5	0	**0**	**0**	**0**	**0**	**0**
31	City Mariinskaya Hospital, St. Petersburg, Northwestern Federal District	**1**	**1**	1	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
32	Volosevich First City Clinical Hospital, Arkhangelsk, Northwestern Federal District	**4**	**4**	4	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
33	Republican Hospital No. 1 – National Center of Medicine, Yakutsk, Far Eastern Federal District	**12**	**9**	7	2	**2**	1	1	**1**	**0**	**0**	**0**	**0**

End of table 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14
34	Meshalkin National Medical Research Center, Novosibirsk, Siberian Federal District	**8**	**0**	0	0	**1**	1	0	**7**	**0**	**0**	**0**	**0**
35	State Novosibirsk Regional Clinical Hospital, Novosibirsk, Siberian Federal District	**68**	**32**	29	3	**36**	23	13	**0**	**0**	**0**	**0**	**0**
36	Research Institute for Complex Issues of Cardiovascular Diseases, Kemerovo, Siberian Federal District	**5**	**0**	0	0	**0**	0	0	**5**	**0**	**0**	**0**	**0**
37	Belyaev Kemerovo Regional Clinical Hospital, Kemerovo, Siberian Federal District	**60**	**60**	60	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
38	Podgorbunsky City Clinical Hospital, Kemerovo, Siberian Federal District	**3**	**0**	0	0	**3**	3	0	**0**	**0**	**0**	**0**	**0**
39	Irkutsk Regional Clinical Hospital, Irkutsk, Siberian Federal District	**16**	**15**	15	0	**1**	1	0	**0**	**0**	**0**	**0**	**0**
40	Omsk City Clinical Hospital No. 1, Omsk, Siberian Federal District	**6**	**6**	6	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
41	Regional Clinical Hospital, Altai Krai (Barnaul), Siberian Federal District	**21**	**17**	17	0	**2**	2	0	**2**	**0**	**0**	**0**	**0**
42	Federal Center for Cardiovascular Surgery, Krasnoyarsk, Siberian Federal District	**4**	**0**	0	0	**0**	0	0	**4**	**0**	**0**	**0**	**0**
43	Federal Siberian Research and Clinical Center, Krasnoyarsk, Siberian Federal District	**30**	**25**	24	1	**5**	5	0	**0**	**0**	**0**	**0**	**0**
44	Regional Clinical Hospital, Krasnoyarsk, Siberian Federal District	**40**	**20**	20	0	**9**	9	0	**11**	**0**	**0**	**0**	**0**
45	Sverdlovsk Regional Clinical Hospital No. 1, Yekaterinburg, Ural Federal District	**68**	**46**	44	2	**15**	15	0	**7**	**0**	**0**	**0**	**0**
46	Chelyabinsk Regional Clinical Hospital, Chelyabinsk, Ural Federal District	**13**	**10**	8	2	**2**	2	0	**1**	**0**	**0**	**0**	**0**
47	Regional Clinical Hospital No. 1, Tyumen, Ural Federal District	**32**	**32**	26	6	**0**	0	0	**0**	**0**	**0**	**0**	**0**
48	District Clinical Hospital, Khanty-Mansiysk, Ural Federal District	**10**	**10**	7	3	**0**	0	0	**0**	**0**	**0**	**0**	**0**
49	Samara State Medical University, Samara, Volga Federal District	**44**	**43**	43	0	**1**	1	0	**0**	**0**	**0**	**0**	**0**
50	Saratov State Medical University, Saratov, Volga Federal District	**8**	**8**	0	8	**0**	0	0	**0**	**0**	**0**	**0**	**0**
51	Regional Clinical Hospital, Saratov, Volga Federal District	**12**	**12**	12	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
52	Volga Regional Medical Center, Nizhny Novgorod, Volga Federal District	**42**	**24**	21	3	**17**	10	7	**0**	**1**	**0**	**0**	**0**
53	Specialized Cardiac Surgical Clinical Hospital, Nizhny Novgorod, Volga Federal District	**1**	**0**	0	0	**0**	0	0	**1**	**0**	**0**	**0**	**0**
54	Republican Clinical Hospital, Kazan, Volga Federal District	**28**	**27**	8	19	**1**	1	0	**0**	**0**	**0**	**0**	**0**
55	Interregional Clinical Diagnostic Center, Kazan, Volga Federal District	**1**	**0**	0	0	**0**	0	0	**1**	**0**	**0**	**0**	**0**
56	Republican Clinical Hospital, Ufa, Volga Federal District	**42**	**38**	38	0	**4**	4	0	**0**	**0**	**0**	**0**	**0**
57	Republican Cardiology Clinic, Ufa, Volga Federal District	**4**	**0**	0	0	**0**	0	0	**4**	**0**	**0**	**0**	**0**
58	Perm Regional Clinical Hospital, Perm, Volga Federal District	**4**	**4**	0	4	**0**	0	0	**0**	**0**	**0**	**0**	**0**
59	Ulyanovsk Regional Clinical Center for Specialized Types of Medical Care, Ulyanovsk, Volga Federal District	**3**	**3**	0	3	**0**	0	0	**0**	**0**	**0**	**0**	**0**
60	City Clinical Hospital for Emergency Medical Care No. 1, Orenburg, Volga Federal District	**26**	**26**	19	7	**0**	0	0	**0**	**0**	**0**	**0**	**0**
Total for 2018		**2193**	**1361**	**1161**	**200**	**505**	**342**	**163**	**282**	**17**	**25**	**3**	**0**

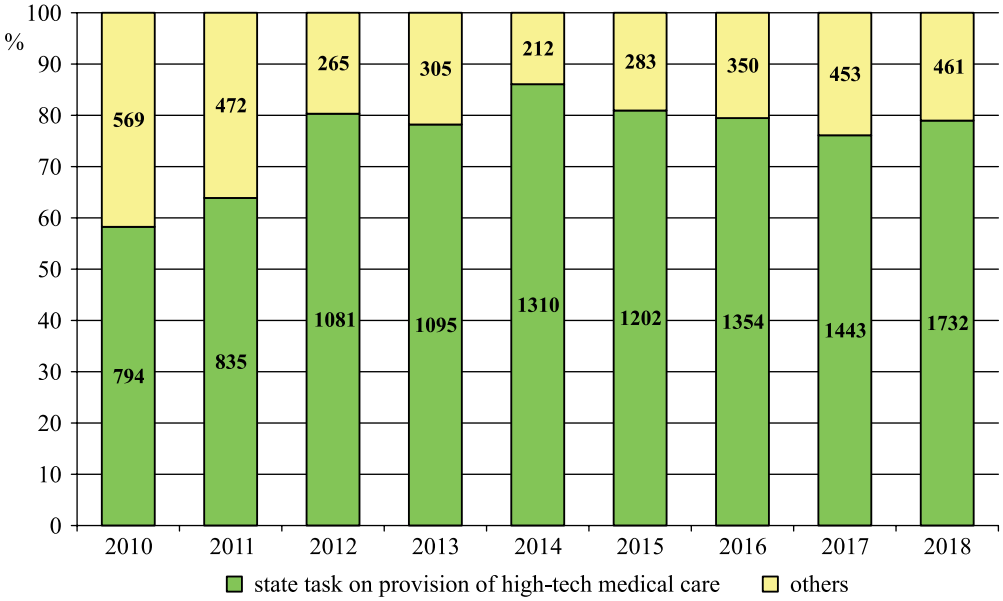

Fig. 3. Financing of transplantation in the Russian Federation in 2010–2018

In 2018, Moscow and Moscow Oblast accounted for 44.7% (286) of effective donors. The figure was 47.9% (270) in 2017.

Donor activity per population of regions implementing donor programs (94.2 million) amounted to 6.8 per million population.

Highest donor activity was recorded in Moscow (17.3), Kemerovo Oblast (11.1), Moscow Oblast (9.1), Tyumen Oblast (8.7), Leningrad Oblast (8.3), Samara Oblast (7.2), St. Petersburg (6.3), Novosibirsk Oblast (6.1), Sverdlovsk Oblast (5.6) and Krasnoyarsk Krai (5.5).

Low donor activity in 2018 was in Ryazan Oblast (1.8 at the beginning of the program), Omsk Oblast (1.6 during recession), Chelyabinsk Oblast (1.1 during recession), Republic of Tatarstan (1.0 during recession), and Stavropol Krai (0.7 at the beginning of the program).

In 2018, regional donor programs showed multidirectional dynamics. See Table 7.

In 19 regions, the number of effective donors increased in 2018 to a total of 99 donors. There was a major hike in donor activity in Moscow (+23), Krasnoyarsk Krai (+13), Tyumen Oblast (+9), Kemerovo Oblast (+8), Voronezh Oblast (+7, resumption of donor program after a collapse in 2017), Rostov Oblast (+6), Arkhangelsk Oblast and Irkutsk Oblast (+5).

In 6 regions, the number of effective donors fell in 2018 to a total of 24 (in 2017, there was a decrease in 8 regions to a total of 33 effective donors). Organ donor activity decreased considerably in Moscow Oblast (–7), Samara Oblast (–5) and Chelyabinsk Oblast (–4).

In 2018, the practice of pronouncing brain death continued to expand in Russia. The number of effective brain-dead donors was 601 (it was 516 in 2017). Their proportion in the total pool of effective donors increased to 94.0% (from 91.5% in 2017). See Fig. 4.

In 24 regions of the Russian Federation, organ donor programs worked only with donors determined to be brain dead (21 organ donor programs in 2017). For the first time, there were no organ donor programs that did not follow the protocol for diagnosing human death based on diagnosis of brain death. The protocol for determining brain death has been successfully implemented in Irkutsk Oblast: 7 effective donors (100%) in 2018.

The low proportion of brain-dead donors in the donor programs of Kemerovo Oblast (36.7%) and Saratov Oblast (62.5%) is not consistent with the modern level of technology development. Moreover, it hampers efficient use of donor resource. This therefore needs a major correction through targeted implementation and supervision of implementation of the protocol for determining brain death.

In 2018, a total of 430 multi-organ procurements were completed. This is more than the 375 recorded in 2017. The proportion of multi-organ procurements was 67.3% (66.5% in 2017).

In Moscow and Moscow Oblast, there were 239 multi-organ donors, which is 55.6% of the total number of multi-organ donors in Russia (217 donors and 57.9% in 2017).

The number of donor programs involving a high share of multi-organ procurements (more than 70%) were 13 in number – in 6 of the programs, multiple organs were procured from all (100%) the patients. They were in Voronezh, Ryazan, Rostov, Novosibirsk, Nizhny Novgorod, and the program of the Russian Ministry of Defense.

In 2018, an average of 2.9 organs were procured from one donor (2.8 in 2017). The highest number of organ procurement were, as before, in regions where extrarenal

Table 5

Donor activity in various regions of the Russian Federation in 2018

S/N	Region	Organ Donation Coordinating Center (region)	Population (million)	Number of donor bases	Effective donors (absolute, per million population)		Including with brain death diagnosis (absolute, %)		Including multi-organ donors (absolute, %)		Total harvested organs	Including harvested kidneys	Ratio of number of organs to number of donors	Percentage of harvested kidneys
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Moscow	Moscow Coordinating Center for Organ Donation, Moscow (Botkin City Clinical Hospital)	12.6	17	218	17.3	215	98.6	182	83.5	722	405	3.3	92.9
2	Moscow Oblast	Vladimirsky Moscow Regional Research Clinical Institute, Moscow	7.5	33	68	9.1	58	85.3	57	83.8	212	123	3.1	90.4
3	Belgorod Oblast	St. Joasaphus Belgorod Regional Clinical Hospital, Belgorod	1.5	1	4	2.7	4	100.0	4	100.0	12	8	3.0	100.0
4	Voronezh Oblast	Voronezh Regional Clinical Hospital No. 1, Voronezh	2.3	10	8	3.5	8	100.0	2	25.0	19	14	2.4	87.5
5	Ryazan Oblast	Ryazan Regional Clinical Hospital, Ryazan, Central Federal District	1.1	1	2	1.8	2	100.0	2	100.0	7	4	3.5	100.0
6	Krasnodar Krai	Ochapovsky Regional Clinical Hospital No.1, Krasnodar	5.6	2	20	3.6	20	100.0	16	80.0	60	31	3.0	77.5
7	Volgograd Oblast	Volzhsky Regional Urological Center, Volzhsky	2.5	11	9	3.6	9	100.0	0	0.0	16	16	1.8	88.9
8	Rostov Oblast	Rostov Regional Clinical Hospital, Rostov-on-Don	4.2	1	19	4.5	19	100.0	19	100.0	57	37	3.0	97.4
9	Stavropol Krai	Stavropol Regional Clinical Hospital, Stavropol, North Caucasian Federal District	2.8	1	2	0.7	2	100.0	1	50.0	5	4	2.5	100.0
10	St. Petersburg	Center for Organ and Tissue Donation, St. Petersburg (St. Petersburg Research Institute of Emergency Medicine)	5.4	13	34	6.3	31	91.2	20	58.8	81	54	2.4	79.4
11	Leningrad Oblast	Leningrad Regional Clinical Hospital, St. Petersburg	1.8	1	15	8.3	15	100.0	10	66.7	47	30	3.1	100.0
12	Arkhangelsk Oblast	Volosevich First City Clinical Hospital, Arkhangelsk, Northwestern Federal District	1.1	1	5	4.5	5	100.0	3	60.0	14	9	2.8	90.0
13	Novosibirsk Oblast	State Novosibirsk Regional Clinical Hospital, Novosibirsk	2.8	10	17	6.1	17	100.0	17	100.0	54	32	3.2	94.1
14	Kemerovo Oblast	Belyaev Kemerovo Regional Clinical Hospital, Kemerovo	2.7	15	30	11.1	11	36.7	8	26.7	70	58	2.3	96.7
15	Irkutsk Oblast	Irkutsk Regional Clinical Hospital, Irkutsk	2.4	1	7	2.9	7	100.0	1	14.3	15	14	2.1	100.0
16	Omsk Oblast	Omsk City Clinical Hospital No.1, Omsk	1.9	2	3	1.6	3	100.0	2	66.7	8	6	2.7	100.0
17	Altai Krai	Regional Clinical Hospital, Barnaul	2.3	1	8	3.5	8	100.0	7	87.5	25	16	3.1	100.0
18	Krasnoyarsk Oblast	Krasnoyarsk Clinical Hospital, Krasnoyarsk	2.9	12	16	5.5	16	100.0	13	81.3	44	26	2.8	81.3
19	Sverdlovsk Oblast	Sverdlovsk Regional Clinical Hospital No. 1, Yekaterinburg	4.3	8	24	5.6	24	100.0	17	70.8	66	44	2.8	91.7
20	Chelyabinsk Oblast	Chelyabinsk Regional Clinical Hospital, Chelyabinsk	3.5	1	4	1.1	4	100.0	3	75.0	12	8	3.0	100.0

End of table 5

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
21	Tyumen Oblast	Regional Clinical Hospital No. 1, Tyumen	1.5	1	13	8.7	13	100.0	1	7.7	27	26	2.1	100.0
22	Khanty-Mansi Autonomous Okrug – Yugra	District Clinical Hospital, Khanty-Mansiysk	1.7	8	4	2.4	4	100.0	0	0.0	7	7	1.8	87.5
23	Samara Oblast	Samara State Medical University, Samara	3.2	5	23	7.2	23	100.0	4	17.4	49	43	2.1	93.5
24	Saratov Oblast	Regional Clinical Hospital, Saratov	2.4	1	8	3.3	5	62.5	0	0.0	16	16	2.0	100.0
25	Nizhny Novgorod Oblast	Volga Regional Medical Center, Nizhny Novgorod	3.2	9	12	3.8	12	100.0	12	100.0	33	21	2.8	87.5
26	Republic of Tatarstan	Republican Clinical Hospital, Kazan	3.9	1	4	1.0	4	100.0	2	50.0	10	8	2.5	100.0
27	Republic of Bashkortostan	Republican Clinical Hospital, Ufa	4.1	12	20	4.9	20	100.0	5	25.0	46	38	2.3	95.0
28	Orenburg Oblast	City Clinical Hospital for Emergency Medical Care No. 1, Orenburg	2.0	2	8	4.0	8	100.0	5	62.5	20	15	2.5	93.8
29	Sakha Republic (Yakutia)	Republican Hospital No. 1-National Center of Medicine, Yakutsk	1.0	1	4	4.0	4	100.0	0	0.0	9	7	2.3	87.5
30	Departmental program of the Federal Biomedical Agency of Russia	Burnazyan Federal Medical and Biophysical Center, Moscow	–	28	5	–	5	100.0	3	60.0	16	9	3.2	90.0
31	Departmental program of the Federal Biomedical Agency of the Russian Federation	Federal Siberian Research and Clinical Center, Krasnoyarsk	–	5	24	–	24	100.0	13	54.2	63	44	2.6	91.7
32	Departmental program of the Ministry of Defense of the Russian Federation	Kirov Military Medical Academy, St. Petersburg, Northwestern Federal District	–	1	1	–	1	100.0	1	100.0	3	2	3.0	100.0
		Total	**146.8**	**216**	**639**	**4.4**	**601**	**94.1**	**430**	**67.3**	**1845**	**1175**	**2.9**	**91.9**

Table 6

Deceased organ donors (effective donors) in 2006–2018

S/N	Region	2006	2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018	
		Number of effective donors	Number of effective donors	Absolute change for the year	Number of effective donors	Absolute change for the year	Number of effective donors	Absolute change for the year	Number of effective donors	Absolute change for the year	Number of effective donors	Absolute change for the year	Number of effective donors	Absolute change for the year	Number of effective donors	Absolute change for the year	Number of effective donors	Absolute change for the year	Number of effective donors	Absolute change for the year	Number of effective donors	Absolute change for the year	Number of effective donors	Absolute change for the year	Number of effective donors	Absolute change for the year
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
1	Moscow	87	126	+39	135	+9	136	+1	151	+15	135	–16	111	–24	125	+14	151	+26	142	–9	183	+41	195	+12	218	+23
2	Moscow Oblast	24	45	+21	59	+14	52	–7	71	+19	82	+11	61	–21	56	–5	51	–5	44	–7	39	–5	75	+36	68	–7
3	Belgorod Oblast		2	+2	3	+1	2	–1	5	+3	6	+1	3	–3	1	–2	2	+1	5	+3	4	–1	4	0	4	0
4	Voronezh Oblast	6	2	–4	8	+6	2	–6	0	–2	1	+1	6	+5	6	0	5	–1	7	+2	4	–3	1	–3	8	+7
5	Ryazan Oblast																								2	+2
6	Krasnodar Krai						3	+3	39	+36	52	+13	42	–10	41	–1	23	–18	25	+2	24	–1	19	–5	20	+1
7	Volgograd Oblast	5	0	–5	11	+11	15	+4	16	+1	17	+1	19	+2	15	–2	18	+3	8	–10	8	0	9	+1	9	0
8	Rostov Oblast																		1	+1	7	+6	13	+6	19	+6
9	Stavropol Krai																								2	+2
10	St. Petersburg	30	45	+15	47	+2	47	0	41	–6	34	–7	22	–12	13	–9	23	+10	31	+8	29	–2	31	+2	34	+3
11	Leningrad Oblast	12	8	–4	11	+3	11	0	13	+2	10	–3	10	0	10	0	9	–1	7	–2	12	+5	11	–1	15	+4
12	Arkhangelsk Oblast																								5	+5
13	Novosibirsk Oblast	17	11	–6	18	+7	29	+11	35	+6	25	–10	20	–4	17	–3	11	–6	14	+3	9	–5	14	+5	17	+3
14	Kemerovo Oblast	16	13	–3	18	+5	18	0	22	+4	12	–10	26	+14	26	0	31	+5	28	–3	34	+6	22	–12	30	+8
15	Irkutsk Oblast				4	+4	6	+2	10	+4	9	–1	8	–1	6	–2	9	+3	4	–5	3	–1	2	–1	7	+5
16	Omsk Oblast	10	15	+5	13	–2	19	+6	19	0	14	–5	11	–3	14	+3	16	+2	11	–5	4	–7	4	0	3	–1
17	Altai Krai														3	+3	5	+2	4	–1	4	0	8	+4	8	0
18	Krasnoyarsk Krai																3	+3	6	+3	18	+12	27	+9	16	Note
19	Sverdlovsk Oblast	14	13	–1	12	–1	13	+1	14	+1	15	+1	14	–1	18	+4	23	+5	18	–5	15	–3	22	+7	24	+2
20	Chelyabinsk Oblast								6	+6	2	–4	7	+5	6	–1	10	+4	9	–1	11	+2	8	–3	4	–4
21	Tyumen Oblast																						4	+4	13	+9
22	Khanty-Mansi Autonomous Okrug – Yugra																						3	+3	4	+1
23	Samara Oblast	4	17	+13	24	+7	18	–6	20	+2	21	+1	19	–2	21	+2	20	–1	18	–2	26	+8	28	+2	23	–5

End of table 6

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
24	Saratov Oblast														4	+4	7	+3	7	0	7	0	7	0	8	+1
25	Nizhny Novgorod Oblast						7	+7	11	+4	12	+1	10	–2	8	–2	12	+4	10	–2	11	+1	10	–1	12	+2
26	Republic of Tatarstan		3	+3	1	–2	3	+2	12	+9	16	+4	9	+7	6	–3	6	0	4	–2	1	–3	3	+2	4	+1
27	Republic of Bashkortostan								2	+2	7	+5	14	+7	18	+4	19	+1	14	+5	20	+6	22	+2	20	–2
28	Orenburg Oblast																		3	+3	8	+5	9	+1	8	–1
29	Sakha Republic (Yakutia)																				2	+2	4	+2	4	0
30	Federal Biomedical Agency, Moscow														6	+6	11	+5	14	+3	16	+2	9	–7	5	–4
31	Federal Biomedical Agency, Krasnoyarsk																								24	Note
32	Russian Ministry of Defense, St. Petersburg																								1	+1
	TOTAL (in the Russian Federation)	**225**	**300**	**+75**	**364**	**+64**	**381**	**+17**	**487**	**+106**	**470**	**–17**	**412**	**–58**	**420**	**+8**	**465**	**+45**	**434**	**–31**	**481**	**+53**	**565**	**+78**	**639**	**+74**

Note. The donor activity of the Federal Siberian Research Clinical Centre (under the Federal Biomedical Agency), Krasnoyarsk, is presented as a separate program.

Table 7

Rating of regions donor activity in 2018

Constituent entities (regions) of the Russian Federation	Population in 2018 (million)	Number of effective donors per million population		Rating	
		2018	2017	2018	2017
Moscow	12.6	17.3	15.7	1	1
Kemerovo Oblast	2.7	11.1	8.1	2	5
Moscow Oblast	7.5	9.1	10.1	3	2
Tyumen Oblast	1.5	8.7	2.7	4	20
Leningrad Oblast	1.8	8.3	6.1	5	6
Samara Oblast	3.2	7.2	8.8	6	4
St. Petersburg	5.4	6.3	5.8	7	7
Novosibirsk Oblast	2.8	6.1	5.0	8	10
Sverdlovsk Oblast	4.3	5.6	5.1	9	9
Krasnoyarsk Krai	2.9	5.5	9.3	10*	3
Republic of Bashkortostan	4.1	4.9	5.4	11	8
Rostov Oblast	4.2	4.5	3.1	12	16
Arkhangelsk Oblast	1.1	4.5	0.0	13	–
Orenburg Oblast	2.0	4.0	4.5	14	11
Sakha Republic (Yakutia)	1.0	4.0	4.0	15	12
Nizhny Novgorod Oblast	3.2	3.8	3.1	16	17
Volgograd Oblast	2.5	3.6	3.6	17	13
Krasnodar Krai	5.6	3.6	3.4	18	15
Altai Krai	2.3	3.5	3.3	19	14
Voronezh Oblast	2.3	3.5	0.4	20	26
Saratov Oblast	2.4	3.3	2.8	21	18
Irkutsk Oblast	2.4	2.9	0.8	22	25
Belgorod Oblast	1.5	2.7	2.7	23	19
Khanty-Mansi Autonomous Okrug – Ugra	1.7	2.4	1.9	24	23
Ryazan Oblast	1.1	1.8	0.0	25	–
Omsk Oblast	1.9	1.6	2.0	26	22
Chelyabinsk Oblast	3.5	1.1	2.3	27	21
Republic of Tatarstan	3.9	1.0	0.8	28	24
Stavropol Krai	2.8	0.7	0.0	29	–
Russia (85 constituent entities of the Russian Federation)	146.9	4.4	3.8	–	–

Note. The donor program of the Federal Siberian Research Clinical Centre (under the Federal Biomedical Agency), Krasnoyarsk, was not included.

organs were transplanted and (or) regions where there was interregional coordination – Ryazan Oblast (3.5), Moscow (3.3), Novosibirsk Oblast (3.2), Moscow Oblast and Leningrad Oblast and Altai Krai (3.1). There were low (1.8) procurement in Volgograd Oblast and Khanty-Mansi Autonomous Okrug – Yugra.

In 2018, the rate of procurement and transplantation of donor kidneys was 91.9% (86.3% in 2017). This indicator was in the optimal range of 90–100% in 21 regions and between 80–90% in 6 regions. It was less than 80% in only 2 programs – Krasnodar Krai (77.5%) and St. Petersburg (79.4%)

In 2018, 364 organs were procured from living related donors – 36.3% of 1003 (the total number of procurements). In 2017, it was 332 procured organs or 37.0% of 896).

KIDNEY TRANSPLANTATION

In 2018, a total of 1,361 kidney transplants were performed (9.3 per million population), which is more than in previous years. See Fig. 5.

The kidney transplants took place at 49 centers.

There were 1,161 cadaveric kidney transplants in 2018, which is 187 (+19.2%) more transplants than in 2017 (974). There were 200 (201 in 2017) kidney transplants from a living related donor.

Table 8 and Fig. 6 show the kidney transplant centers where the highest number of kidney transplants was done as of the end of 2018.

The activity of kidney transplant centers in 2018 varied widely. Five centers performed over 50 transplant surgeries each, 10 centers carried out 30 to 50 surgeries per year, another 14 centers performed 15 to 29 surge-

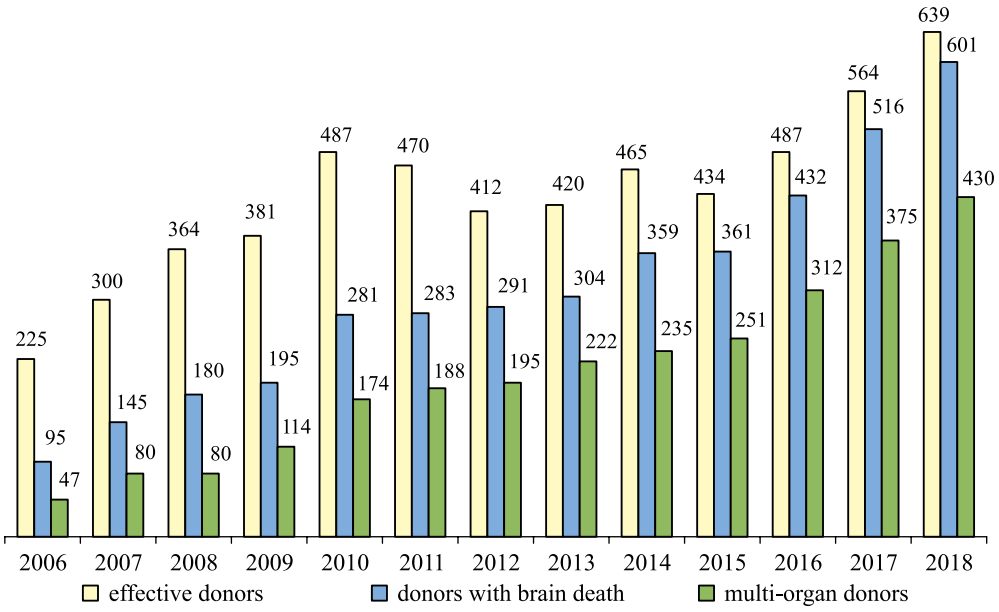

Fig. 4. Structure of effective donors in the Russian Federation in 2006–2018

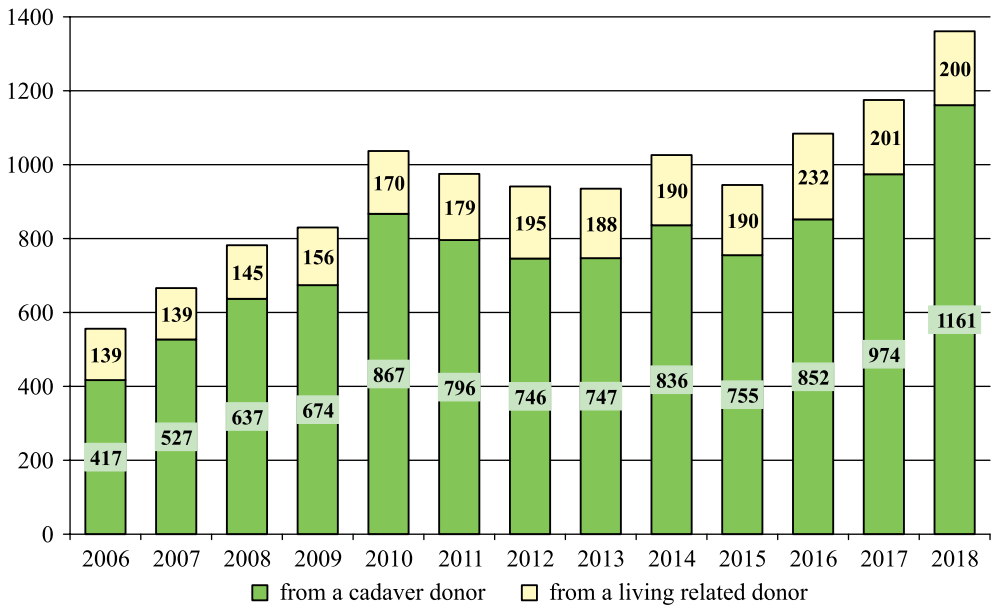

Fig. 5. Kidney transplantation in the Russian Federation in 2006–2018

ries, and the remaining 20 centers performed less than 15 kidney surgeries.

All the 14 kidney transplant centers located in Moscow and Moscow Oblast performed half – 50.3% (685) – of all kidney transplants carried out in the country (against 629 or 53.5% in 2017).

Of these, 4 centers performed more than 50 kidney transplants in a year. They are the Shumakov National Medical Research Center of Transplantology and Artificial Organs (224 kidney transplants), Sklifosovsky Research Institute of Emergency Care (187), Vladimirsky Moscow Regional Research Clinical Institute (59) and National Medical Research Radiological Center (58).

In 2018, 28 centers out of 49 in Russia performed related kidney transplant surgeries. A total of 200 transplants were performed (201 in 2017). Nine centers in Moscow and Moscow Oblast performed 117 related kidney transplants in 2018, or 58.5% of the total number of related kidney transplants performed in the country (114 and 56.5% in 2017). Two centers performed more than 20 related kidney transplants – Shumakov National Medical Research Center of Transplantology and Artificial Organs (61) and Petrovsky National Research Centre of Surgery (23). The average frequency of using intravital kidney donation in 2018 was 14.7% of the total number of kidney transplants (17.1% in 2017).

Table 8

The medical organizations – leaders in number of transplantations of a kidney

Rank	Name of medical organization	Number of kidney transplants performed in 2018
1	Shumakov National Medical Research Center of Transplantology and Artificial Organs, Moscow, Central Federal District	224
2	Sklifosovsky Research Institute of Emergency Care, Moscow, Central Federal District	187
3	Belyaev Kemerovo Regional Clinical Hospital, Kemerovo, Siberian Federal District	60
4	Vladimirsky Moscow Regional Research Clinical Institute, Moscow, Central Federal District	59
5	National Medical Research Center for Radiology, Moscow, Central Federal District	58
6	Sverdlovsk Regional Clinical Hospital No. 1, Yekaterinburg, Ural Federal District	46
7	Pavlov First St. Petersburg State Medical University, St. Petersburg, Northwestern Federal District	43
8	Samara State Medical University, Samara, Volga Federal District	43
9	Petrovsky National Research Centre of Surgery, Moscow, Central Federal District	39
10	Kuvatov Republican Clinical Hospital, Ufa, Volga Federal District	38
	Total	797
	58.6% (1361) of the total number of kidney transplants in the Russian Federation	

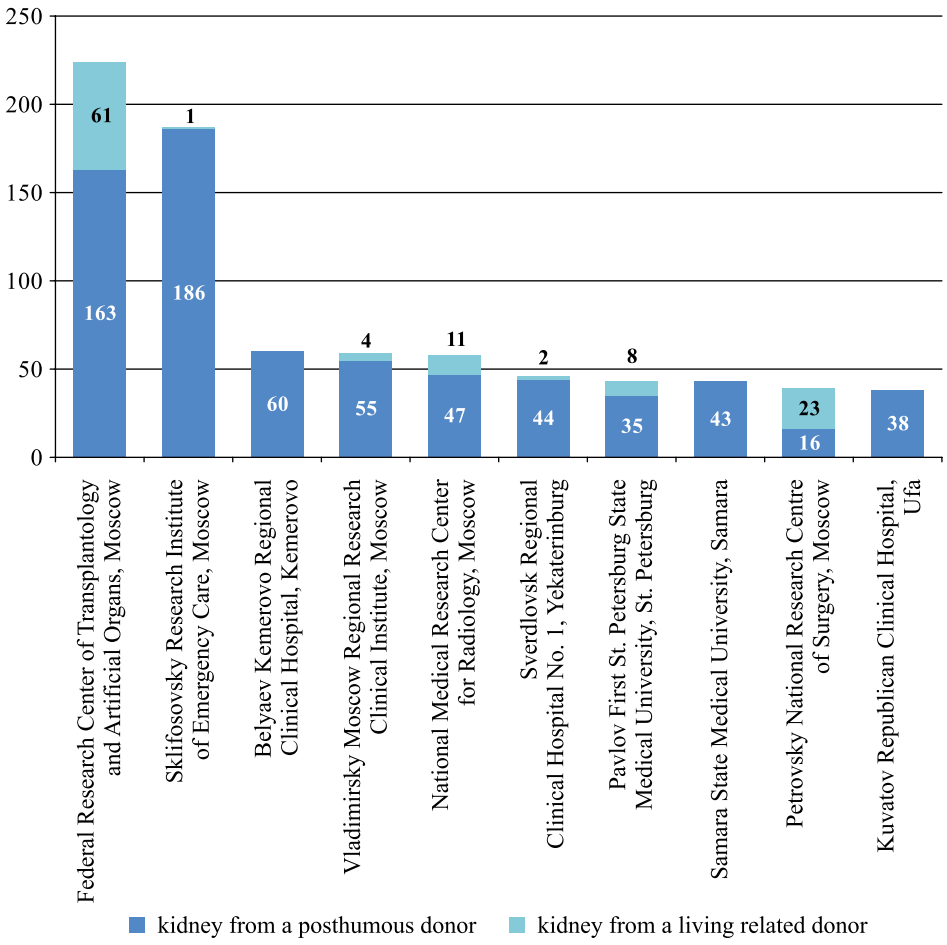

Fig. 6. The medical organizations – leaders in number of transplantations of a kidney

In 2018, nine centers performed pediatric kidney transplants. A total of 89 kidney transplants were carried out (105 in 2017); 85 (95.5%) of them in Moscow, including at Russian Children's Clinical Hospital (33), Petrovsky National Research Centre of Surgery (25) and Shumakov National Medical Research Center of Transplantology and Artificial Organs (20). See Fig. 7.

EXTRARENAL ORGAN TRANSPLANT

In 2018, 282 heart transplants were performed (1.9 per million population), of which 9 were pediatric transplants. This is more than the figure recorded in previous years, especially in 2017 (252), +11.9%.

Heart transplants were performed at 18 centers.

Two new heart transplant programs were launched in 2018: at Republican Hospital No. 1 – National Center of Medicine, Yakutsk, one heart transplant carried out;

In the Regional Clinical Hospital, Barnaul, two heart transplants were performed.

Shumakov National Medical Research Center of Transplantology and Artificial Organs (Moscow) performed 68.8% (194 heart transplants) of the total number of heart transplants done in Russia. The successful heart transplant program in this center, along with new programs, continues to direct the overall positive trend in the increase in the number of heart transplants recorded in 2009–2018 in the country.

Table 9 and Fig. 8 show thoracic organ transplant centers, where the largest number of heart and lung transplants was done as of the end of 2018.

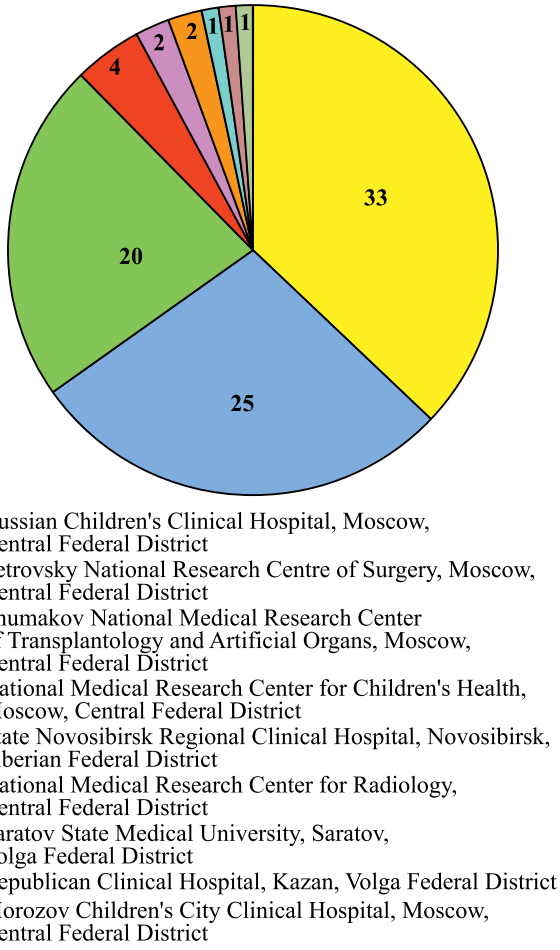

Fig. 7. Pediatric kidney transplantation in the Russian Federation in 2018

Table 9

The medical organizations – leaders in number of transplantations of thoracic organs

Rank	Name of medical organization	Number of heart transplants performed in 2018
1	Shumakov National Medical Research Center of Transplantology and Artificial Organs, Moscow, Central Federal District	194
2	Almazov National Medical Research Centre, St. Petersburg, Northwestern Federal District	16
3	Ochapovsky Regional Clinical Hospital No.1, Krasnodar, Southern Federal District	12
4	Krasnoyarsk Clinical Hospital, Krasnoyarsk, Siberian Federal District	11
5	Sverdlovsk Regional Clinical Hospital No. 1, Yekaterinburg, Ural Federal District	7
6	Meshalkin National Medical Research Center, Novosibirsk, Siberian Federal District	7
7	Bakulev Scientific Center for Cardiovascular Surgery, Moscow, Central Federal District	6
8	Research Institute for Complex Problems of Cardiovascular Diseases, Kemerovo, Siberian Federal District	5
9	Rostov Regional Clinical Hospital, Rostov-on-Don, Southern Federal District	5
10	Sklifosovsky Research Institute of Emergency Care, Moscow, Central Federal District	5
	TOTAL	268
	95.0% (282) of the total number of heart transplants in the Russian Federation	

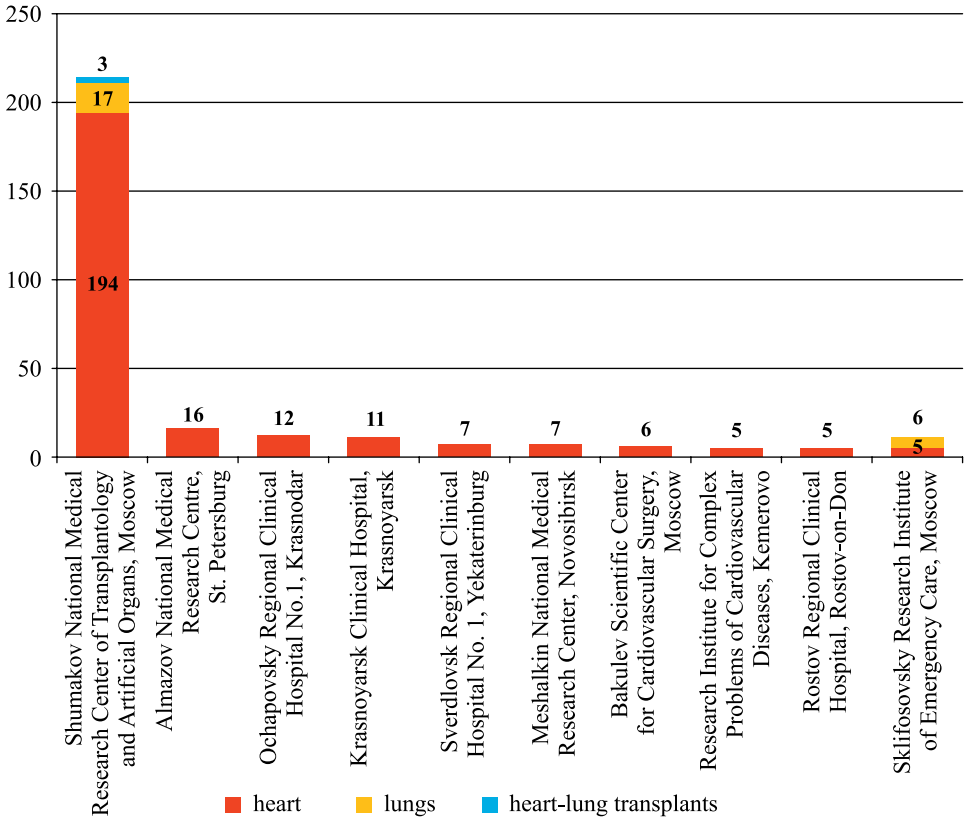

Fig. 8. The medical organizations – leaders in number of transplantations of thoracic organs

Apart from the Shumakov National Medical Research Center of Transplantology and Artificial Organs, three other transplantation centers did over 10 heart transplants in 2018 – the Almazov National Medical Research Centre in St. Petersburg (16 heart transplants), Ochapovsky Regional Clinical Hospital No. 1 in Krasnodar (11) and Regional Clinical Hospital in Krasnoyarsk (11).

In 2018, three transplantation centers performed lung transplants. A total of 25 transplants were performed (25 in 2017), of which 2 were pediatric lung transplantations; 17 lung transplants were performed at the Shumakov National Medical Research Center of Transplantology and Artificial Organs, 6 transplants at Sklifosovsky Research Institute of Emergency Care, and two at Pavlov First St. Petersburg State Medical University. In 2018, Shumakov National Medical Research Center of Transplantology and Artificial Organs also performed three heart–lung transplants.

In 2018, a total of 505 liver transplants were done – 3.4 per million population. This is more than in previous years, especially in 2017 (438), +15.3%.

Liver transplants were performed at 28 centers.

In 2018, four new liver transplant programs were launched. Specifically, Botkin City Clinical Hospital (Moscow) performed 10 transplantations from posthumous organ donors; Irkutsk Regional Clinical Hospital (Irkutsk) conducted one liver transplant from a posthumous donor.

In 2018, the five Moscow-based transplant centers retained their share in liver transplantation – 68.7% (347 transplants) – against the 68.3% (299 transplants) recorded in 2017.

Table 10 and Fig. 9 present liver transplant centers, where the highest liver transplants were done as of the end of 2018.

In 2018, four transplant centers performed over 20 liver transplants each. They are the Shumakov National Medical Research Center of Transplantology and Artificial Organs (176 liver transplant surgeries), Sklifosovsky Research Institute of Emergency Care (90), Burnazyan Federal Medical and Biophysical Center (45) and State Novosibirsk Regional Clinical Hospital (36).

Related liver transplants were performed in 9 centers. The proportion of living related donor transplantations was 164 (32.5%). In 2017, there were 11 centers that performed 131 related liver transplants (29.9%).

In 2018, a total of 133 pediatric (mostly young children) liver transplants were performed against 106 (+25.5%) in 2016. Three centers performed pediatric liver transplants: Shumakov National Medical Research Center of Transplantology and Artificial Organs (123), Petrovsky National Research Centre of Surgery (7) and State Novosibirsk Regional Clinical Hospital (3). See Fig. 10.

In 2018, six transplantation centers performed pancreas transplants. A total of 17 pancreas transplants were

done (against 6 in 2017), of which 16 were in conjunction with kidney.

There were 832 extrarenal transplants performed in 2018 or 37.9% of the total number (2193) of transplants (against 721 or 38.0% of 1896 recorded in 2017). Transplant centers located in Moscow and Moscow Oblast remain key players in extrarenal organ transplantation in the country. In 2018, the two performed 593 extrarenal

Table 10

The medical organizations – leaders in number of transplantations of a liver

Rank	Leading centers in terms of number of liver transplants performed	Number of liver transplants performed in 2018
1	Shumakov National Medical Research Center of Transplantology and Artificial Organs, Moscow, Central Federal District	176
2	Sklifosovsky Research Institute of Emergency Care, Moscow, Central Federal District	90
3	Burnazyan Federal Medical and Biophysical Center, Moscow, Central Federal District	45
4	State Novosibirsk Regional Clinical Hospital, Novosibirsk, Siberian Federal District	36
5	Vladimirsky Moscow Regional Research Clinical Institute, Moscow, Central Federal District	17
6	Volga Regional Medical Center, Nizhny Novgorod, Volga Federal District	17
7	Russian Research Center for Radiology and Surgical Technologies, St. Petersburg, Northwestern Federal District	15
8	Sverdlovsk Regional Clinical Hospital No. 1, Yekaterinburg, Ural Federal District	15
9	Rostov Regional Clinical Hospital, Rostov-on-Don, Southern Federal District	14
10	Ochapovsky Regional Clinical Hospital No. 1, Krasnodar, Southern Federal District	13
	TOTAL	438
	86.7% (505) of the total number of liver transplants in the Russian Federation	

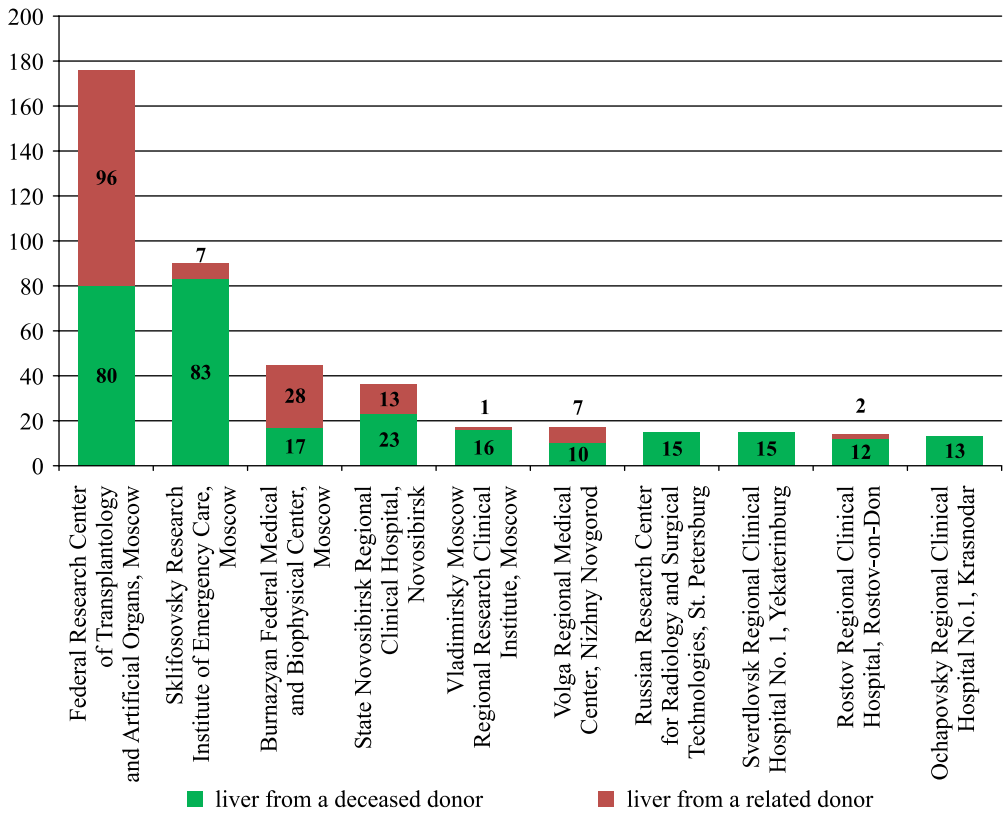

Fig. 9. The medical organizations – leaders in number of transplantations of a liver

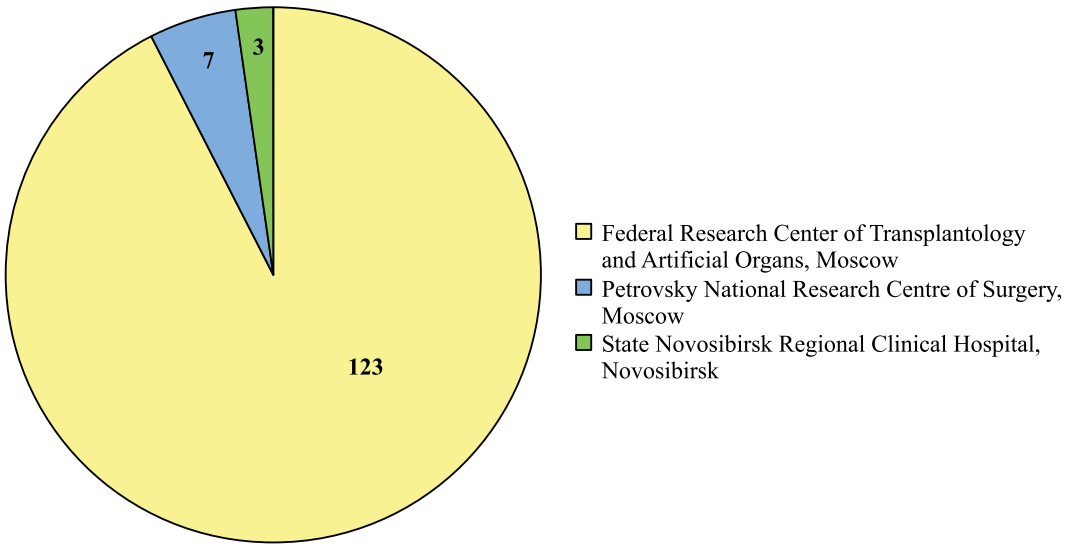

Fig. 10. Pediatric liver transplantation in the Russian Federation in 2018

organ transplantations (71.3%) against 514 (71.3%) in 2017.

Over the observation period (from 2006 to 2018), the number of extrarenal organ transplants in Russia increased by 723 (7.8 times). See Fig. 11. In the total number of transplants, the proportion of extrarenal transplantations increased by 22.0%.

Table 11 contains information on the dynamics of the number of organ transplants performed in Russia in 2006–2018.

ORGAN TRANSPLANT RECIPIENTS

Information on the number of patients in Russia with transplanted organs (from 2013 to 2018), obtained from the Federal Registry of the Ministry of Health of the Russian Federation (see Order No. 2323-r of the Government of the Russian Federation dated October 23, 2017; Decree No. 404 of the Government of the Russian Federation dated April 26, 2012), is presented in Table 12.

According to information from the Federal Registry, there were 15,810 patients with transplanted organs in 2018 in Russia (107.6 per million population). Among these patients, 10,851 (73.9 per million population) had a kidney transplant, 2,632 (17.9 per million population) had liver transplant, and 1,164 (7.9 per million) had heart transplant.

Over the 6 years of observation (from 2013), organ transplant recipients in Russia has increased in number by 7,257 (84.8%).

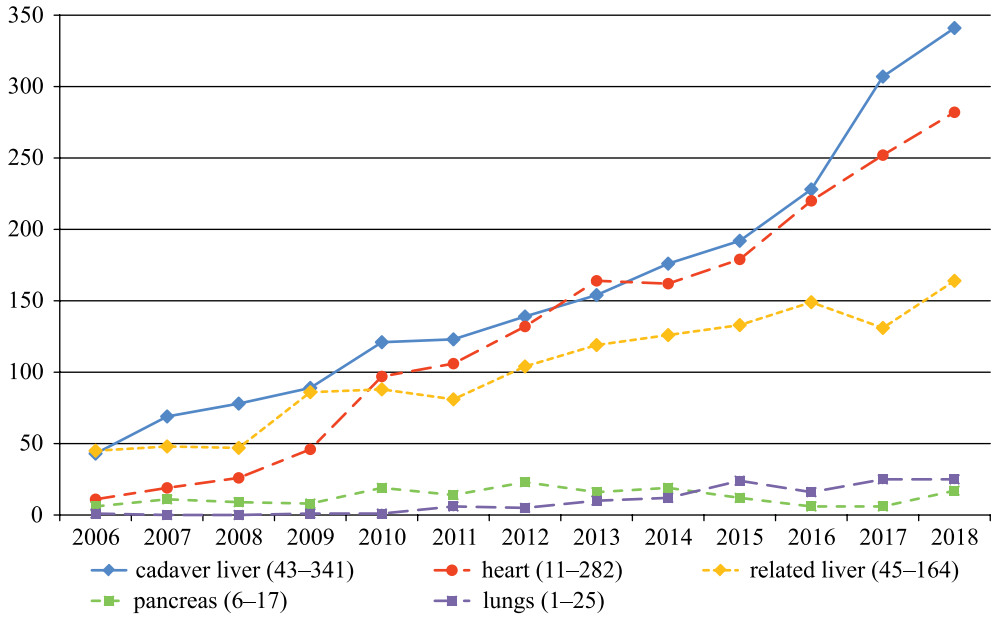

Fig. 11. Nonrenal solid organ transplantation in 2006–2018

Table 11

Organ transplantation in the Russian Federation in 2006–2018

S/N	Organ	2006	2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018	
		Absolute number	Absolute number	Change for the year	Absolute number	Change for the year	Absolute number	Change for the year	Absolute number	Change for the year	Absolute number	Change for the year	Absolute number	Change for the year	Absolute number	Change for the year	Absolute number	Change for the year	Absolute number	Change for the year	Absolute number	Change for the year	Absolute number	Change for the year	Absolute number	Change for the year
1	Kidney (total)	556	666	+110	782	+116	830	+48	1037	+207	975	–62	941	–34	935	–6	1026	+91	945	–81	1084	+139	1175	+91	1361	+186
2	including cadaver	417	527	+110	637	+110	666	+29	867	+201	796	–71	746	–50	747	+1	836	+89	755	–81	852	+97	974	+122	1161	+187
3	and from a living related donor	139	139	0	145	+6	156	+11	170	+14	179	+9	195	+16	188	–7	190	+2	190	0	232	+42	201	–31	200	–1
4	Liver (total)	88	117	+29	125	+8	175	+50	209	+34	204	–5	243	+39	272	+29	302	+30	325	+23	378	+53	438	+60	505	+67
5	including cadaver	43	69	+26	78	+9	89	+11	121	+32	123	+2	139	+16	154	+15	176	+22	192	+16	229	+37	307	+78	341	+34
6	and from a living related donor	45	48	+3	47	–1	86	+39	88	+2	81	–7	104	+23	119	+15	126	+7	133	+7	149	+16	131	–18	164	+33
7	Heart	11	19	+8	26	+7	46	+20	97	+51	106	+9	132	+26	164	+32	162	–2	179	+17	220	+41	252	32	282	+30
8	Pancreas	6	11	+5	9	–2	8	–1	19	+11	14	–5	23	+9	14	–9	19	+5	12	–7	6	–6	6	0	17	+11
9	Lungs	1	0	–1	0	0	1	+1	1	0	6	+5	5	–1	10	+5	12	+2	14	+2	16	+2	25	+9	25	0
10	Heart-lung										2	+2	2	0	1	–1	0	–1	0	0	0	0	0	0	3	+3
11	Small intestine														1	+1	1	0	0	–1	0	0	0	0	0	0
	Total	662	813	+151	942	+129	1060	+118	1363	+303	1307	–56	1345	+38	1400	+55	1522	+122	1485	–37	1704	+219	1896	+192	2193	+297

Table 12

Number of patients with transplanted organs in the Russian Federation in 2013–2018

ICD code	Number of patients in the registry										
	2013	2014		2015		2016		2017		2018	
		Absolute	Change (%)	Absolute	Change (%)	Absolute	Change (%)	Absolute	Change (%)	Absolute	Change (%)
Z94.0 Kidney transplant status	6651	7502	12.8	8164	8.8	9063	11.0	9658	6.6	10,851	12.4
Z94.1 Heart transplant status	416	520	25.0	639	22.9	803	25.7	952	18.6	1164	22.3
Z94.2 Lung transplant status	2	3	50.0	4	33.3	5	25.0	8	60.0	28	250.0
Z94.4 Liver transplant status	1150	1406	22.3	1649	17.3	1948	18.1	2152	10.5	2632	22.3
Z94.8 Other transplanted organ and tissue status (bone marrow, intestines, pancreas)	334	467	39.8	654	40.0	808	23.5	909	12.5	1135	24.9
TOTAL	8553	9898	15.7	11,110	12.2	12,627	13.7	13,679	8.3	15,810	15.6

CONCLUSION

Results recorded in 2018 show a long-term trend – organ transplant surgeries in Russia is increasing in number (10–15% per year). Over the past year, over 2,000 (precisely 2193) organ transplants were performed in Russia for the first time.

Apart from the increasing number of organ transplants, the current trend is characterized by the following:

The geographic spread of transplant centers continues to expand,

The number of transplantation centers and their transplantation activity are increasing (21 transplants per center in 2006, and 38 in 2018),

Efficiency of donor programs (proportion of brain death diagnoses, proportion of multi-organ procurements, average number of organs procured from one donor) are all increasing,

Extrarenal transplantation technologies are being deployed in Russian regions,

Higher number of patients on organ transplant waitlists,

Lower waitlist mortality rates;

The number of organ transplant recipients in need of follow-up care and treatment is increasing.

In Russia, demand for organ transplantation still exceeds organ availability. In 2018, there were over 9,000 patients on organ transplant waitlists and the number continues to grow. Therefore, provision of adequate medical support for waitlisted patients requires special attention. This includes applying separate tariffs for such patient models in the compulsory health insurance system.

Shortages in donor organs in Russia is still down to human causes – lack of or insufficient medical organ donation activities in Russian regions. In this regard, the issue of responsibility (irresponsibility) of heads of regions, regional health care and medical organizations on organizing medical organ donation activities remains an urgent one.

Government funding, as well as the funding sources and mechanisms for bringing the funds down to organ donation and transplantation organizations remain key factors determining the extent of transplant care to the population. One of the approaches to increasing the availability of kidney transplant care could be, for example, by incorporating it into the basic compulsory health insurance program, while retaining the financial cost standards. By so doing, the government would be creating equal conditions for financing different types of renal replacement therapy. Besides, patients will be able to choose the type of treatment that they think is preferable, more effective and safer.

In 2018, transplant activity in transplantation centers varied widely. However, only those medical organizations where such high-tech surgeries are regularly performed can guarantee the quality and safety of organ transplants. The Shumakov National Medical Research Center of Transplantology and Artificial Organs recommends that regions and medical institutions should optimize their transplantation programs for certain reasons: to avoid having too many transplantation centers, to ensure that the number of such centers is dictated by demand, donor, staffing and financial level, and also to ensure that there is an acceptable level of transplantation activity (at least 30–40 organ transplants per year).

The effectiveness of organ transplantation as a treatment method will be fully recognized only when long-term survival and functioning of transplants are guaranteed. Therefore, as the number of organ transplant

recipients in Russia increases (almost 16,000 people at present), regions, chief external experts and medical organizations should focus particularly on proper organization of medical and drug support for the recipients – being guided by medical care protocols and standards, as well as national clinical recommendations for transplantation.

In 2019, the Shumakov National Medical Research Center of Transplantology and Artificial Organs continues to serve as a national medical research center in the area of transplantation – the Center performs organizational and methodological management functions, including on-site "audits" in Russian regions and remote consultations using telemedicine technologies; it also serves as a monitor, doing analytical work and training specialists.

The authors declare no conflict of interest.

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