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ORGAN DONATION AND TRANSPLANTATION IN THE RUSSIAN FEDERATION IN 2019

12TH REPORT FROM THE REGISTRY OF THE RUSSIAN TRANSPLANT SOCIETY

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Objective: to monitor current trends and developments in organ donation and transplantation in the Russian Federation based on the 2019 data. **Materials and methods.** Heads of organ transplant centers were surveyed. Data obtained over years from federal subjects of the Russian Federation and from organ transplant centers in the country were analyzed and compared. **Results.** Based on data retrieved from the 2019 Registry, only 46 kidney, 31 liver and 17 heart transplant centers were functioning in Russia. In 2019, there were 6,878 potential recipients in the kidney transplant waitlist. This represents 13.7% of the 50,000 dialysis patients in the country. Donation activity in 2019 reached 5.0 per million population; multi-organ procurement rate was 71.6%; 2.9 organs on average were procured from one effective donor. In 2019, there were 10.0 kidney transplants per million population, 4.0 liver transplants per million population and 2.3 heart transplants per million people. Same year, the number of transplant surgeries performed in Russia rose 10.7% from the previous year. Moscow and Moscow Oblast alone have 13 functioning organ transplantation centers. They account for half of all kidney transplant surgeries and 70% of all liver and heart transplants performed in the country. Organ recipients in the Russian Federation have exceeded 16,000 in number. **Conclusion.** Organ transplantations in Russia keep on increasing – 10–15% per year. Donor and transplant programs are also becoming more effective and efficient. However, the demand for organ transplants far exceeds the current supply of available organs in the Russian Federation. Peculiarities of the development of organ donation and organ transplantation in Russia in 2019 were associated with some factors, such as structure and geographical location of transplant centers, waitlisting of patients, funding sources and amount, and management of donor and transplant programs. The national transplantation registry will be developed taking into account new monitoring and analysis challenges.

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

INTRODUCTION

Current trends and developments in organ donation and transplantation in Russia are monitored via the National Registry under the auspices of the organ transplant commission of the Russian Ministry of Health and the Russian Transplant Society. Previous reports have been published in 2009–2019 [1–10].

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), and Registries of the International Society for Heart and Lung Transplantation (ISHLT Registries).

Since 2016, the National Registry has been serving as a tool for ensuring quality control and data integrity in the information system used for recording donor organs, human tissues, and information about donors and recipients. The information system was created by executive order No. 355n of the Ministry of Health of Russia, dated June 8, 2016.

Annual reports of the Registry contain not only statistical data for the reporting period, but also systems analysis of the data with an assessment of the current situation in transplantology, challenges, trends and prospects for further development in this healthcare sector.

Since 2019, the Registry has also been popularly used for monitoring the implementation of departmental target program "Organ Donation and Transplantation in the Russian Federation", approved via executive order No. 365 of the Russian Ministry of Health, dated June 4, 2019.

Data entered in the Registry is collected via a questionnaire survey of the relevant officials at all transplant centers in the Russian Federation. Data gathered over

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years from Russian regions, transplant centers 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, as well as to the Russian Ministry of Health and the Central Research Institute for Healthcare Organization and Informatization of the Russian Ministry of Health.

TRANSPLANT CENTERS AND WAITING LISTS

As of December 31, 2019, there were 58 organ transplantation centers functioning in Russia (60 in 2018). Kidney transplant was performed at 46 of these 58 centers, liver transplantation in 31, heart transplantation in 17, pancreatic transplantation in 2, and lung transplantation in 3 centers.

Of the 58 functioning transplantation centers: 21 institutions are subordinate to the federal government, including 13 institutions from the Russian Ministry of Health, 2 from the Russian Ministry of Science and Higher Education, 5 from the Federal Biomedical Agency (FMBA), 1 from the Russian Ministry of Defense, and 37 institutions are run by the federal subjects of the Russian Federation.

The structure of transplantation centers, taking into account their departmental affiliation to kidney, liver and heart transplantation programs in the Russian Federation in 2019 is presented in Fig. 1.

Major contributions to transplantation programs in Russia came from the medical organizations owned by federal subjects of the Russian Federation and national medical research centers of the Russian Ministry of Health.

Medical organizations owned by federal subjects of the Russian Federation account for about 62.7% of the total number of kidney transplants, 53.1% of liver, and 18.5% of heart transplants performed in Russia.

Approximately 21.7% of the total number of kidney transplants, 29.1% of liver transplants, and 76.1% of heart transplants performed in Russia were carried out at national medical research centers of the Russian Ministry of Health.

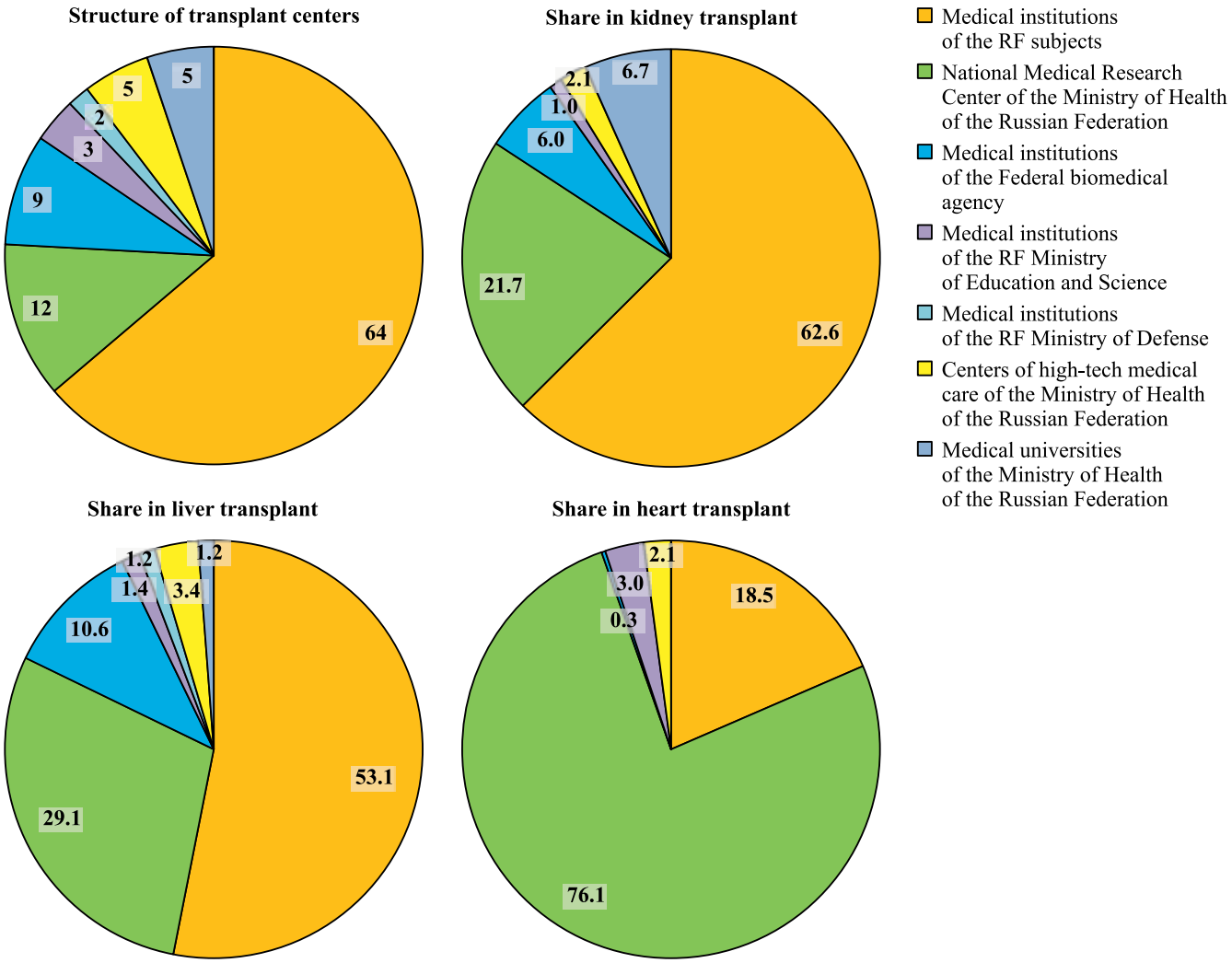

Fig. 1. Contribution of the centers of organ transplantation taking into account their departmental accessory to kidney, liver and heart transplantation programs in the Russian Federation in 2019, %

Other transplant centers in the country accounted for 15.7% of total number of kidney transplants, 17.8% of liver transplants, and 5.4% of all heart transplants performed in Russia.

The 58 transplantation centers operating in the Russian Federation are located in 32 federal subjects of the Russian Federation with a total population of 99.5 million people. Of these centers, 13 are in Moscow and Moscow Oblast, while 7 centers are operating in St. Petersburg and Leningrad Oblast (Fig. 2).

53 federal subjects of the Russian Federation with a population of 47.3 million people do not have any transplant centers on their territory, despite existing need for organ transplantation (primarily patients on renal replacement therapy) and an unused donor organ resource [11].

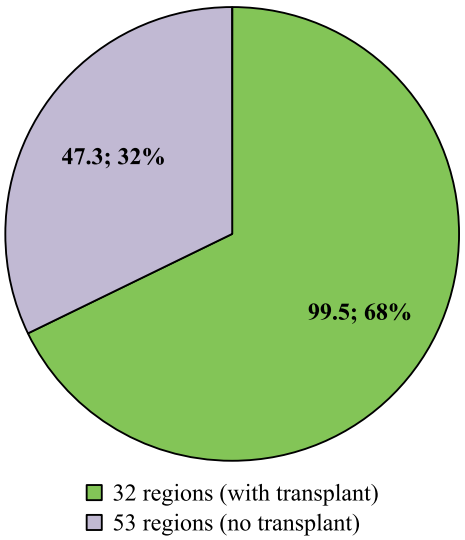

Fig. 2. Geography of the centers of organ transplantation in the Russian Federation in 2019

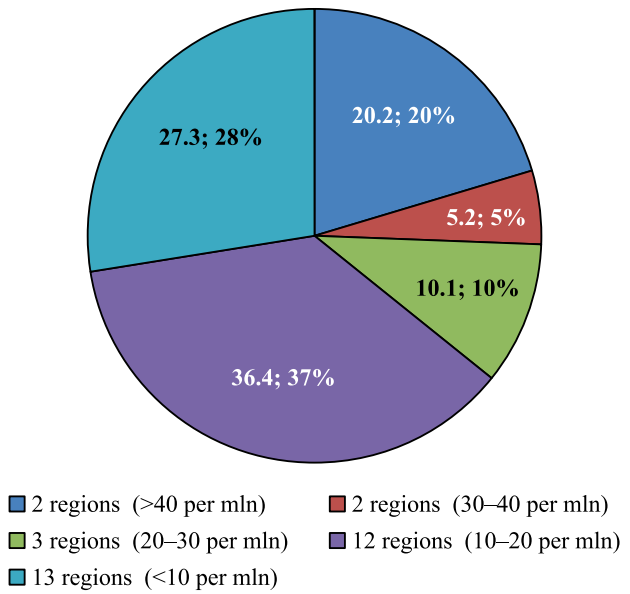

Fig. 3. The population of the Russian Federation living in regions with different availability of medical care for organ transplantation

The transplantation activity of centers located in the federal subjects of the Russian Federation varies considerably. A significant part of the country's population still lives in regions with low accessibility of medical assistance for organ transplantation (Fig. 3).

As the geographical coverage of transplant programs in Russia expands, the vector of managerial decisions aimed at increasing the availability and quality of transplant care for the population will shift from extensive replication of such programs in the federal subjects of the Russian Federation to higher effectiveness of existing programs. Moreover, the potential for extensive replication of transplant programs in the federal subjects of the Russian Federation has not yet been exhausted.

Table 1 presents data on the number of waitlisted transplant candidates at transplant centers.

In 2019, Russia had 6,878 potential recipients on the kidney transplant waiting list, i.e. 13.7% of the total number of patients on hemodialysis and peritoneal dialysis (approximately 50,000). Of these, 2,053 were waitlisted in 2019 for the first time. In Moscow and Moscow Oblast, 2,335 potential recipients (33.9% of waitlisted candidates in the country) were on the kidney transplant waitlist. The waiting list in the Russian Federation had a 0.9% mortality rate (62 patients) in 2019.

There were 2,060 potential recipients on the liver transplant waiting list in 2019; 889 were waitlisted for the first time in 2019. In Moscow and Moscow oblast, 665 potential recipients (32.3% of the waiting list in the country) were included in the liver transplant waitlist. Liver transplant waitlist mortality in Russia in 2019 was 8.2% (170 patients).

There were 789 patients waitlisted for heart transplantation in 2019; 303 of them were included in the waiting list for the first time in 2019. In Moscow, the heart transplantation waiting list had 317 potential recipients (40.2% of the waiting list in the country). Heart transplant waitlist mortality in Russia was 6.7% (53 patients).

The dynamics of waitlist indicators for organ transplantation in Russia from 2012 to 2019 is presented in Table 2.

From 2012 to 2019, the number of patients in the kidney transplant waiting list in Russia increased by almost twice, the liver transplant waiting list increased by 4.2 times, while that of heart transplant increased by 2 times. Meanwhile, the average waiting time for organ transplantation remained unchanged. On the contrary, waitlist mortality fell by 64.0%, 31.1%, and 13.0% for kidney, liver and heart transplants respectively.

Based on data obtained on the number of candidates waitlisted for kidney transplant and on the transplant activity of medical organizations in 2019, the kidney transplant waiting time in the federal subjects of the Russian Federation was calculated (Fig. 4).

Table 1

Waiting lists for organ transplantation in the regions of the Russian Federation in 2019

Federal district, region, population in 2019 (mln)* Transplant	Russian Federation	Central Federal District					Southern Federal District			North Caucasian Federal District	Northwestern Federal District		Siberian Federal District						Urals Federal District				Volga Federal District								Far Eastern Federal District
		Moscow & Moscow Region	Belgorod Oblast	Voronezh Oblast	Ryazan Oblast	Tula Oblast	Krasnodar Kraj	Volgograd Oblast	Rostov Oblast	Stavropol Kraj	Saint Petersburg and Leningrad region	Arkhangelsk Oblast without Nenets Autonomous District	Novosibirsk Oblast	Kemerovo Oblast	Irkutsk Oblast	Omsk Oblast	Altai Kraj	Krasnoyarsk Kraj	Sverdlovsk Oblast	Tyumen Oblast without autonomous districts	Khanty-Mansiisk autonomous district – Yugra	Chelyabinsk Oblast	Samara Oblast	Saratov Oblast	Nizhny Novgorod Oblast	Republic of Tatarstan	Republic of Bashkortostan	Orenburg Oblast	Perm Kraj	Ulyanovsk Oblast	Sakha Republic (Yakutia)
	146.8	**12.6**	**1.5**	**2.3**	**1.1**	**1.5**	**5.6**	**2.5**	**4.2**	**2.8**	**5.4**	**1.1**	**2.8**	**2.7**	**2.4**	**1.9**	**2.3**	**2.9**	**4.3**	**1.5**	**1.7**	**3.5**	**3.2**	**2.4**	**3.2**	**3.9**	**4.0**	**2.0**	**2.6**	**1.2**	**1.0**
		7.6									**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																															
Transplant Centers	**46**	12	1	1	1	1	1	1	1	1	4	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1
New patients in the waiting list in 2019	**2053**	806	8	12	29	13	75	25	48	6	260	10	59	72	25	42	22	62	30	12	42	12	61	33	71	78	44	30	26	38	12
Total number of patients in the waiting list in 2019	**6878**	2335	54	111	46	13	393	133	127	6	375	70	146	182	74	102	111	179	253	97	153	150	272	129	502	293	241	104	117	38	72
Patients in the waiting list as of December 31, 2019	**5339**	1584	42	95	32	10	356	110	92	0	262	66	104	109	51	98	90	140	210	68	140	137	226	108	475	254	197	78	112	31	62
Parients in the waiting list died in 2019	**62**	15	4	2	3	1	1	2	1	0	5	0	2	0	1	0	4	2	0	3	1	1	2	2	3	0	4	1	0	2	0
LIVER																															
Transplant Centers	**31**	6	1	0	1	0	2	0	1	1	4	0	1	1	1	1	1	2	1	0	1	1	1	0	1	1	1	0	0	0	1
New patients in the waiting list in 2019	**889**	457	2	0	31	0	22	0	66	2	43	0	35	18	20	5	8	25	29	0	7	4	6	0	44	48	15	0	0	0	2
Total number of patients in the waiting list in 2019	**2060**	665	69	0	31	0	74	0	157	2	247	0	79	72	20	5	44	45	127	0	7	29	14	0	196	62	95	0	0	0	20
Patients in the waiting list as of December 31, 2019	**1288**	238	66	0	5	0	46	0	116	0	201	0	35	59	1	4	42	25	97	0	3	27	2	0	179	41	85	0	0	0	16
Parients in the waiting list died in 2019	**170**	51	0	0	4	0	15	0	24	0	11	0	4	5	5	0	0	5	15	0	0	1	8	0	5	8	6	0	0	0	3

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
HEART																															
Transplant Centers	**17**	4	1	0	0	0	1	0	1	0	1	0	1	1	0	0	1	2	1	0	0	1	0	0	0	1	1	0	0	0	0
New patients in the waiting list in 2019	**303**	133	4	0	0	0	43	0	9	0	34	0	19	16	0	0	7	9	14	0	0	1	0	0	0	8	6	0	0	0	0
Total number of patients in the waiting list in 2019	**789**	317	14	0	0	0	101	0	25	0	70	0	49	67	0	0	9	35	50	0	0	10	0	0	0	16	26	0	0	0	0
Patients in the waiting list as of December 31, 2019	**405**	80	12	0	0	0	88	0	17	0	38	0	25	46	0	0	7	18	34	0	0	8	0	0	0	11	21	0	0	0	0
Parients in the waiting list died in 2019	**53**	10	1	0	0	0	2	0	2	0	7	0	9	11	0	0	0	3	5	0	0	1	0	0	0	1	1	0	0	0	0
PANCREAS																															
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
New patients in the waiting list in 2019	**14**	10	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total number of patients in the waiting list in 2019	**110**	106	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Patients in the waiting list as of December 31, 2019	**100**	97	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parients in the waiting list died in 2019	**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	0	0
LUNGS																															
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
New patients in the waiting list in 2019	**46**	45	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
Total number of patients in the waiting list in 2019	**80**	79	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
Patients in the waiting list as of December 31, 2019	**48**	48	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
Parients in the waiting list died in 2019	**7**	7	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/Popul2019.xls.

Table 2

The indicators connected with the waiting list of organ transplantation in the Russian Federation during the period from 2012 to 2019

Parameter	2012	2013	2014	2015	2016	2017	2018	2019
Number of patients in kidney transplant waiting list	3276	4172	4636	4167	4818	5401	6219	6878
Average waiting time, years	4.4	5.6	5.5	5.5	5.7	5.5	4.6	4.7
Mortality while in the waiting list, %	2.5	3.0	1.2	2.0	1.6	1.4	0.9	0.9
Number of patients in liver transplant waiting list	488	765	949	1062	1260	1535	1830	2060
Average waiting time, years	3.5	5.0	5.4	5.5	5.5	5.0	3.6	3.5
Mortality while in the waiting list, %	11.9	8.8	9.3	10.8	6.7	9.2	8.4	8.2
Number of patients in heart transplant waiting list	399	402	428	434	497	692	823	789
Average waiting time, years	3.0	2.5	2.6	2.4	2.3	2.7	2.9	2.3
Mortality while in the waiting list, %	7.7	12.4	10.5	9.2	7.4	6.1	5.8	6.7

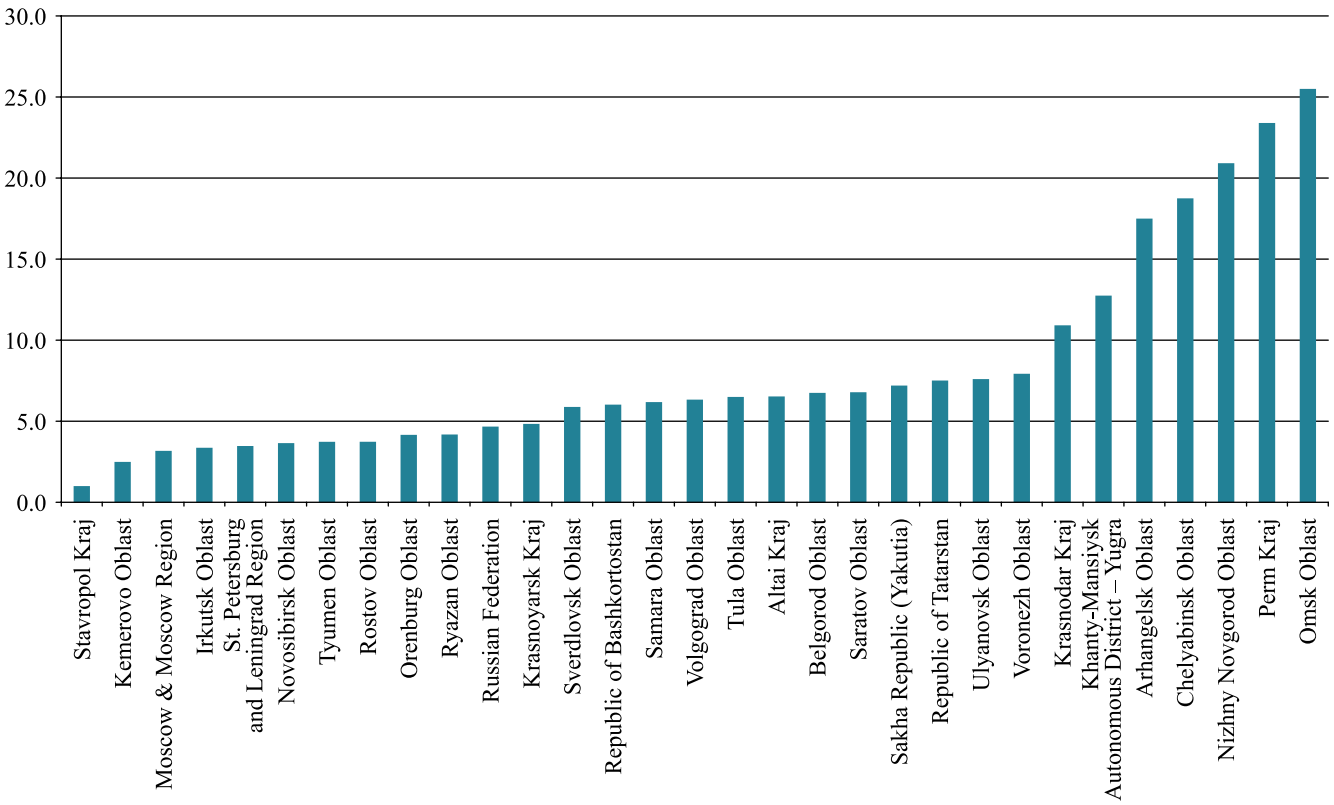

Fig. 4. Estimated waiting period for kidney transplantation in the regions of the Russian Federation in 2019, years

Long waiting times for kidney transplantation typically indicate low activity of donor and transplantation programs in the federal subjects and (or) insufficient work with the waiting list. A long waiting list has quite predictable negative consequences – higher number of patients (recipients) with associated diseases and complications of renal replacement therapy, with additional risks when treating with a kidney transplant, and the cost of such treatment. Moreover, there is significant financial cost for long-term medical and drug support for waitlisted candidates.

Lack of sufficient number of waitlisted candidates is an obstacle to optimal immunological selection of a donor/recipient pair. It poses the risk of not using a suitable organ for transplantation due to absence of a recipient, and also does not allow justifying and planning the need for kidney transplantation medical care.

In 2019, 2427 organ transplants were performed in Russia, or 16.5 per million population; 227 of them were pediatric transplants. In 2018, it was 2193 transplants or 14.9 per million population). See Tables 3 and 4.

Based on data obtained from the Federal Registry for High-Tech Medical Care, 2,119 (87.3%) organ transplant

Table 3

Organ donation and transplantation in the Russian Federation in 2019

Parameter	Qty (abs.)	Per 1 mln*
Organ donation		
Organ donors, total	1062	7,2
Cadaver donors	732	5,0
Live (relative) donors	330	2,2
Organ transplant		
Organs transplanted, total	2427	16,5
of these, in juveniles	227	1,5
Kidney,	1473	10,0
incl. cadaver	1290	8,8
from live donor	183	1,2
of these, in juveniles	101	0,7
Liver,	584	4,0
incl. cadaver	437	3,0
from live donor	147	1,0
of these, in juveniles	113	0,8
Heart	335	2,3
of these, in juveniles	11	0,1
Pancreas	10	0,1
Lungs	23	0,2
of these, in juveniles	2	0,0

* – The RF population in 2019: 146.8 mln (http://www.gks.ru/free_doc/new_site/population/demo/Popul2019.xls).

Table 4

Transplantation activity in the Russian Federation in 2019

No.	Transplant center, region, federal district	Total	Kidney, total	Kidnay, cadaver	Kidney, relative	Liver, tota	Liver, cadaver	Liver, relative	Heart	Pancreas	Lungs	Heart/lungs complex	Small intestine
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	FGBU V.I. Shumakov National Medical Research Center for Transplant and Artificial Organs, RF Ministry of Health, Moscow, Central Federal District	**646**	**240**	172	68	**170**	85	85	**212**	**6**	**16**	**2**	**0**
2	N.A. Lopatkin Research Institute of Urology and Interventional Radiology, branch of FGBU Scientific Medical Research Center for Radiology, RF Ministry of Health, Moscow, Central Federal District	**53**	**53**	39	14	**0**	0	0	**0**	**0**	**0**	**0**	**0**
3	FGBU Russian Children's Clinical Hospital, RF Ministry of Health, Moscow, Central Federal District	**31**	**31**	31	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
4	FGBNU B.V. Petrovsky Russian Scientific Center for Surgery, Moscow, Central Federal District	**23**	**15**	7	8	**8**	0	8	**0**	**0**	**0**	**0**	**0**
5	FGBU A.I. Burnazyan State Scientific Center of the Russian Federation - Federal Medical Biophysical Center, FMBA of Russia, Moscow, Central Federal District	**59**	**14**	11	3	**45**	15	30	**0**	**0**	**0**	**0**	**0**
6	FGBU A.N. Bakulev National Medical Research Center for Cardiovascular Surgery, RF Ministry of Health, Moscow, Central Federal District	**3**	**0**	0	0	**0**	0	0	**3**	**0**	**0**	**0**	**0**

Continuation table 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14
7	FGBU National Medical Research Center for Hematology, RF Ministry of Health, Moscow, Central Federal District	**3**	**3**	3	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
8	FGANU National Medical Research Center for Children's Health, RF Ministry of Health, Moscow, Central Federal District	**23**	**23**	2	21	**0**	0	0	**0**	**0**	**0**	**0**	**0**
9	GBUZ, Moscow S.P. Botkin City Clinical Hospital of the Moscow Healthcare Department, Moscow, Central Federal District	**75**	**50**	50	0	**25**	25	0	**0**	**0**	**0**	**0**	**0**
10	GBUZ, Moscow N.V. Sklifosovsky Research Institute of Emergency Medicine of the Moscow Healthcare Department, Moscow, Central Federal District	**354**	**230**	229	1	**103**	103	0	**12**	**3**	**6**	**0**	**0**
11	GBUZ, Moscow Scientific Research Institute of Emergency Pediatric Surgery and Traumatology of the Moscow Healthcare Department, Moscow, Central Federal District	**3**	**3**	3	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
12	GBUZ MO M.F. Vladimirsky Moscow Regional Research Clinical Institute, Moscow, Central Federal District	**74**	**49**	47	2	**25**	17	8	**0**	**0**	**0**	**0**	**0**
13	FGBU Federal Clinical High MedTech Center of the Federal Medical and Biological Agency, Moscow Region, Central Federal District	**26**	**25**	18	7	**0**	0	0	**1**	**0**	**0**	**0**	**0**
14	GBUZ Belgorod St. Joasaph Regional Clinical Hospital, Belgorod, Central Federal District	**12**	**8**	8	0	**3**	3	0	**1**	**0**	**0**	**0**	**0**
15	BUZ VO Voronezh Regional Clinical Hospital No. 1, Voronezh, Central Federal District	**14**	**14**	14	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
16	GUZ TO Tula Regional Clinical Hospital, Tula, Central Federal District	**2**	**2**	2	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
17	GBU RO Ryazan Regional Clinical Hospital, Ryazan, Central Federal District	**13**	**11**	11	0	**2**	2	0	**0**	**0**	**0**	**0**	**0**
18	GBUZ SK Stavropol Regional Clinical Hospital, Stavropol, North Caucasian Federal District	**8**	**6**	6	0	**2**	2	0	**0**	**0**	**0**	**0**	**0**
19	GBUZ S.V. Ochapovsky Regional Clinical Hospital No. 1, Krasnoyarsk Kraj Department of Healthcare, Krasnodar, Southern Federal District	**58**	**36**	32	4	**11**	11	0	**11**	**0**	**0**	**0**	**0**
20	GBUZ Regional Clinical Hospital No. 2, Krasnoyarsk Kraj Department of Healthcare, Krasnodar, Southern Federal District	**2**	**0**	0	0	**2**	2	0	**0**	**0**	**0**	**0**	**0**
21	GBUZ Volzhsky Regional Uronephrological Center, Volzhsky, Southern Federal District	**21**	**21**	20	1	**0**	0	0	**0**	**0**	**0**	**0**	**0**
22	GBU RO Rostov Regional Clinical Hospital, Rostov-on-Don, Southern Federal District	**57**	**34**	34	0	**17**	16	1	**6**	**0**	**0**	**0**	**0**
23	FGBU A.M. Granov Russian Scientific Center for Radiology and Surgical Technologies, RF Ministry of Health, St. Petersburg, Northwestern Federal District	**20**	**0**	0	0	**20**	20	0	**0**	**0**	**0**	**0**	**0**
24	FGBU V.A. Almazov National Medical Research Center, RF Ministry of Health, St. Petersburg, Northwestern Federal District	**25**	**0**	0	0	**0**	0	0	**25**	**0**	**0**	**0**	**0**
25	GBOU VPO I.P. Pavlov Saint Petersburg State Medical University, RF Ministry of Health, St. Petersburg, Northwestern Federal District	**51**	**46**	36	10	**4**	4	0	**0**	**0**	**1**	**0**	**0**

Continuation table 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14
26	GBU I.I. Dzhanelidze Saint Petersburg Research Institute of Emergency Medicine, St. Petersburg, Northwestern Federal District	**46**	**41**	41	0	**4**	4	0	**0**	**1**	**0**	**0**	**0**
27	GBUZ Leningrad Regional Clinical Hospital, St. Petersburg, Northwestern Federal District	**18**	**18**	18	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
28	FGBVOU VO S.M. Kirov Military Medical Academy, St. Petersburg, Northwestern Federal District	**7**	**0**	0	0	**7**	7	0	**0**	**0**	**0**	**0**	**0**
29	SPB GUZ City Mariinsky Hospital, St. Petersburg, Northwestern Federal District	**3**	**3**	3	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
30	GBUZ Arkhangelsk Oblast E.E. Volosevich First City Clinical Hospital, Arkhangelsk, Northwestern Federal District	**4**	**4**	4	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
31	GBU RS(Y) Republican Hospital No. 1 – National Center of Medicine, Yakutsk, Far Eastern Federal District	**11**	**10**	4	6	**1**	1	0	**0**	**0**	**0**	**0**	**0**
32	FGBU E.N. Meshalkin National Medical Research Center, RF Ministry of Health, Novosibirsk, Siberian Federal District	**15**	**0**	0	0	**0**	0	0	**15**	**0**	**0**	**0**	**0**
33	GBUZ NSO State Novosibirsk Regional Clinical Hospital, Novosibirsk, Siberian Federal District	**80**	**40**	36	4	**40**	29	11	**0**	**0**	**0**	**0**	**0**
34	FGBNU Research Institute for Complex Issues of Cardiovascular Diseases, Kemerovo, Siberian Federal District	**10**	**0**	0	0	**0**	0	0	**10**	**0**	**0**	**0**	**0**
35	GBUZ S.V. Belyaev Kemerovo Regional Clinical Hospital, Kemerovo, Siberian Federal District	**73**	**73**	73	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
36	MBUZ M.A. Podgorbunsky City Clinical Hospital, Kemerovo, Siberian Federal District	**11**	**0**	0	0	**11**	11	0	**0**	**0**	**0**	**0**	**0**
37	GBUZ Irkutsk Regional Clinical Hospital, Irkutsk, Siberian Federal District	**36**	**22**	22	0	**14**	14	0	**0**	**0**	**0**	**0**	**0**
38	FGBUZ West Siberian Medical Center, FMBA of Russia, Omsk, Siberian Federal District	**1**	**0**	0	0	**1**	1	0	**0**	**0**	**0**	**0**	**0**
39	BUZOO A.N. Kabanov Omsk City Clinical Hospital No. 1, Omsk, Siberian Federal District	**4**	**4**	4	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
40	KGBUZ Regional Clinical Hospital, Altai Kraj (Barnaul), Siberian Federal District	**21**	**17**	16	1	**2**	2	0	**2**	**0**	**0**	**0**	**0**
41	FGBU Federal Center for Cardiovascular Surgery, Krasnoyarsk, Siberian Federal District	**7**	**0**	0	0	**0**	0	0	**7**	**0**	**0**	**0**	**0**
42	FGBU Federal Siberian Research and Clinical Center of FMBA of Russia, Krasnoyarsk, Siberian Federal District	**29**	**25**	24	1	**4**	4	0	**0**	**0**	**0**	**0**	**0**
43	KGBUZ Regional Clinical Hospital, Krasnoyarsk, Siberian Federal District	**30**	**12**	12	0	**11**	10	1	**7**	**0**	**0**	**0**	**0**
44	GBUZ SO Sverdlovsk Regional Clinical Hospital No. 1, Yekaterinburg, Ural Federal District	**69**	**43**	41	2	**15**	15	0	**11**	**0**	**0**	**0**	**0**
45	GBUZ Chelyabinsk Regional Clinical Hospital, Chelyabinsk, Ural Federal District	**10**	**8**	8	0	**1**	1	0	**1**	**0**	**0**	**0**	**0**
46	GBUZ TO Regional Clinical Hospital No. 1, Tyumen, Ural Federal District	**26**	**26**	26	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
47	BU Regional Clinical Hospital, Khanty-Mansiysk, Ural Federal District	**16**	**12**	10	2	**4**	4	0	**0**	**0**	**0**	**0**	**0**
48	GBOU VPO Samara State Medical University, RF Ministry of Health, Samara, Volga Federal District	**47**	**44**	44	0	**3**	3	0	**0**	**0**	**0**	**0**	**0**

End of table 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14
49	GBOU VPO V.I. Razumovsky Saratov State Medical University, RF Ministry of Health, Saratov, Volga Federal District	**8**	**8**	0	8	**0**	0	0	**0**	**0**	**0**	**0**	**0**
50	GUZ Regional Clinic Hospital, Saratov, Volga Federal District	**11**	**11**	11	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
51	FBUZ Privolzhsky District Medical Center, FMBA of Russia, Nizhny Novgorod, Volga Federal District	**36**	**24**	22	2	**12**	9	3	**0**	**0**	**0**	**0**	**0**
52	GAUZ Republican Clinical Hospital, Ministry of Health, Republic of Tatarstan, Kazan, Volga Federal District	**52**	**39**	30	9	**13**	13	0	**0**	**0**	**0**	**0**	**0**
53	GAUZ Interregional Clinical Diagnostic Center, Kazan, Volga Federal District	**4**	**0**	0	0	**0**	0	0	**4**	**0**	**0**	**0**	**0**
54	GBUZ G.G. Kuvatov Republican Clinical Hospital, Ufa, Volga Federal District	**44**	**40**	40	0	**4**	4	0	**0**	**0**	**0**	**0**	**0**
55	GBUZ Republican Cardiology Outpatient Clinic, Ufa, Volga Federal District	**7**	**0**	0	0	**0**	0	0	**7**	**0**	**0**	**0**	**0**
56	GBUZ PK Perm Regional Clinical Hospital, Perm, Volga Federal District	**5**	**5**	0	5	**0**	0	0	**0**	**0**	**0**	**0**	**0**
57	GUZ E.M. Chuchkalov Ulyanovsk Regional Clinical Center for Specialized Types of Medical Care, Ulyanovsk, Volga Federal District	**5**	**5**	5	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
58	MBUZ City Clinical Emergency Hospital No. 1, Orenburg, Volga Federal District	**25**	**25**	21	4	**0**	0	0	**0**	**0**	**0**	**0**	**0**
Всего за 2019 год		**2427**	**1473**	**1290**	**183**	**584**	**437**	**147**	**335**	**10**	**23**	**2**	**0**

surgeries were performed in 2019 using funds from the compulsory medical insurance system, allocated for provision of high-tech medical care on organ transplant (there were 1732 transplant surgeries (79.0%) in 2018). See Fig. 5.

Since 2010, when funding was included in the Registry as an indicator, the number of organ transplants performed using the funds allocated for provision of high-tech medical care on organ transplant has increased 2.7 times. At the same time, the share of organ transplants performed using these funds has increased by 29.0%.

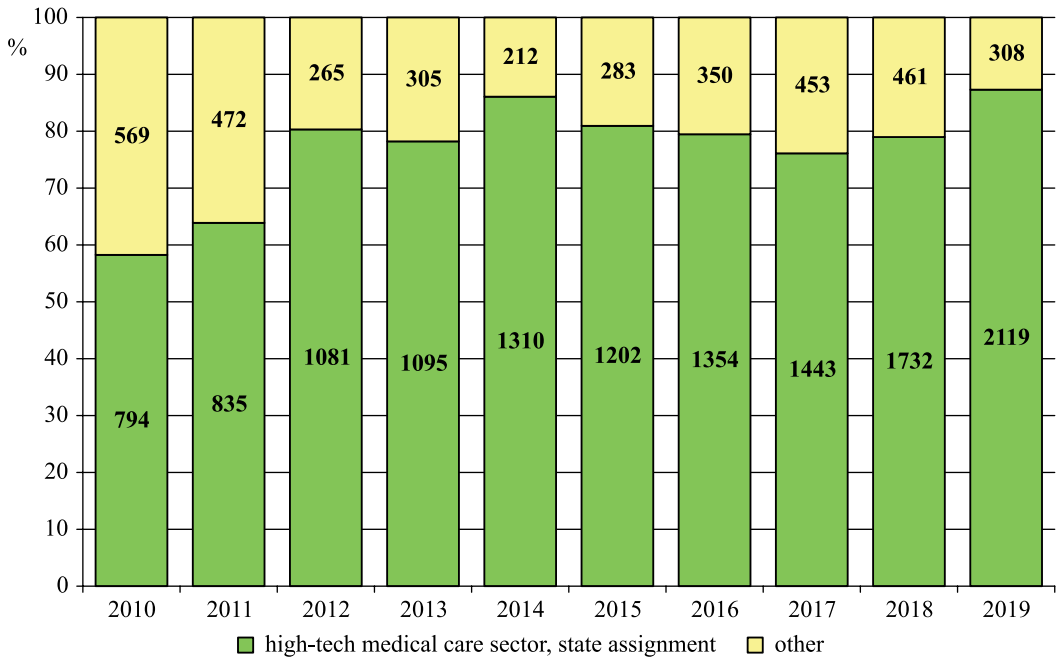

Fig. 5. Financing of transplantation in the Russian Federation in 2010–2019

In 2019, 56 (96.5%) of the 58 transplant centers participated in implementation of state assignment on provision of high-tech medical care for organ transplant.

The financial cost per unit of high-tech medical care for transplantation in 2019 was:

– 923,200 rubles for kidney, pancreas, kidney-pancreas, small bowel, lung transplants;
– 1,171,200 rubles for heart and liver transplants;
– 1,673,420 rubles for heart-lung transplants.

(Resolution No. 1506 of the Government of the Russian Federation, dated December 10, 2018).

ORGAN DONATION

In 2019, donor programs were implemented in 31 (out of 85) federal subjects of the Russian Federation with a population of 96.9 million people. In Perm Oblast, only living-related donor kidney transplants were performed.

There were a total of 732 effective deceased donors in 2019, or 5.0 per million population, which is 93 more donors than in 2018 (639). See Table 5.

In 2019, 43.4% (318) of effective donors in the country came from Moscow and Moscow Oblast alone. Last year's figure was 44.7% (286).

Donor activity per population of federal subjects implementing donor programs (96.9 million) reached 7.5 per 1 million population.

The highest donor activity was recorded in Moscow (22.0), Kemerovo Oblast (14.8), Ryazan Oblast (11.8), St. Petersburg (9.8), Tyumen Oblast (8.7), Novosibirsk Oblast (8.2), Samara Oblast (7.8), and Irkutsk Oblast (6.7). Low donor activity in 2019 was noted in Omsk Oblast (1.1; amid recession), Chelyabinsk Oblast (1.1; recession), Stavropol Krai (1.1; beginning of the program), and Tula Oblast (1.3; beginning of the program). See Table 6.

In 2019, the donor programs of federal subjects were multidirectional in nature (See Table 7).

In 17 federal subjects, effective donors increased in 2019 to 146 donors. Donor activity had a major increase in Moscow (+59), St. Petersburg (+19), Ryazan Oblast (+11), Republic of Tatarstan (+11), Kemerovo donors (+10), and Irkutsk donors (+9).

In 5 federal subjects, effective donors decreased to 48 in 2019. A considerable fall in organ donor activity was observed in Moscow Oblast (–27), Krasnoyarsk Krai, including the FMBA program (–11), and Leningrad Oblast (–8).

In 2019, the practice of brain death pronouncement continued to expand in Russia. There were 692 effective brain-dead donors (601 in 2018) – 94.5% (94.0% in 2018) of the total pool of effective donors. See Fig. 6.

In 25 federal subjects of the Russian Federation, organ donor programs worked only with brain-dead donors (24 federal subjects participated in 2018). At the same time, there were no organ donor programs in the country that did not follow the guidelines for determining human death based on brain death diagnosis.

The low proportion of brain-dead donors in the donor program of Kemerovo Oblast, 47.5% (36.7% in 2018), is not consistent with the modern level of technology development. Moreover, it hampers efficient use of donor resources. This therefore needs to be significantly corrected through targeted implementation and supervision of implementation of the guidelines for determining brain death.

A total of 524 multi-organ procurements were done in 2019, which is more than the 430 recorded in changed from 2017 to 2018. Multi-organ procurements accounted for 71.6% (67.3% in 2018).

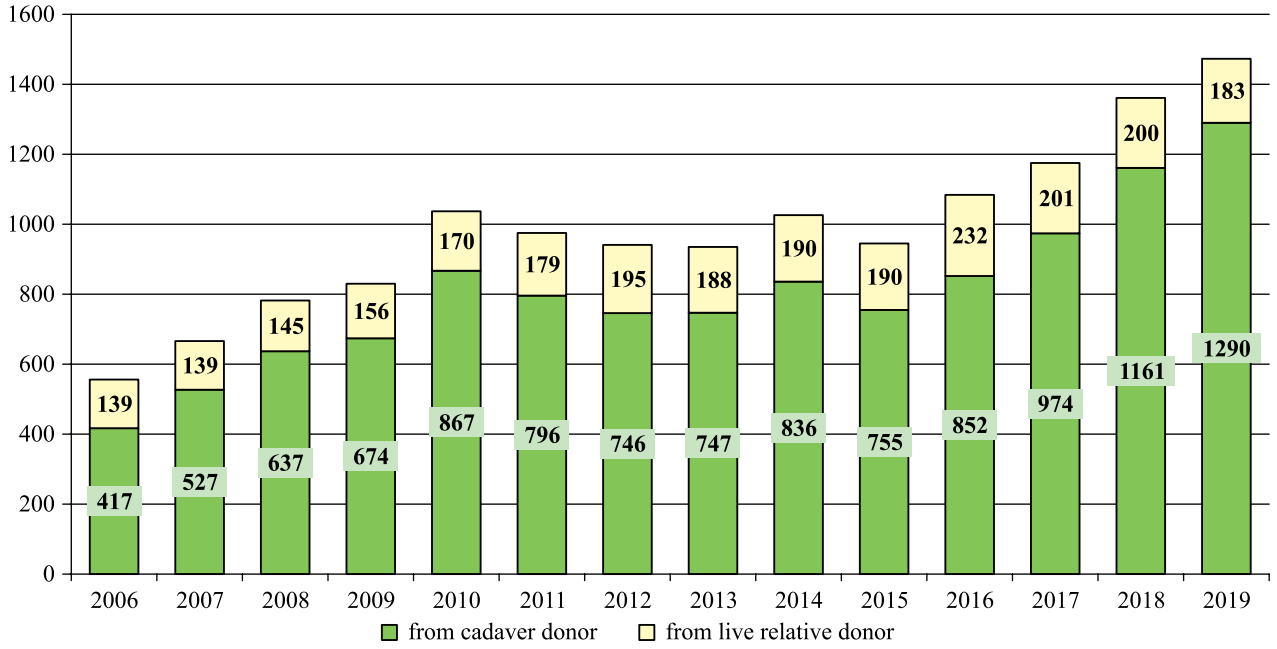

Fig. 6. Structure of effective donors in the Russian Federation in 2006–2019

Table 5

The indicators connected with the organ donation activity in the regions of the Russian Federation in 2019

Nos.	Region	Organ Donation Coordination Center, region	Population (mln)	Number of donor bases	Effective donors (abs., per 1 mln)		incl. with diagnosed brain death (abs., %)		incl. multi-organ donors (abs., %)		Organs prepared, total	incl. kidneys	organs / donors ratio	prepared kidneys, %
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Moscow	Moscow Coordination Center for Organ Donationa, Moscow (GBUZ, Moscow S.P. Botkin City Clinical Hospital of the Moscow Healthcare Department)	12.6	17	277	22.0	273	98.6	229	82.7	893	507	3.2	91.5
2	Moscow Region	GBUZ MO M.F. Vladimirsky Moscow Regional Research Clinical Institute, Moscow	7.5	33	41	5.5	39	95.1	34	82.9	140	72	3.4	87.8
3	Belgorod Oblast	GBUZ Belgorod St. Joasaph 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	BUZ VO Voronezh Regional Clinical Hospital No. 1, Voronezh	2.3	10	8	3.5	8	100.0	2	25.0	18	14	2.3	87.5
5	Tula Oblast	GUZ TO Tula Regional Clinical Hospital, Tula	1.5	1	2	1.3	2	100.0	2	100.0	5	4	2.5	100.0
6	Ryazan Oblast	GBU RO Ryazan Regional Clinical Hospital, Ryazan, Central Federal District	1.1	1	13	11.8	13	100.0	11	84.6	39	24	3.0	92.3
7	Krasnodar Kraj	GBUZ S.V. Ochapovsky Regional Clinical Hospital No. 1, Department of Healthcare of Krasnodar Kraj, Krasnodar	5.6	2	23	4.1	23	100.0	11	47.8	54	30	2.3	65.2
8	Volgograd Oblast	GBUZ Volga Regional Uronephrological Center, Volzhsky	2.5	11	10	4.0	10	100.0	0	0.0	20	20	2.0	100.0
9	Rostov Oblast	GBU RO Rostov Regional Clinical Hospital, Rostov-on-Don	4.2	1	21	5.0	21	100.0	20	95.2	65	40	3.1	95.2
10	Stavropol Kraj	GBUZ SK Stavropol Regional Clinical Hospital, Stavropol, North Caucasus Federal District	2.8	1	3	1.1	3	100.0	3	100.0	9	6	3.0	100.0
11	St. Petersburg	Organ and Tissue Donation Center, St. Petersburg(GBU I.I. Dzhanelidze Saint Petersburg Research Institute of Emergency Medicine)	5.4	14	53	9.8	47	88.7	40	75.5	143	86	2.7	81.1
12	Leningrad Oblast	GBUZ Leningrad Regional Clinical Hospital, St. Petersburg	1.8	1	7	3.9	7	100.0	3	42.9	16	12	2.3	85.7
13	Arkhangelsk Oblast	GBUZ E.E. Volosevich Arkhangelsk Region First City Clinical Hospital, Arkhangelsk, Northwestern Federal District	1.1	1	5	4.5	5	100.0	4	80.0	12	8	2.4	80.0
14	Novosibirsk Oblast	GBUZ NSO State Novosibirsk Regional Clinical Hospital, Novosibirsk	2.8	10	23	8.2	23	100.0	22	95.7	65	38	2.8	82.6
15	Kemerovo Oblast	GBUZ S.V. Belyaev Kemerovo Regional Clinical Hospital, Kemerovo	2.7	15	40	14.8	19	47.5	16	40.0	100	70	2.5	87.5
16	Irkutsk Oblast	GBUZ Irkutsk Regional Clinical Hospital, Irkutsk	2.4	1	16	6.7	16	100.0	14	87.5	36	22	2.3	68.8
17	Omsk Oblast	BUZOO A.N. Kabanov Omsk City Clinical Hospital No. 1, Omsk	1.9	2	2	1.1	2	100.0	2	100.0	6	4	3.0	100.0
18	Altai Kraj	KGBUZ Regional Clinical Hospital, Barnaul	2.3	1	8	3.5	8	100.0	8	100.0	26	16	3.3	100.0

End of table 5

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
19	Krasnoyarsk Kraj	KGBU Krasnoyarsk Clinical Hospital, Krasnoyarsk	2.9	12	13	4.5	13	100.0	11	84.6	33	17	2.5	65.4
20	Sverdlovsk Oblast	GBUZ SO Sverdlovsk Regional Clinical Hospital No. 1, Yekaterinburg	4.3	8	24	5.6	24	100.0	20	83.3	69	43	2.9	89.6
21	Chelyabinsk Oblast	GBUZ Chelyabinsk Regional Clinical Hospital, Chelyabinsk	3.5	1	4	1.1	4	100.0	2	50.0	11	8	2.8	100.0
22	Tyumen Oblast	GBUZ TO Regional Clinical Hospital No. 1, Tyumen	1.5	1	13	8.7	13	100.0	5	38.5	31	26	2.4	100.0
23	Khanty-Mansi Autonomous Okrug – Yugra	BU Regional Clinical Hospital, Khanty-Mansiysk	1.7	8	5	2.9	5	100.0	4	80.0	14	10	2.8	100.0
24	Samara Oblast	GBOU VPO Samara State Medical University, RF Ministry of Health and Social Development, Samara	3.2	5	25	7.8	19	76.0	5	20.0	52	46	2.1	92.0
25	Saratov Oblast	GUZ Regional Clinical Hospital, Saratov	2.4	1	10	4.2	10	100.0	1	10.0	21	20	2.1	100.0
26	Nizhny Novgorod Oblast	FBUZ Privolzhsky District Medical Center, FMBA of Russia, Nizhny Novgorod	3.2	9	12	3.8	12	100.0	12	100.0	32	22	2.7	91.7
27	Republic of Tatarstan	GAUZ Republican Clinical Hospital, Ministry of Health of the Republic of Tatarstan, Kazan	3.9	2	15	3.8	15	100.0	13	86.7	47	30	3.1	100.0
28	Republic of Bashkortostan	GBUZ G.G. Kuvatov Republican Clinical Hospital, Ufa	4.1	12	24	5.9	24	100.0	7	29.2	51	40	2.1	83.3
29	Orenburg Oblast	MBUZ City Clinical Emergency Hospital No. 1, Orenburg	2.0	2	11	5.5	11	100.0	7	63.6	28	21	2.5	95.5
30	Sakha Republic (Yakutia)	GAU RS(Y) Republican Hospital No. 1 – National Center of Medicine, Yakutsk	1.0	1	3	3.0	3	100.0	1	33.3	5	4	1.7	66.7
31	Departmental program of FMBA of Russia	FGBU GNTs A.I. Burnazyan Federal Medical Biophysical Center, FMBA of Russia, Moscow	–	28	1	–	1	100.0	1	100.0	4	2	4.0	100.0
32	Departmental program of FMBA of Russia	FGBU Federal Siberian Research Clinical Center, FMBA of Russia, Krasnoyarsk	–	5	16	–	15	93.8	10	62.5	42	24	2.6	75.0
		Total	**146.8**	**218**	**732**	**5.0**	**692**	**94.5**	**524**	**71.6**	**2099**	**1294**	**2.9**	**88.4**

Table 6

Rating of regions donor activity in 2019

RF subject (region)	Population in 2019, mln	Effective donors per 1 mln population		Rating	
		2019	2018	2019	2018
Moscow	12.6	22.0	17.3	1	1
Kemerovo Oblast	2.7	14.8	11.1	2	2
Ryazan Oblast	1.1	11.8	1.8	3	25
St. Petersburg	5.4	9.8	6.3	4	7
Tyumen Oblast	1.5	8.7	8.7	5	4
Novosibirsk Oblast	2.8	8.2	6.1	6	8
Samara Oblast	3.2	7.8	7.2	7	6
Irkutsk Oblast	2.4	6.7	2.9	8	22
Republic of Bashkortostan	4.1	5.9	4.9	9	11
Sverdlovsk Oblast	4.3	5.6	5.6	10	9
Orenburg Oblast	2.0	5.5	4.0	11	14
Mosow Region	7.5	5.5	9.1	12	3
Rostov Oblast	4.2	5.0	4.5	13	12
Arkhangelsk Oblast	1.1	4.5	4.5	14	13
Krasnoyarsk Kraj*	2.9	4.5	5.5	15	10
Saratov Oblast	2.4	4.2	3.3	16	21
Krasnodar Kraj	5.6	4.1	3.6	17	18
Volgograd Oblast	2.5	4.0	3.6	18	17
Leningrad Oblast	1.8	3.9	8.3	19	5
Republic of Tatarstan	3.9	3.8	1.0	20	28
Nizhny Novgorod Oblast	3.2	3.8	3.8	21	16
Voronezh Oblast	2.3	3.5	3.5	22	20
Altai Kraj	2.3	3.5	3.5	23	19
Sakha Republic (Yakutia)	1.0	3.0	4.0	24	15
Khanty-Mansi Autonomous Okrug – Yugra	1.7	2.9	2.4	25	24
Belgorod Oblast	1.5	2.7	2.7	26	23
Tula Oblast	1.5	1.3	–	27	–
Chelyabinsk Oblast	3.5	1.1	1.1	28	27
Stavropol Kraj	2.8	1.1	0.7	29	29
Omsk Oblast	1.9	1.1	1.6	30	26
Russia (85 RF subjects)	146.8	5.0	4.3	–	–

Note. Without taking into account the donor program Federal Siberian Scientific and Clinical Center of the Federal Medical and Biological Agency, Krasnoyarsk

In Moscow and Moscow Oblast, there were 263 multi-organ donors, which is 50.2% of the total number of multi-organ donors in Russia (239 donors, 56.2% in 2017).

There were 18 organ donor programs involving a high share of multi-organ procurements (more than 70%). In 6 of the programs, multiple organs were procured from all (100%) the patients.

In 2019, the average number of organs procured from one donor remained the same with that of 2018 – 2.9 procurements. The highest number of organ procurements were, as before, performed at federal subjects where extrarenal organs were transplanted and (or) at federal subjects where there was interregional coordination: Moscow Oblast (3.4), Altai Krai (3.3), Moscow (3.2), Rostov Oblast (3.1), and Republic of Tatarstan (3.1). There was low procurement in the Republic of Sakha (Yakutia) (1.7) and in Volgograd Oblast (2.0)).

In 2019, the rate of procurement and use of donor kidneys was 88.4% (in 2018 – 91.9%). In 17 federal subjects this indicator was in the optimal range of 90–100%, in 9 regions between 80–90% and in 4 programs it was less than 80% (Krasnodar Krai (65.2%), Irkutsk Oblast (68.8%), Krasnoyarsk Krai (65.4%), Republic of Sakha (Yakutia) (66.7%)).

In 2019, 330 organs were procured from living related donors – 31.1% of 1062 (the total number of procurements). In 2018, there were 364 procured organs or 36.3% of 1003).

Table 7

Deceased organ donors (effective donors) in 2006–2019

Nos.	Region	2006	2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019	
		Efefctive donors	Efefctive donors	Change per year (abs.)	Efefctive donors	Change per year (abs.)	Efefctive donors	Change per year (abs.)	Efefctive donors	Change per year (abs.)	Efefctive donors	Change per year (abs.)	Efefctive donors	Change per year (abs.)	Efefctive donors	Change per year (abs.)	Efefctive donors	Change per year (abs.)	Efefctive donors	Change per year (abs.)	Efefctive donors	Change per year (abs.)	Efefctive donors	Change per year (abs.)	Efefctive donors	Change per year (abs.)	Efefctive donors	Change per year (abs.)
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
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	277	+59
2	Moscow Region	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	41	–27
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	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	8	0
5	Tula Oblast																										2	+2
6	Ryazan Oblast																								2	+2	13	+11
7	Krasnodar Kraj						3	+3	39	+36	52	+13	42	–10	41	–1	23	–18	25	+2	24	–1	19	–5	20	+1	23	+3
8	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	10	+1
9	Rostov Oblast																		1	+1	7	+6	13	+6	19	+6	21	+2
10	Stavropol Kraj																								2	+2	3	+1
11	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	53	+19
12	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	7	–8
13	Arkhangelsk Oblast																								5	+5	5	0
14	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	23	+6
15	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	40	+10
16	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	+9
17	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	2	–1
18	Altai Kraj														3	+3	5	+2	4	–1	4	0	8	+4	8	0	8	0
19	Krasnoyarsk Kraj																3	+3	6	+3	18	+12	27	+9	16	прим.	13	–3
20	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	24	0

End of table 7

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
21	Chelyabinsk Oblast								6	+6	2	–4	7	+5	6	–1	10	+4	9	–1	11	+2	8	–3	4	–4	4	0
22	Tymen Oblast																						4	+4	13	+9	13	0
23	Khanty-Mansi Autonomous Okrug – Yugra																						3	+3	4	+1	5	+1
24	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	25	+2
25	Saratov Oblast														4	+4	7	+3	7	0	7	0	7	0	8	+1	10	+2
26	Nizhny Novgorod Oblast						7	+7	11	+4	12	+1	10	–2	8	–2	12	+4	10	–2	11	+1	10	–1	12	+2	12	0
27	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	15	+11
28	Republic of Bashkortostan								2	+2	7	+5	14	+7	18	+4	19	+1	14	+5	20	+6	22	+2	20	–2	24	+4
29	Orenburg Oblast																		3	+3	8	+5	9	+1	8	–1	11	+3
30	Sakha Republic (Yakutia)																				2	+2	4	+2	4	0	3	–1
31	FMBA, Moscow														6	+6	11	+5	14	+3	16	+2	9	–7	5	–4	1	–4
32	FMBA, Krasnoyarsk																								24	прим.	16	–8
	RF total	**225**	**300**	**+75**	**364**	**+64**	**381**	**+17**	**487**	**+106**	**470**	**–17**	**412**	**–58**	**420**	**+8**	**465**	**+45**	**434**	**–31**	**499**	**+53**	**564**	**+65**	**638**	**+74**	**732**	**+94**

Note. Donor activity of the donor program of the Federal Siberian Scientific and Clinical Center of the Federal Medical and Biological Agency, Krasnoyarsk is presented as a separate program.

KIDNEY TRANSPLANTATION

A total of 1,473 kidney transplantations were performed (10.0 per million population) in 2019, which is more than in previous years. See Fig. 7.

Kidney transplant surgeries were performed at 46 centers.

There were 1,290 deceased-donor kidney transplants in 2019, which is 129 (+11.1 %) more transplants than in 2018 (1,161). There were 183 living-related donor kidney transplants in 2019 (200 in 2018).

Table 8 and Fig. 8 show the kidney transplant centers where the highest number of kidney transplants were done as of the end of 2019.

The activity of kidney transplant centers in 2019 varied widely. Five centers performed over 50 transplant surgeries each, 11 centers conducted 30 to 50 operations within the year, 11 centers carried out 15 to 29 surgeries,

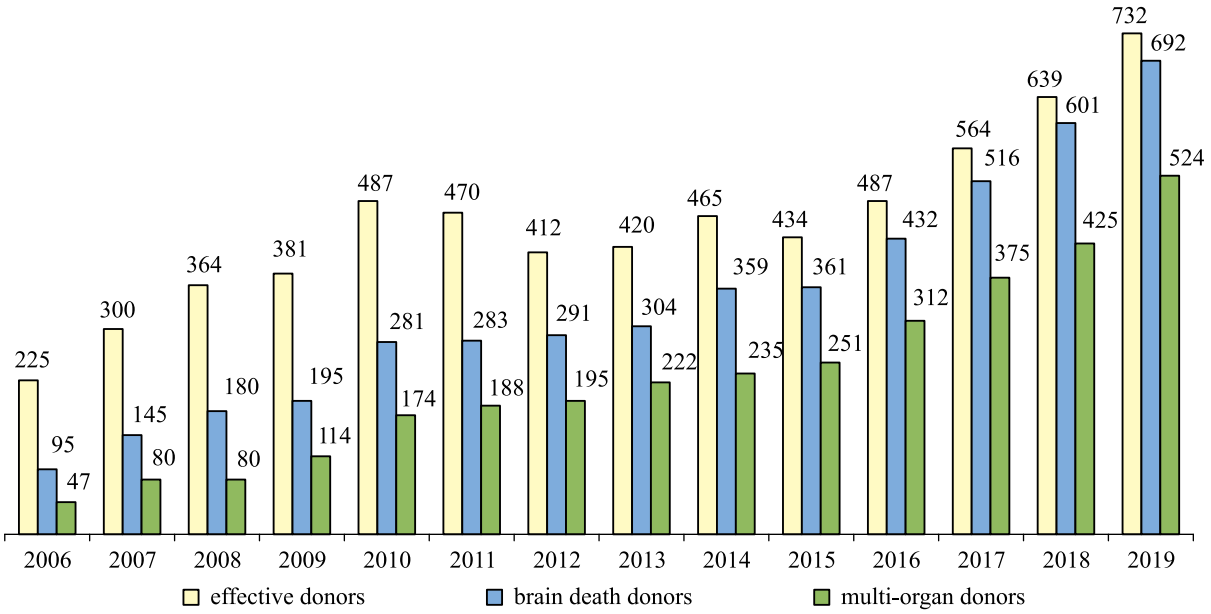

Fig. 7. Kidney transplantation in the Russian Federation in 2006–2019

Table 8

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

Rank	Centers leading in numbers of kidney transplant	Kidney transplants in 2019
1	FGBU V.I. Shumakov National Medical Research Center for Transplant and Artificial Organs, RF Ministry of Health, Moscow, Central Federal District	240
2	GBUZ, Moscow, N.V. Sklifosofsky Research Institute of Emergency Medicine, Moscow Healthcare Department, Moscow, Central Federal District	230
3	GBUZ S.V. Belyaev Kemerovo Regional Clinical Hospital, Kemerovo, Siberian Federal District	73
4	N.A. Lopatkin Research Institute of Urology and Interventional Radiology – branch of FGBU Scientific Medical Research Center for Radiology, RF Ministry of Health, Moscow, Central Federal District	53
5	GBUZ, Moscow S.P. Botkin City Clinical Hospital, Moscow Healthcare Department, Moscow, Central Federal District	50
6	GBUZ MO M.F. Vladimirsky Moscow Regional Research Clinical Institute, Moscow, Central Federal District	49
7	GBOU VPO I.P. Pavlov Saint Petersburg State Medical University, RF Ministry of Health, St. Petersburg, Northwestern Federal District	46
8	GBOU VPO Samara State Medical University, RF Ministry of Health, Samara, Volga Federal District	44
9	GBUZ SO Sverdlovsk Regional Clinical Hospital No. 1, Yekaterinburg, Ural Federal Distric	43
10	GBU I.I. Dzhanelodze Saint Petersburg Research Institute of Emergency Medicine, St. Petersburg, Northwestern Federal District	41
	TOTAL	**869**
	59.0% of total kidney transplants in the RF (1473)	

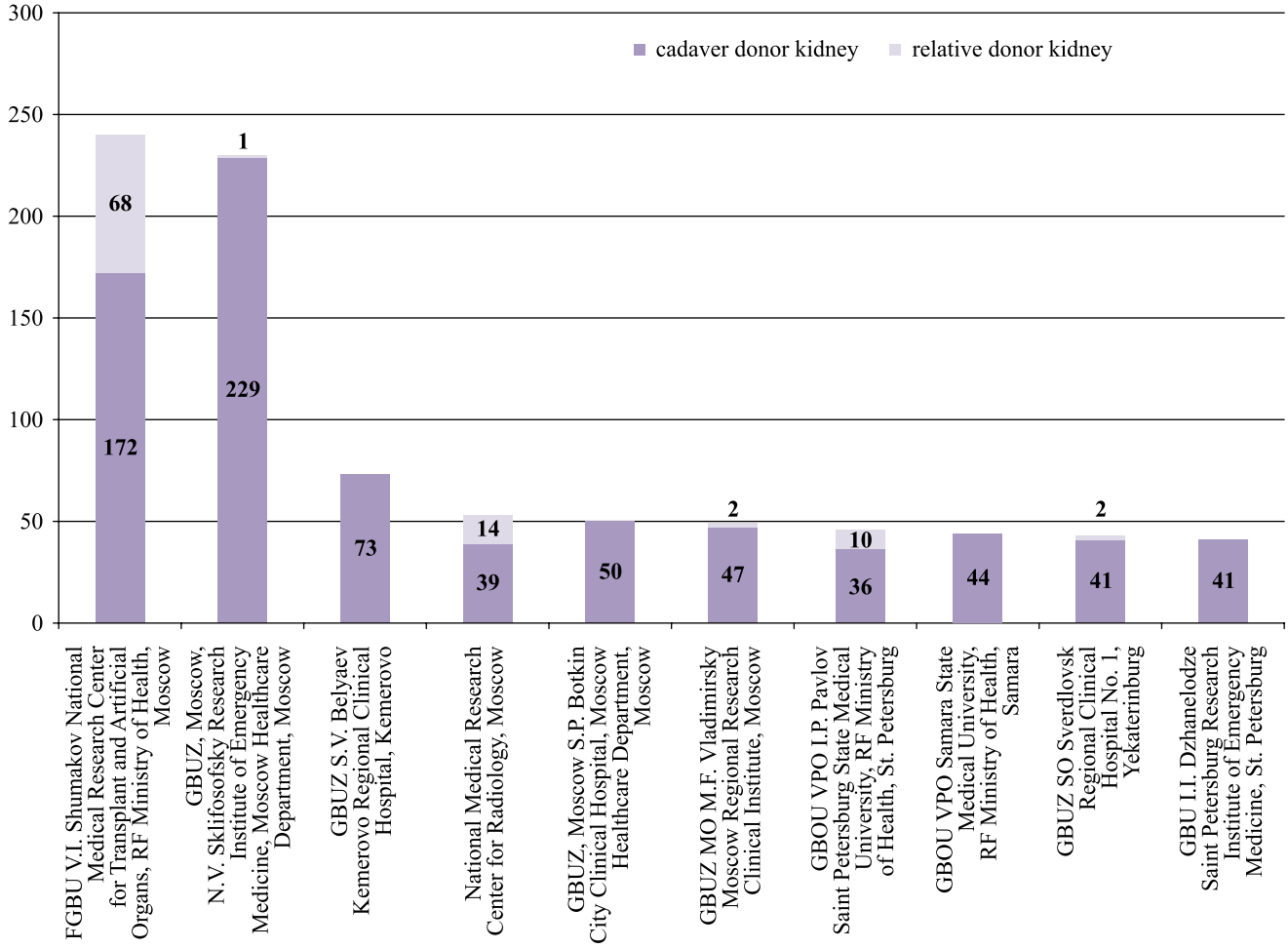

Fig. 8. The medical organizations – leaders in number of transplantations of a kidney

while the remaining 19 centers performed less than 15 kidney transplant surgeries.

All the 12 kidney transplant centers located in Moscow and Moscow Oblast performed half (50.0%, 736 surgeries) of all kidney transplantations performed in the country (50.3%, 685 surgeries in 2018).

Of these, 4 centers carried out 50 or more kidney transplants within the year. The 4 centers were Shumakov National Medical Research Center of Transplantology and Artificial Organs (Shumakov Center) (240 kidney transplants), Sklifosovsky Research Institute of Emergency Care (Sklifosovsky Institute) (230), National Medical Research Center for Radiology (53), and Botkin City Clinical Hospital (50).

In 2019, 28 centers out of 46 performed related-donor kidney transplants. A total of 183 transplants were performed (200 in 2018). In the same year, Moscow and Moscow Oblast accounted for 8 centers that performed 124 related kidney transplants or 66.3% of the total number of related kidney transplants in Russia (117 or 58.5% in 2018). Two centers performed 20 or more related kidney transplants – Shumakov Center (68 operations) and the National Medical Research Center for Children's Health (21). The average frequency of living-donor kidney transplants in 2019 was 12.4% of the total number of kidney transplants performed (14.7% in 2018).

In 2019, 6 centers carried out pediatric kidney transplants. A total of 101 kidney transplants were done (89 in 2018), of which 96 (95.0%) were in Moscow – Shumakov Center (36), Russian Children's Clinical Hospital (31), and National Medical Research Center for Children's Health (23). See Fig. 9.

EXTRARENAL ORGAN TRANSPLANT

In 2019, 335 heart transplants were performed (2.3 per million population), of which 11 were pediatric transplants. This was more than the figure recorded in previous years, particularly in 2018 (282), +18.8%.

Heart transplants were performed at 17 centers.

The Shumakov Center (Moscow) accounted for 63.3% (212 heart transplant surgeries) of the total number of heart transplants in the Russian Federation. The successful heart transplant program in this center, along with new programs, continues to drive the overall positive trend in the increasing number of heart transplants recorded so far in the country from 2009 to 2019.

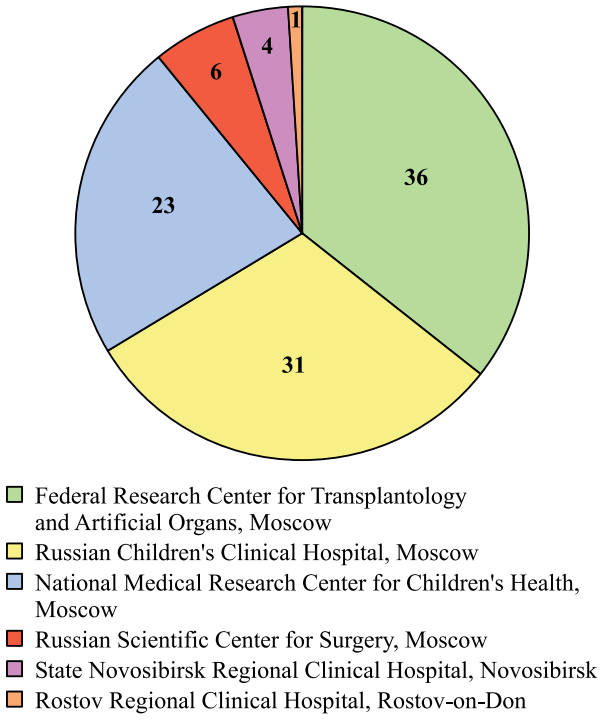

Fig. 9. Pediatric kidney transplantation in the Russian Federation in 2019

Table 9 and Fig. 10 show thoracic organ transplant centers that performed the highest number of heart and lung transplants as of the end of 2019.

Apart from Shumakov Center, 6 other transplantation centers carried out 10 or more heart transplants in 2019. They were the Almazov National Medical Research Centre in St. Petersburg (25 heart transplants), Meshalkin National Medical Research Center in Novosibirsk (15), Sklifosovsky Institute in Moscow (12), Ochapovsky Regional Clinical Hospital No. 1 in Krasnodar (11), Sverdlovsk Regional Clinical Hospital No. 1 (11), and the Research Institute for Complex Problems of Cardiovascular Diseases in Kemerovo (10).

In 2019, lung transplants were performed at 3 transplantation centers. A total of 23 transplants were conducted (25 in 2018), of which 2 were pediatric lung transplantations. They were Shumakov Center (16 lung transplants), Sklifosovsky Institute (6), and Pavlov First St. Petersburg State Medical University in St. Petersburg (1). In 2019, Shumakov Center also performed 2 heart-lung transplants.

In 2019, a total of 584 liver transplants were carried out (4.0 per million population). This was more than in previous years, particularly in 2018 (505), +15.6%.

Liver transplants were performed at 31 centers.

In 2019, two new liver transplant programs were launched – four and two deceased-donor liver transplants were performed at District Clinical Hospital (Khanty-Mansiysk) and Ryazan Regional Clinical Hospital (Ryazan), respectively.

The 6 Moscow-based transplant centers accounted for 64.4% (376 liver transplants) in 2019 (68.7%, 347 transplants in 2018).

Table 10 and Fig. 11 show the liver transplant centers that performed the highest number of liver transplants as of the end of 2019.

In 2019, 7 transplant centers performed 20 or more liver transplants each: Shumakov Center (170), Sklifosovsky Institute (103), Burnazyan Federal Medical and Biophysical Center (45), State Novosibirsk Regional Clinical Hospital (40), Botkin City Clinical Hospital

Table 9

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

Rank	Centers leading in numbers of heart transplants	Heart transplants in 2019
1	FGBU V.I. Shumakov National Medical Research Center for Transplant and Artificial Organs, RF Ministry of Health, Moscow, Central Federal District	214
2	FGBU V.A. Almazov National Medical Research Center, RF Ministry of Health, St. Petersburg, Northwestern Federal District	25
3	FGBU E.N. Meshalkin National Medical Research Center, RF Ministry of Health, Novosibirsk, Siberian Federal District	15
4	GBUZ, Moscow, N.V. Sklifosofsky Research Institute of Emergency Medicine, Moscow Healthcare Department, Moscow, Central Federal District	12
5	GBUZ SO Sverdlovsk Regional Clinical Hospital No. 1, Yekaterinburg, Ural Federal Distric	11
6	GBUZ S.V. Ochapovsky Regional Clinical Hospital No. 1, Healthcare Department, Krasnodar Kraj, Krasnodar, Southern Federal District	11
7	FGBNU Research Institute for Complex Issues of Cardiovascular Diseases, Kemerovo, Siberian Federal District	10
8	FGBU Federal Center for Cardiovascular Surgery, Krasnoyarsk, Siberian Federal District	7
9	KGBU Krasnoyarsk Clinical Hospital, Krasnoyarsk, Siberian Federal District	7
10	GBUZ Republican Cardiology Outpatient Clinic, Ufa, Volga Federal District	7
	TOTAL	**319**
	94.7% of the total heart transplants in the RF (337)	

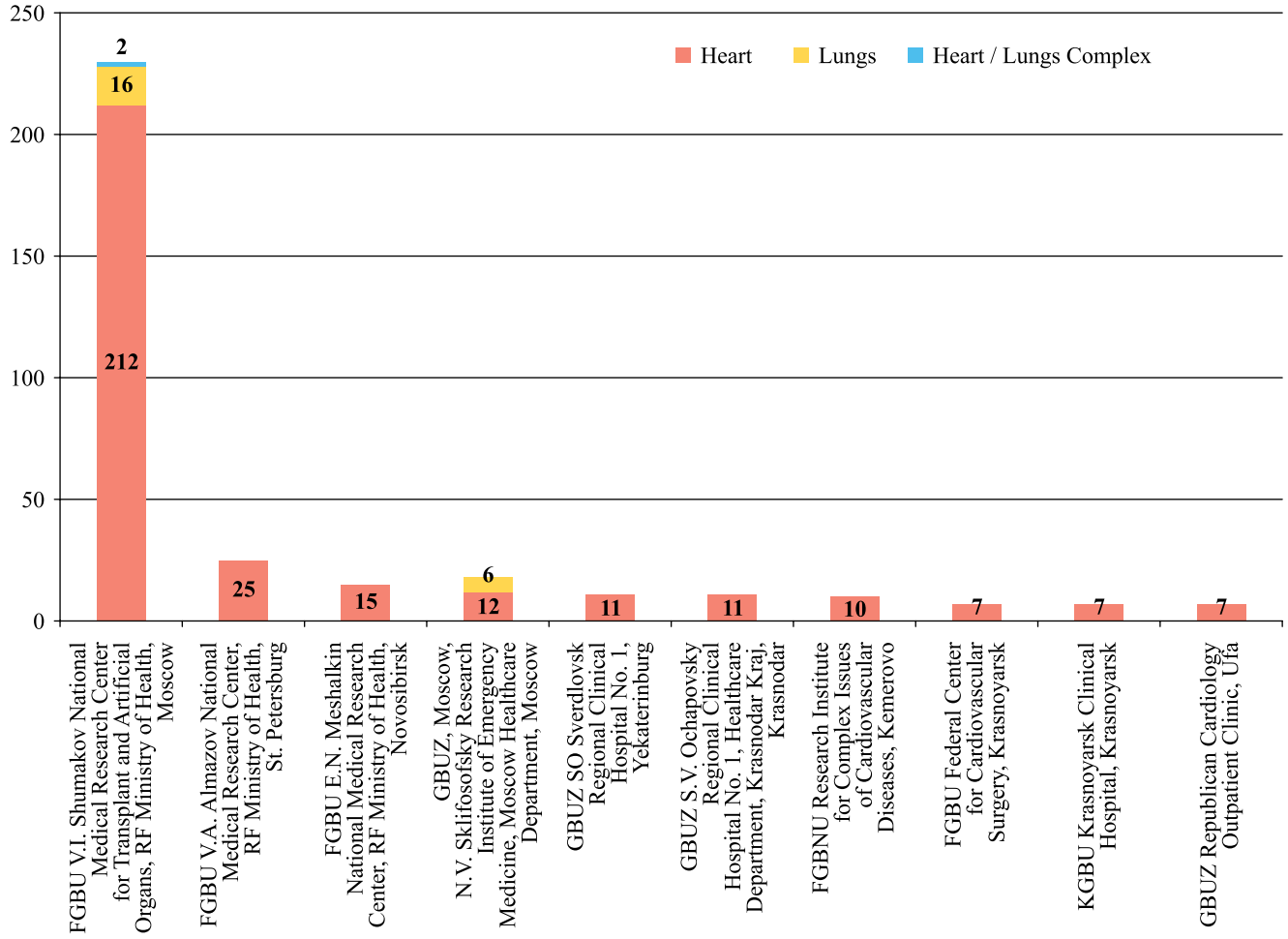

Fig. 10. The medical organizations – leaders in number of transplantations of thoracic organs

Table 10

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

Rank	Centers leading in numbers of liver transplants	Liver transplants in 2019
1	FGBU V.I. Shumakov National Medical Research Center for Transplant and Artificial Organs, RF Ministry of Health, Moscow, Central Federal District	170
2	GBUZ, Moscow, N.V. Sklifosofsky Research Institute of Emergency Medicine, Moscow Healthcare Department, Moscow, Central Federal District	103
3	FGBU A.I. Burnazyan State Scientific Center of the Russian Federation – Federal Medical Biophysical Center, FMBA of Russia, Moscow, Central Federal District	45
4	GBUZ NSO State Novosibirsk Regional Clinical Hospital, Novosibirsk, Siberian Federal District	40
5	GBUZ MO M.F. Vladimirsky Moscow Regional Research Clinical Institute, Moscow, Central Federal District	25
6	GBUZ, Moscow S.P. Botkin City Clinical Hospital, Moscow Department of Healthcare, Moscow, Central Federal District	25
7	FGBU Russian Scientific Center for Radiology and Surgical Technologies, RF Ministry of Health, St. Petersburg, Northwestern Federal District	20
8	GBU RO Rostov Regional Clinical Hospital, Rostov-on-Don, Southern Federal District	17
9	GBUZ SO Sverdlovsk Regional Clinical Hospital No. 1, Yekaterinburg, Ural Federal District	15
10	GBUZ Irkutsk Regional Clinical Hospital, Irkutsk, Siberian Federal District	14
	TOTAL	**474**
	81.2% of the total liver transplants in the RF (584)	

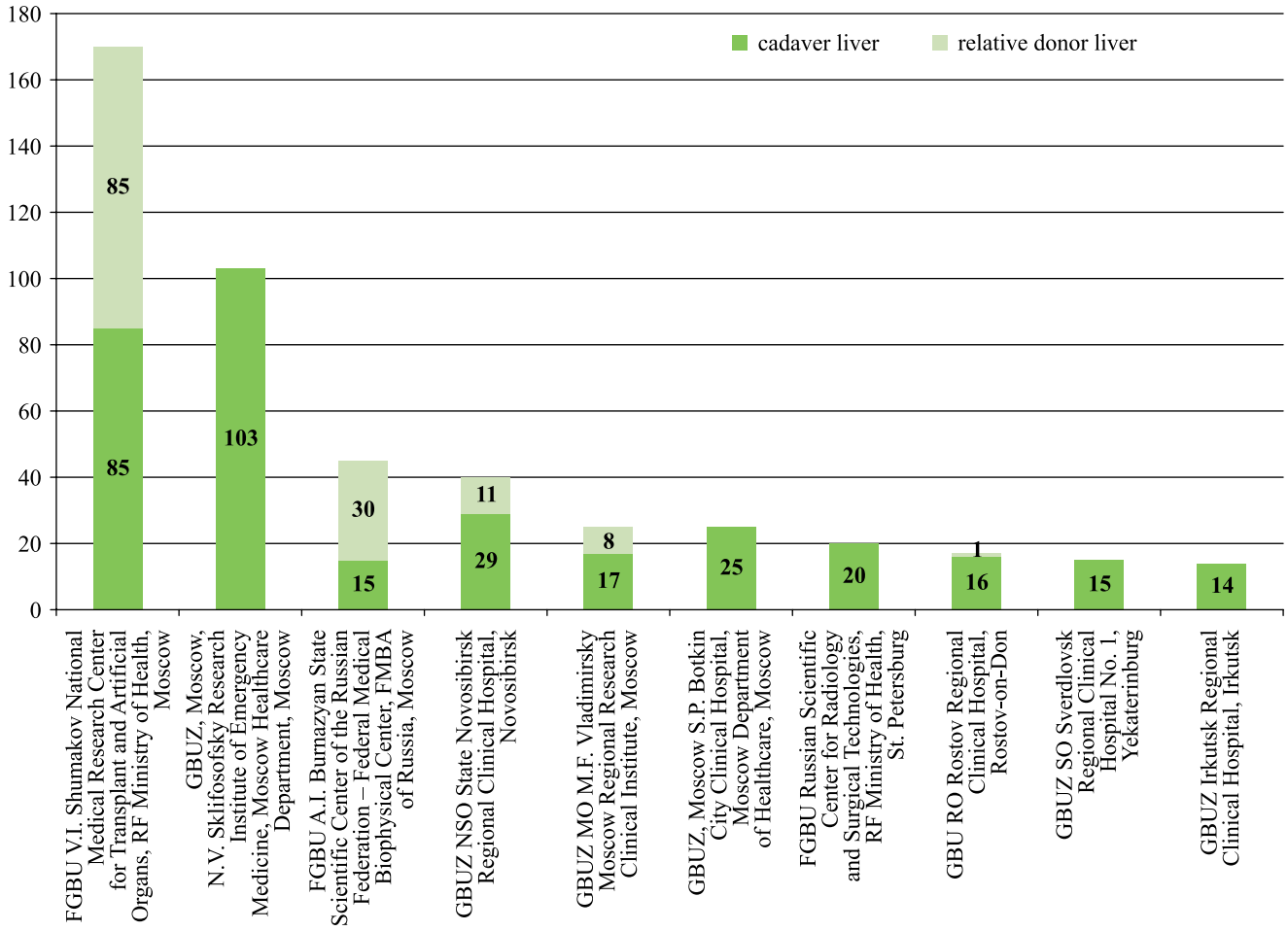

Fig. 11. The medical organizations – leaders in number of transplantations of a liver

(25); Vladimirsky Moscow Regional Research Clinical Institute (25), and the Granov Russian Research Center of Radiology and Surgical Technologies (20).

Related liver transplants were performed at 8 centers. Living-related transplants accounted for 147 surgeries (25.2%). In 2018, there were 9 centers that performed 164 related liver transplants (32.5%).

In 2019, 113 pediatric (mostly young children) liver transplants were carried out (133 in 2018). Three centers performed pediatric liver transplants: Shumakov Center (98), Petrovsky National Research Centre of Surgery (8) and State Novosibirsk Regional Clinical Hospital (7). See Fig. 12.

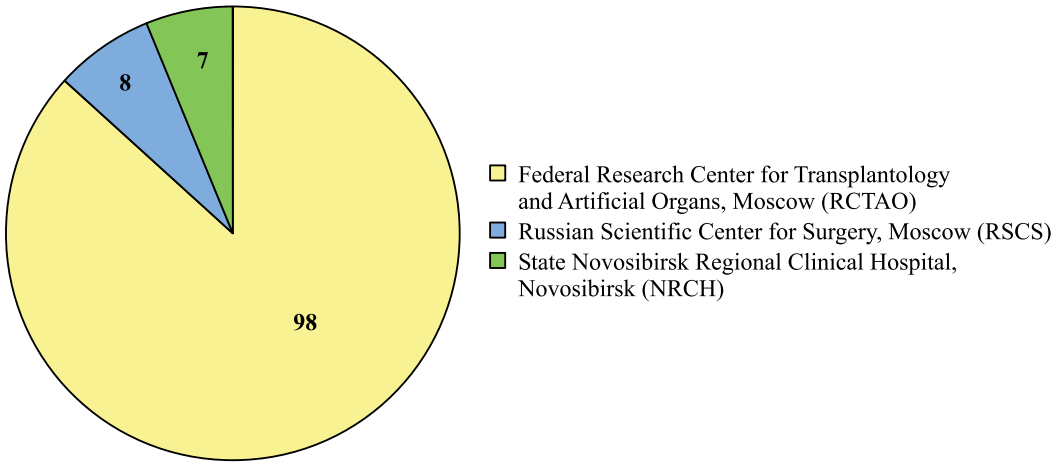

Fig. 12. Pediatric liver transplantation in the Russian Federation in 2019

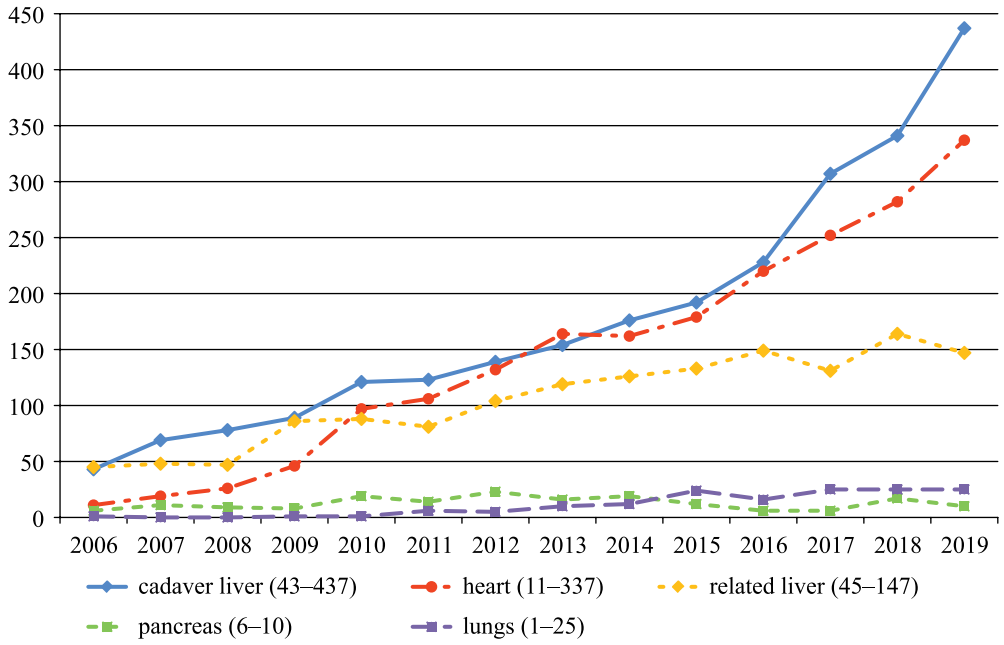

Fig. 13. Nonrenal solid organ transplantation in 2006–2019

In 2019, pancreas transplants were performed at 2 centers. A total of 10 pancreas transplant surgeries were carried out (17 in 2018) – 9 of them were kidney-pancreas transplants.

There were 954 extrarenal transplants performed in 2019 – 39.3% of the total number of transplants (2427). In 2018, it was 832 (37.9% of 2193 transplants). Transplant centers located in Moscow and Moscow Oblast remain key players in extrarenal transplantation in the country. In 2019, these centers accounted for 637 extrarenal transplants (66.8%) performed in the country; it was 593 (71.3%) in 2018.

Over the observation period (from 2006 to 2019), the number of extrarenal organ transplants in Russia increased by 848 (9 times). See Fig. 13.

Extrarenal transplantations increased by 23.3% in the total number of transplants performed.

Table 11 contains information on the number of organ transplants performed in the Russian Federation from 2006 to 2019.

ORGAN TRANSPLANT RECIPIENTS

Information concerning the number of organ transplant recipients in Russia (from 2013 to 2018), obtained from the Federal Registry of the Ministry of Health of the Russian Federation (see Executive Order No. 2323-r of the Government of the Russian Federation dated October 23, 2017; Resolution 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 17,637 organ transplant recipients in Russia as of 2019 (120.1 per million population). Among these recipients, 11,880 (80.9 per million population) had kidney transplants, 3,032 (20.6 per million population) received liver transplants, while 1,355 (9.2 per million) were heart transplant recipients.

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

CONCLUSION

Results recorded in 2019 show organ donors and organ transplants in Russia continue to increase in number – by 10–15% per year (2,427 transplant surgeries in 2019). Moreover, the potential for both quantitative and qualitative development of donor and transplantation programs in the federal subjects of the Russian Federation is far from being fully utilized. Organ transplantation demand among the population significantly exceeds supply.

Last year, the following features of the development of donor and organ transplantation programs in the Russian Federation became apparent.

The main contributors to kidney, liver and heart transplantation programs in the Russian Federation were medical institutions of the federal subjects of the Russian Federation (37) and national medical research centers (7). The way these transplant programs would develop at these organizations will determine the general trends in organ donation and organ transplantation in the country.

About 67.8% of the population lives in federal subjects of the Russian Federation where, one way or the other, there is medical assistance on organ transplantation. This is certainly one of the positive results of the many years of progressive development of the sector,

Table 11

Organ transplantation in the Russian Federation in 2006–2019

Nos.	Organ	2006	2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019	
		Abs.	Abs.	Change per year	Abs.	Change per year	Abs.	Change per year	Abs.	Change per year	Abs.	Change per year	Abs.	Change per year	Abs.	Change per year	Abs.	Change per year	Abs.	Change per year	Abs.	Change per year	Abs.	Change per year	Abs.	Change per year	Abs.	Change per year
1	Kidneys, 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	1473	+112
2	incl. 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	1290	+129
3	from live relative 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	183	–17
4	Livers, 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	584	+79
5	incl. 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	437	+96
6	from live relative 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	147	–17
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	335	+53
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	10	–7
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	23	–2
10	Heart/ lungs complex										2	+2	2	0	1	–1	0	–1	0	0	0	0	0	0	3	+3	2	–1
11	Small intestine														1	+1	1	0	0	–1	0	0	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	2427	+234

Table 12

Number of patients with transplanted organs in the Russian Federation in 2013–2019

ICD-10 Code	Patients in register												
	2013	2014		2015		2016		2017		2018		2019	
		abs.	rel. (%)	abs.	rel. (%)	abs.	rel. (%)	abs.	rel. (%)	abs.	rel. (%)	abs.	rel. (%)
Z94.0 Kidney transplant status	6651	7502	12.8	8164	8.8	9063	11.0	9658	6.6	10 851	12.4	11 880	9.5
Z94.1 Heart transplant status	416	520	25.0	639	22.9	803	25.7	952	18.6	1164	22.3	1355	16.4
Z94.2 Lung transplant status	2	3	50.0	4	33.3	5	25.0	8	60.0	28	250.0	26	–7.1
Z94.4 Liver transplant status	1150	1406	22.3	1649	17.3	1948	18.1	2152	10.5	2632	22.3	3032	15.2
Z94.8 Other transplanted organ and tissue status (bone marrow, intestine, pancreas, stem cells)	334	467	39.8	654	40.0	808	23.5	909	12.5	1135	24.9	1344	18.4
TOTAL	8553	9898	15.7	11 110	12.2	12 627	13.7	13 679	8.3	15 810	15.6	17 637	11.6

popularization and introduction of an organ transplantation method at federal subjects of the Russian Federation. At the same time, 27.3 million people live in 13 federal subjects of the Russian Federation with low availability of organ transplantation services (less than 10 organ transplants per million population). Therefore, boosting transplantation activity at such federal subjects (Omsk Oblast, Chelyabinsk Oblast, Stavropol Krai, etc.) is one of the key development tasks in the coming years.

Over half of the organ transplant waitlists in federal subjects of the Russian Federation requires revision and optimization in terms of number of patients. Adequate provision of organ transplantation care begins with selection of patients on the waiting list. Here, the average waiting times for organs influences both transplant outcome and economic component of medical care. The inclusion of a waitlisted patient subsystem in the state system for donor organs, donors and recipients, which is planned for 2020, would ensure transparency and increase the efficiency of the activities of transplant centers with regards to transplant waitlists.

In Russia, medical care on organ transplantation is provided in the overwhelming majority of cases (87.3% in 2019) through funds from the compulsory medical insurance system, allocated for provision of high-tech medical care on organ transplant. Without adequate increase in financial support, the 10–15% annual growth in the number of organ transplants in the Russian Federation, observed in recent years, becomes unrealistic. Therefore, in order to further increase the number of organ transplantations in the federal subjects (to meet the real need of the population), funding appears to be a crucial factor along with effective administration of donor and transplantation programs by health care authorities in federal subjects of the Russian Federation.

The essential difference, observed in 2019, between donor and transplantation activity in federal subjects, and the unstable development over the years, which depends on a number of subjective factors, confirm the urgency of two development tasks: first, to increase and balance the level of donor and transplantation activity across federal subjects of the Russian Federation; secondly, to increase the stability of programs to subjective and other factors. There are successful organizational models for implementation at the federal subjects of the Russian Federation.

In 2019, a technology for determining human death based on brain death diagnosis was widely used in medical organizations running donor transplant programs (94.5% of effective donors). The only program that is lagging behind on this indicator is the Belyaev Kemerovo Regional Clinical Hospital – 47.5% with 40 effective donors in 2019.

The number of kidney transplants in the Russian Federation continues to increase (in 2019 there were 1473 transplants, +8.2%), but the rate of development in most federal subjects does not match the increase in the number of patients receiving renal replacement therapy via dialysis. This problem should be taken into account when planning the tasks and the scope of medical care on kidney transplant, including in regional health development programs.

The number of extrarenal organ transplants in the Russian Federation also continues to rise. This reflects the need for such technologies for health care and confirms their effectiveness. Liver and heart transplantation programs are an indicator of the level of development of medical technology in the federal subjects of the Russian Federation.

The number of pediatric organ transplants in the country remains approximately at the same level every

year (227 transplants in 2019). The number of pediatric liver transplants (110–130) meets the identified need of the population for this intervention method.

The number of pediatric kidney transplants (90–110) is currently limited by the geographic location of transplant centers – 95% of pediatric kidney transplant operations are performed in Moscow. To increase the number of pediatric kidney transplant operations, 4–5 more corresponding programs need to be launched at leading transplant centers in the country's federal districts (Northwestern Federal District, Southern Federal District, Volga Federal District, Ural Federal District and Siberian Federal District).

The Transplantation Registry, including its analytical part, complements the state recording system for donor organs, donors and recipients (executive order No. 355n of the Ministry of Health of Russia, dated June 8, 2016). The Registry remains popular as a tool for supporting management decisions on assessing the state, challenges and trends in donor and transplant programs in the federal subjects of the Russian Federation. In 2020, there are plans to improve the Registry in order to ensure monitoring of the implementation of departmental target program "*Organ Donation and Transplantation in the Russian Federation*" (approved via executive order No. 365 of the Russian Ministry of Health, dated June 4, 2019). Improvement of the Registry is also aimed at monitoring the interaction of regional health authorities and medical organizations with the Shumakov Center with regards to running and developing donor and transplant programs.

The authors declare no conflict of interest.

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