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ORGAN DONATION AND TRANSPLANTATION IN THE RUSSIAN FEDERATION IN 2020

13th Report from the Registry of the Russian Transplant Society

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Objective: to monitor the current trends and developments in organ donation and transplantation in the Russian Federation based on the 2020 data. **Materials and methods.** Heads of organ transplant centers were surveyed through questionnaires. Data control was done using the information accounting system of the Russian Ministry of Health. Between separate federal subjects of the Russian Federation and between transplantation centers, comparative analysis of data obtained over years was performed. **Results.** Based on data retrieved from the 2020 Registry, 44 kidney, 29 liver and 16 heart transplantation programs were functioning in the Russian Federation in 2020. The kidney transplant waitlist in 2020 included about 11.5% of the total 60,000 patients receiving dialysis. Organ donation activity in 2020 was 3.9 per million population, with a 74.6% multi-organ procurement rate and an average of 2.9 organs being procured from one effective donor. In 2020, there were 7.7 kidney transplants per million population, 3.8 liver transplants per million population and 1.7 heart transplants per million population. Same year, the number of transplant surgeries performed in the Russian Federation fell by 19.2% to 13.4 per million population against the background of the outbreak caused by the new coronavirus disease COVID-19. The city of Moscow and the Moscow region in 2020 accounted for 13 out of the 14 functioning organ transplantation centers, performing 66.3% of all kidney transplants and 72.4% of all extrarenal transplants in the country. The number of organ recipients in the Russian Federation have exceeded 130 per million population. **Conclusion.** In 2020, despite the new coronavirus disease COVID-19 pandemic and accompanying restrictive measures, transplant centers continued to perform organ transplants, run a waiting list and monitor organ recipients. However, the number of effective donors (–22.9%) and organ transplants (–19.2%) decreased, tentatively to the 2017 levels. In 2021, transplant centers with support from health authorities will have to restore the volume of transplant care with consideration to the real needs of the population and the donor resource. The COVID-19 factor, including vaccination of the population, as well as financial support to transplantation programs, will be decisive in shaping the trend of transplantation care and organ donation in the federal subjects of the Russian Federation in the coming 1–2 years.

Keywords: organ donation, kidney, liver, heart, lung, pancreas transplantation, transplant center, waiting list, registry, COVID-19.

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 [1–11].

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 served as a tool for ensuring quality control and data integrity in the information system used for recording human donor organs and tissues, and information about donors and recipients. The information system operates under executive order No. 355n of the Russian Ministry of Health, dated June 8, 2016.

Annual reports of the Registry contain not only statistical data for the reporting period, but also systematic 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 used for monitoring the implementation of departmental target pro-

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gram "*Organ Donation and Transplantation in the Russian Federation*", approved via executive order No. 365 of the Russian Ministry of Health on June 4, 2019.

The data for the Registry are collected via questionnaires administered to all transplantation centers in the Russian Federation. Comparative analysis of all data gathered over years from Russian regions, transplant centers and from international registries is performed.

The working group would like to thank all permanent and new participants in the Registry who have provided data, as well as the Russian Ministry of Health and the Central Research Institute for Healthcare Organization and Informatization.

TRANSPLANT CENTERS AND WAITING LISTS

In the Russian Federation, there are transplant centers in 32 federal subjects with a total population of 99.3 million people, Fig. 1.

In 2020, despite the outbreak caused by the new coronavirus infection COVID-19 and related restrictive measures, most of the 60 functioning transplant centers continued to provide transplant care to the population. Eleven medical institutions that were hosting transplant centers, suspended transplant care for varying periods of time due to reassignment, Table 1.

Kidney transplantation was performed in 44 centers, liver transplantation in 29, heart transplantation in 16, pancreas transplantation in 3, lung transplantation in 3, and small intestine transplantation in 1.

Of the 60 transplant centers, 19 are federal institutions, including 11 institutions under the Russian Ministry of Health, 2 institutions under the Russian Ministry of Science and Higher Education, 4 institutions under the Federal Biomedical Agency, 2 institutions under the Russian Ministry of Defense, and 41 are institutions run by federal subjects of the Russian Federation.

In 2020, there were 6,929 potential recipients on the kidney transplant waiting list in the Russian Federation, i.e. 11.5% of the total number of patients hemodialysis and peritoneal dialysis (approximately 60,000). Of these, 1,433 were waitlisted in 2020 for the first time. The kidney transplant waitlist mortality in the Russian Federation in 2020 was 1.8% (125 patients).

There were 2,237 potential recipients on the liver transplant waiting list in 2020; 780 of them were included in the list for the first time in 2020. Liver transplant waitlist mortality in the Russian Federation in 2020 was 5.5% (124 patients).

There were 708 potential recipients waitlisted for heart transplantation in 2020; 303 of them were included in the waiting list for the first time in 2020. Heart transplant waitlist mortality in Russia was 7.5% (53 patients).

Between 2012 and 2020, as the number of organ transplants increased in the Russian Federation, the number of waitlisted patients for kidney transplantation almost doubled, the liver transplant waiting list increased 4.6 times, while heart transplant list increased 1.8 times. Meanwhile, the average waiting time for organ transplantation remained virtually unchanged. Waitlist mortality in 2012–2019 tends to decrease; taking into account the COVID-19 pandemic, waitlist mortality was higher in 2020 than in 2019.

Table 2 presents the number of potential recipients on waiting lists at transplant centers.

In 2020, 1,960 organ transplants (13.4 per 1 million population) were performed in Russia of which 258 were pediatric organ transplants. See Tables 3 and 4.

Because of the growing incidence of COVID-19 in a number of regions in Russia, medical organizations with functioning transplantation centers were reassigned to provide medical care to patients with suspected or diagnosed COVID-19. In the spring of 2020, known restrictions were imposed on movement of citizens, there were restrictions on routine consultations and hospitalizations of citizens.

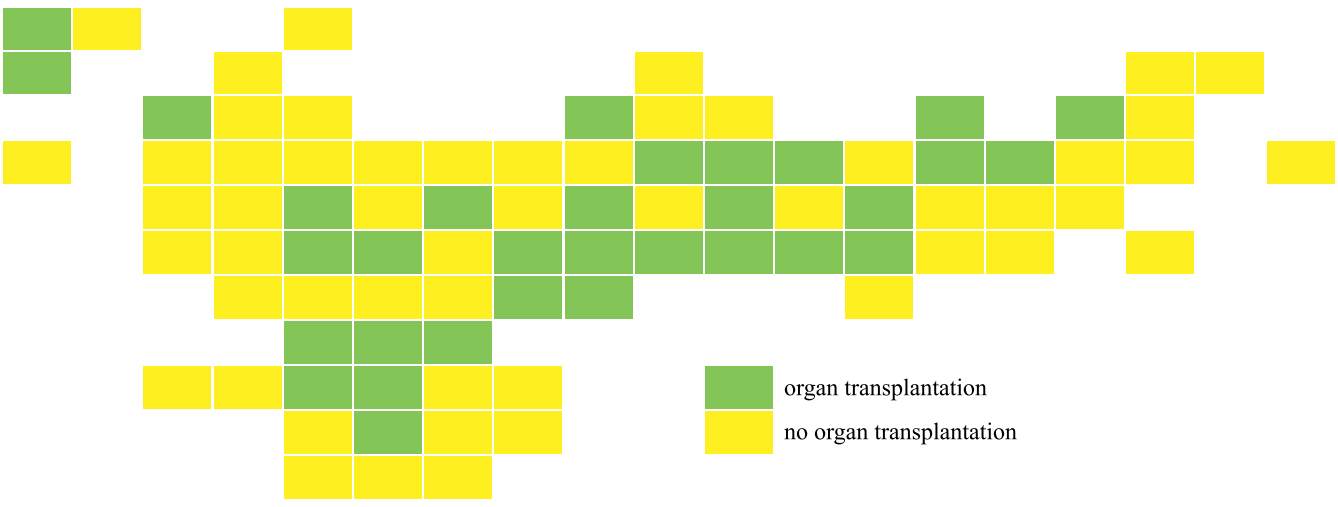

Fig. 1. Geography of organ transplant centers in Russia in 2020

Table 1

Participation of medical institutions (transplant centers) in provision of medical care to patients with suspected or diagnosed COVID-19

No.	Transplant center, region, Federal District	Participation of medical institutions in provision of medical care to patients with suspected or confirmed COVID-19	Reassignment of the surgical department where organ transplant surgeries are performed, with the suspension of organ transplant surgeries
1	2	3	4
1	Shumakov National Medical Research Center of Transplantology and Artificial Organs, Moscow, Central Federal District	yes	no
2	Branch of Shumakov National Medical Research Center of Transplantology and Artificial Organs, Volzhsky, Southern Federal District	no	no
3	Lopatkin Research Institute of Urology and Interventional Radiology – a branch of the National Medical Research Center for Radiology, Moscow, Central Federal District	yes	yes
4	Russian Children's Clinical Hospital, Moscow, Central Federal District	no	no
5	Petrovsky National Research Centre of Surgery, Moscow, Central Federal District	no	no
6	Burnazyan Federal Medical and Biophysical Center, Moscow, Central Federal District	yes	no
7	Bakulev Scientific Center of Cardiovascular Surgery, Moscow, Central Federal District	no	no
8	National Medical Research Center for Children's Health, Moscow, Central Federal District	no	no
9	Botkin City Clinical Hospital, Moscow, Central Federal District	yes	no
10	Research Institute of Emergency Pediatric Surgery and Traumatology, Moscow, Central Federal District	no	no
11	Sklifosovsky Research Institute of Emergency Care, Moscow, Central Federal District	yes	no
12	Morozovskaya Children's City Clinical Hospital, Moscow, Central Federal District	no	no
13	Vladimirsky Moscow Regional Research Clinical Institute, Moscow Oblast, Central Federal District	yes	yes
14	Federal Clinical Center for High Medical Technologies under the Federal Medical-Biological Agency (119), Moscow Oblast, Central Federal District	yes	yes
15	Vishnevsky 3rd Central Military Clinical Hospital, Moscow Oblast, Central Federal District	no	no
16	St. Joasaphus Belgorod Regional Clinical Hospital, Belgorod, Central Federal District	no	no
17	Voronezh Regional Clinical Hospital No. 1, Voronezh, Central Federal District	yes	no
18	Tula Regional Clinical Hospital, Tula, Central Federal District	yes	yes
19	Ryazan Regional Clinical Hospital, Ryazan, Central Federal District	yes	no
20	Stavropol Regional Clinical Hospital, Stavropol, North Caucasian Federal District	yes	no
21	Ochapovsky Regional Clinical Hospital No. 1, Krasnodar, Southern Federal District	yes	no
22	Regional Clinical Hospital No. 2, Krasnodar, Southern Federal District	yes	no
23	Volzhsky Regional Urological Center, Volzhsky, Southern Federal District	no	no
24	Rostov Regional Clinical Hospital, Rostov-on-Don, Southern Federal District	yes	no
25	Granov Russian Research Center of Radiology and Surgical Technologies, St. Petersburg, Northwestern Federal District	no	no

End of table 1

1	2	3	4
26	Almazov National Medical Research Centre, St. Petersburg, Northwestern Federal District	yes	no
27	Pavlov First St. Petersburg State Medical University, St. Petersburg, Northwestern Federal District	yes	no
28	St. Petersburg Dzhanelidze Research Institute of Emergency Medicine, St. Petersburg, Northwestern Federal District	yes	no
29	Leningrad Regional Clinical Hospital, St. Petersburg, Northwestern Federal District	yes	no
30	Kirov Military Medical Academy, St. Petersburg, Northwestern Federal District	no	no
31	City Mariinskaya Hospital, St. Petersburg, Northwestern Federal District	yes	yes
32	Volosevich First City Clinical Hospital, Arkhangelsk, Northwestern Federal District	yes	no
33	Republican Hospital No. 1 – National Center of Medicine, Yakutsk, Far Eastern Federal District	yes	yes
34	Meshalkin National Medical Research Center, Novosibirsk, Siberian Federal District	no	no
35	State Novosibirsk Regional Clinical Hospital, Novosibirsk, Siberian Federal District	yes	no
36	Research Institute for Complex Issues of Cardiovascular Diseases, Kemerovo, Siberian Federal District	yes	no
37	Belyaev Kemerovo Regional Clinical Hospital, Kemerovo, Siberian Federal District	yes	no
38	Podgorbunsky City Clinical Hospital, Kemerovo, Siberian Federal District	yes	no
39	Irkutsk Regional Clinical Hospital, Irkutsk, Siberian Federal District	yes	no
40	Omsk City Clinical Hospital No. 1, Omsk, Siberian Federal District		
41	Regional Clinical Hospital, Altai Krai (Barnaul), Siberian Federal District	yes	no
42	Federal Center for Cardiovascular Surgery, Krasnoyarsk, Siberian Federal District	no	no
43	Federal Siberian Research and Clinical Center, Krasnoyarsk, Siberian Federal District	yes	yes
44	Krasnoyarsk Clinical Hospital, Krasnoyarsk, Siberian Federal District	yes	no
45	Sverdlovsk Regional Clinical Hospital No. 1, Yekaterinburg, Ural Federal District	yes	no
46	Chelyabinsk Regional Clinical Hospital, Chelyabinsk, Ural Federal District	no	no
47	Regional Clinical Hospital No. 1, Tyumen, Ural Federal District	yes	no
48	District Clinical Hospital, Khanty-Mansiysk, Ural Federal District	yes	yes
49	Samara State Medical University, Samara, Volga Federal District	no	no
50	Saratov State Medical University, Saratov, Volga Federal District	yes	yes
51	Regional Clinical Hospital, Saratov, Volga Federal District	yes	yes
52	Volga District Medical Center, Nizhny Novgorod, Volga Federal District	yes	no
53	Specialized Cardiac Surgical Clinical Hospital, Nizhny Novgorod, Volga Federal District	no	no
54	Republican Clinical Hospital, Kazan, Volga Federal District	yes	no
55	Interregional Clinical Diagnostic Center, Kazan, Volga Federal District	no	no
56	Republican Clinical Hospital, Ufa, Volga Federal District	yes	no
57	Republican Cardiology Clinic, Ufa, Volga Federal District	no	no
58	Perm Regional Clinical Hospital, Perm, Volga Federal District	yes	no
59	Ulyanovsk Regional Clinical Center for Specialized Types of Medical Care, Ulyanovsk, Volga Federal District	yes	no
60	City Clinical Hospital for Emergency Medical Care No. 1, Orenburg, Volga Federal District	yes	yes

Table 2

Organ transplant waiting lists in regions across Russia in 2020

Federal district, region, population in 2020 (million people)* Type of transplantation	Russian Federation	Central Federal District					Southern Federal District			North Caucasian Federal District	Northwestern Federal District		Siberian Federal District						Ural Federal District				Volga Federal District								Far Eastern Federal District
		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	The Republic of Tatarstan	The Republic of Bashkortostan	Orenburg Oblast	Perm Krai	Ulyanovsk Oblast	Republic of Sakha (Yakutia)
	146.2	12.6	1.5	2.3	1.1	1.5	5.7	2.5	4.2	2.8	5.4	1.1	2.8	2.6	2.4	1.9	2.3	2.8	4.3	1.5	1.7	3.4	3.1	2.4	3.2	3.9	4.0	1.9	2.6	1.2	1.0
		7.7									1.9																				
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	**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
Number of patients waitlisted for the first time in 2020	**1433**	736	6	7	0	5	41	0	30	9	66	4	40	27	19	15	20	49	25	10	13	26	27	15	35	46	44	2	112	4	0
Total number of waitlisted patients in 2020	**6929**	2555	48	102	32	15	397	110	122	9	328	70	144	136	70	113	110	189	235	78	153	163	253	123	510	300	241	114	112	35	62
Number of waitlisted patients as of 12/31/20	**5680**	1894	43	86	24	7	372	91	78	0	267	68	120	94	50	87	94	160	224	63	147	146	203	112	486	251	197	110	110	34	62
Number of waitlisted patients who died in 2020	**125**	22	1	9	0	2	0	0	7	0	0	1	1	3	0	25	0	1	2	4	2	13	3	4	10	9	6	0	0	0	0
LIVER																															
Number of transplant centers	**31**	6	1	0	1	0	2	0	1	1	4	0	1	1	1	1	1	2	1	1	1	1	0	0	1	1	1	0	0	0	1
Number of patients waitlisted for the first time in 2020	**780**	473	2	0	0	0	5	0	55	4	32	0	66	9	18	4	7	16	12	6	4	11	2	0	23	20	11	0	0	0	0
Total number of waitlisted patients in 2020	**2237**	886	68	0	5	0	51	0	171	4	233	0	101	68	19	4	49	41	109	6	7	38	2	0	202	61	96	0	0	0	16

End of table 2

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 waitlisted patients as of 12/31/20	**1554**	437	64	0	4	0	41	0	140	0	209	0	59	59	5	4	45	26	92	2	4	31	2	0	190	39	85	0	0	0	16
Number of waitlisted patients who died in 2020	**124**	56	3	0	0	0	2	0	16	0	0	0	8	0	0	0	0	3	15	1	2	5	0	0	6	2	5	0	0	0	0
HEART																															
Number of transplant centers	**18**	4	1	1	0	0	1	0	1	0	1	0	1	1	0	0	1	1	1	0	0	1	0	0	1	1	1	0	0	0	0
Number of patients waitlisted for the first time in 2020	**304**	157	4	1	0	0	19	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 waitlisted patients in 2020	**709**	317	14	1	0	0	42	0	25	0	48	0	49	67	0	0	9	35	50	0	0	10	0	0	0	16	26	0	0	0	0
Number of waitlisted patients as of 12/31/20	**404**	164	12	0	0	0	22	0	17	0	19	0	25	46	0	0	7	18	34	0	0	8	0	0	0	11	21	0	0	0	0
Number of waitlisted patients who died in 2020	**53**	11	1	0	0	0	1	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																															
Number of transplant centers	**4**	2	0	0	0	0	0	0	1	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 2020	**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 waitlisted patients in 2020	**114**	110	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
Number of waitlisted patients as of 12/31/20	**98**	95	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
Number of waitlisted patients who died in 2020	**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																															
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 2020	**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 waitlisted patients in 2020	**94**	93	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
Number of waitlisted patients as of 12/31/20	**76**	76	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 waitlisted patients who died in 2020	**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.

Table 3

Organ donation and transplantation in Russia in 2020

Indicator	Number (abs)	Indicator per million population
Organ donation		
Total number of organ donors	890	6.1
Deceased donor	564	3.9
Living (related) donors	326	2.2
Organ transplantation		
Total number of organs transplanted	1960	13.4
including pediatric transplants	256	
Kidney	1124	7.7
as well as cadaveric	967	6.6
from a living donor	157	1.1
including pediatric transplants	119	
Liver	559	3.8
as well as cadaveric	390	2.7
from a living donor	169	1.2
including pediatric transplants	131	
Heart	251	1.7
including pediatric transplants	6	
Pancreas	16	0.1
Lungs	11	0.1
including pediatric transplants	0	
Small intestine	1	0.0
including pediatric transplants	0	

* Population of the Russian Federation in 2020: 146.2 million people. (www.gks.ru).

The impact of COVID-19 and related restrictive measures was reflected in the monthly organ transplant statistics in 2020. See Figs. 2 and 3.

In 2020, high-tech medical care for organ transplantation was fully funded. Based on data obtained from the Federal Registry for High-Tech Medical Care, 1842 (94.0%) organ transplant surgeries were performed in 2020 using funds from the compulsory medical insurance system, allocated for provision of high-tech medical care on organ transplant (there were 2119 transplant surgeries (87.3%) in 2019). 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 2.3 times. At the same time, the proportion of organ transplants performed using these funds has increased by 35.8%.

The financial costs per unit of high-tech medical care for transplantation in 2020 were as follows:

– 950,896 rubles for kidney, pancreas, kidney-pancreas, small bowel, lung transplant;
– 1,206,336 rubles for heart and liver transplant;
– 1,723,623 rubles for heart-lung transplant.

(Resolution No. 1610 of the Government of the Russian Federation, dated December 7, 2019).

ORGAN DONATION

In 2020, donor programs were implemented in 31 (out of 85) federal subjects of the Russian Federation with a population of 98.3 million people. In Perm Krai,

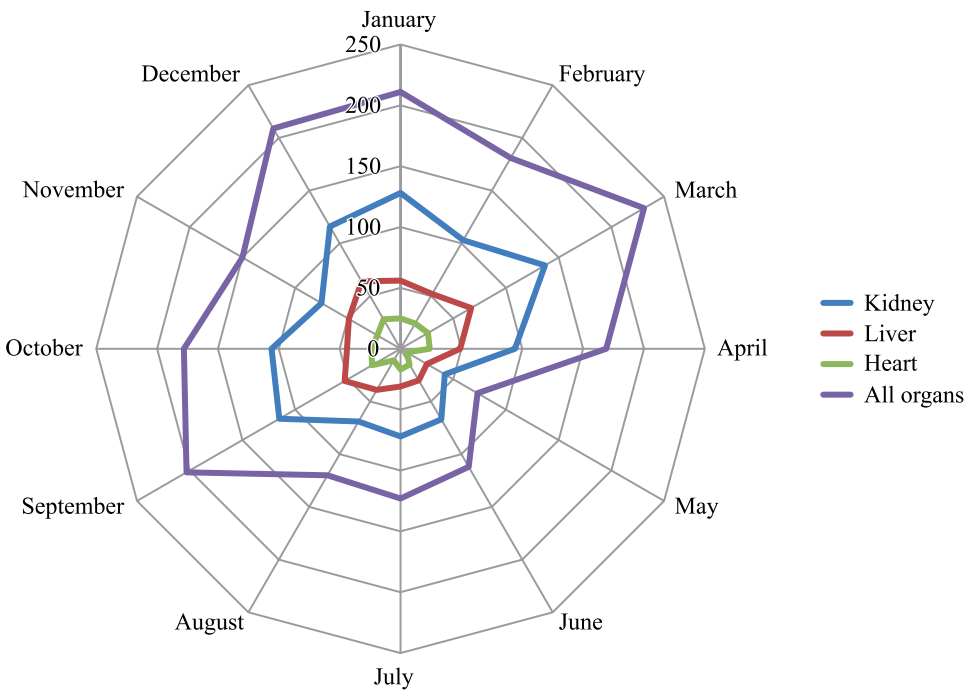

Fig. 2. Number of organ transplants by months in 2020

Table 4

Transplantation activity in Russia in 2020

No.	Transplant center, region, federal district	**Total**	**Kidney (total)**	Kidney (cadaveric)	Kidney (living related)	**Liver (total)**	Liver (cadaveric)	Liver (living related)	**Heart**	**Pancreas**	**Lungs**	**Heart-lungs**	**Small intestine**
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Branch of Shumakov National Medical Research Center of Transplantology and Artificial Organs, **Moscow, Central Federal District**	**563**	**198**	134	64	**165**	57	108	**190**	**2**	**6**	**2**	**0**
2	Branch of Shumakov National Medical Research Center of Transplantology and Artificial Organs, **Volzhsky, Southern Federal District**	**8**	**8**	0	8	**0**	0	0	**0**	**0**	**0**	**0**	**0**
3	Lopatkin Research Institute of Urology and Interventional Radiology – a branch of the National Medical Research Center for Radiology, **Moscow, Central Federal District**	**28**	**28**	22	6	**0**	0	0	**0**	**0**	**0**	**0**	**0**
4	Russian Children's Clinical Hospital, **Moscow, Central Federal District**	**30**	**30**	30	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
5	Petrovsky National Research Centre of Surgery, **Moscow, Central Federal District**	**21**	**13**	6	7	**8**	1	7	**0**	**0**	**0**	**0**	**0**
6	Burnazyan Federal Medical and Biophysical Center, **Moscow, Central Federal District**	**59**	**12**	10	2	**47**	10	37	**0**	**0**	**0**	**0**	**0**
7	Bakulev Scientific Center of Cardiovascular Surgery, **Moscow, Central Federal District**	**3**	**0**	0	0	**0**	0	0	**3**	**0**	**0**	**0**	**0**
8	National Medical Research Center for Children's Health, **Moscow, Central Federal District**	**34**	**34**	8	26	**0**	0	0	**0**	**0**	**0**	**0**	**0**
9	Botkin City Clinical Hospital, **Moscow, Central Federal District**	**110**	**75**	75	0	**35**	35	0	**0**	**0**	**0**	**0**	**0**
10	Research Institute of Emergency Pediatric Surgery and Traumatology, **Moscow, Central Federal District**	**1**	**1**	1	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
11	Sklifosovsky Research Institute of Emergency Care, **Moscow, Central Federal District**	**333**	**198**	196	2	**118**	117	1	**1**	**13**	**2**	**0**	**1**
12	Morozovskaya Children's City Clinical Hospital, **Moscow, Central Federal District**	**0**	**0**	0	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
13	Vladimirsky Moscow Regional Research Clinical Institute, **Moscow Oblast, Central Federal District**	**54**	**36**	35	1	**17**	14	3	**1**	**0**	**0**	**0**	**0**
14	Federal Clinical Center for High Medical Technologies under the Federal Medical-Biological Agency (119), **Moscow Oblast, Central Federal District**	**8**	**8**	6	2	**0**	0	0	**0**	**0**	**0**	**0**	**0**
15	Vishnevsky 3rd Central Military Clinical Hospital, **Moscow Oblast, Central Federal District**	**0**	**0**	0	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
16	St. Joasaphus Belgorod Regional Clinical Hospital, **Belgorod, Central Federal District**	**5**	**4**	4	0	**1**	1	0	**0**	**0**	**0**	**0**	**0**

Continuation table 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14
17	Voronezh Regional Clinical Hospital No. 1, **Voronezh, Central Federal District**	**8**	**7**	7	0	**0**	0	0	**1**	**0**	**0**	**0**	**0**
18	Tula Regional Clinical Hospital, **Tula, Central Federal District**	**6**	**6**	3	3	**0**	0	0	**0**	**0**	**0**	**0**	**0**
19	Ryazan Regional Clinical Hospital, **Ryazan, Central Federal District**	**9**	**8**	8	0	**1**	1	0	**0**	**0**	**0**	**0**	**0**
20	Stavropol Regional Clinical Hospital, **Stavropol, North Caucasian Federal District**	**13**	**9**	9	0	**4**	3	1	**0**	**0**	**0**	**0**	**0**
21	Ochapovsky Regional Clinical Hospital No. 1, **Krasnodar, Southern Federal District**	**33**	**22**	22	0	**7**	7	0	**4**	**0**	**0**	**0**	**0**
22	Regional Clinical Hospital No. 2, **Krasnodar, Southern Federal District**	**1**	**0**	0	0	**1**	1	0	**0**	**0**	**0**	**0**	**0**
23	Volzhsky Regional Urological Center, **Volzhsky, Southern Federal District**	**19**	**19**	18	1	**0**	0	0	**0**	**0**	**0**	**0**	**0**
24	Rostov Regional Clinical Hospital, **Rostov-on-Don, Southern Federal District**	**56**	**37**	37	0	**15**	14	1	**3**	**1**	**0**	**0**	**0**
25	Granov Russian Research Center of Radiology and Surgical Technologies, St. Petersburg, **St. Petersburg, Northwestern Federal District**	**17**	**0**	0	0	**17**	17	0	**0**	**0**	**0**	**0**	**0**
26	Almazov National Medical Research Centre, **St. Petersburg, Northwestern Federal District**	**18**	**0**	0	0	**0**	0	0	**18**	**0**	**0**	**0**	**0**
27	Pavlov First St. Petersburg State Medical University, St. Petersburg, **St. Petersburg, Northwestern Federal District**	**18**	**15**	9	6	**2**	2	0	**0**	**0**	**1**	**0**	**0**
28	St. Petersburg Dzhanelidze Research Institute of Emergency Medicine, **St. Petersburg, Northwestern Federal District**	**22**	**20**	20	0	**2**	2	0	**0**	**0**	**0**	**0**	**0**
29	Leningrad Regional Clinical Hospital, **St. Petersburg, Northwestern Federal District**	**20**	**20**	20	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
30	Kirov Military Medical Academy, **St. Petersburg, Northwestern Federal District**	**3**	**0**	0	0	**3**	3	0	**0**	**0**	**0**	**0**	**0**
31	City Mariinskaya Hospital, **St. Petersburg, Northwestern Federal District**	**6**	**6**	6	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
32	Volosevich First City Clinical Hospital, **Arkhangelsk, Northwestern Federal District**	**1**	**1**	1	0	**0**	0	0	**0**	**0**	**0**	**0**	0
33	Republican Hospital No. 1 – National Center of Medicine, **Yakutsk, Far Eastern Federal District**	**0**	**0**	0	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
34	Meshalkin National Medical Research Center, **Novosibirsk, Siberian Federal District**	**5**	**0**	0	0	**0**	0	0	**5**	**0**	**0**	**0**	**0**
35	State Novosibirsk Regional Clinical Hospital, **Novosibirsk, Siberian Federal District**	**57**	**23**	21	2	**34**	24	10	**0**	**0**	**0**	**0**	**0**
36	Research Institute for Complex Issues of Cardiovascular Diseases, **Kemerovo, Siberian Federal District**	**7**	**0**	0	0	**0**	0	0	**7**	**0**	**0**	**0**	**0**
37	Belyaev Kemerovo Regional Clinical Hospital, **Kemerovo, Siberian Federal District**	**39**	**39**	38	1	**0**	0	0	**0**	**0**	**0**	**0**	**0**

End of table 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14
38	Podgorbunsky City Clinical Hospital, **Kemerovo, Siberian Federal District**	**9**	**0**	0	0	**9**	9	0	**0**	**0**	**0**	**0**	**0**
39	Irkutsk Regional Clinical Hospital, **Irkutsk, Siberian Federal District**	**34**	**20**	19	1	**14**	14	0	**0**	**0**	**0**	**0**	**0**
40	Omsk City Clinical Hospital No. 1, **Omsk, Siberian Federal District**	**1**	**1**	1	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
41	Regional Clinical Hospital, **Altai Krai (Barnaul), Siberian Federal District**	**20**	**16**	16	0	**4**	4	0	**0**	**0**	**0**	**0**	**0**
42	Federal Center for Cardiovascular Surgery, **Krasnoyarsk, Siberian Federal District**	**0**	**0**	0	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
43	Federal Siberian Research and Clinical Center, **Krasnoyarsk, Siberian Federal District**	**14**	**12**	12	0	**2**	2	0	**0**	**0**	**0**	**0**	**0**
44	Krasnoyarsk Clinical Hospital, **Krasnoyarsk, Siberian Federal District**	**29**	**16**	16	0	**10**	10	0	**3**	**0**	**0**	**0**	**0**
45	Sverdlovsk Regional Clinical Hospital No. 1, **Yekaterinburg, Ural Federal District**	**17**	**9**	9	0	**5**	5	0	**3**	**0**	**0**	**0**	**0**
46	Chelyabinsk Regional Clinical Hospital, **Chelyabinsk, Ural Federal District**	**7**	**4**	4	0	**2**	2	0	**1**	**0**	**0**	**0**	**0**
47	Regional Clinical Hospital No. 1, **Tyumen, Ural Federal District**	**14**	**11**	11	0	**3**	3	0	**0**	**0**	**0**	**0**	**0**
48	District Clinical Hospital, **Khanty-Mansiysk, Ural Federal District**	**5**	**4**	4	0	**1**	1	0	**0**	**0**	**0**	**0**	**0**
49	Samara State Medical University, **Samara, Volga Federal District**	**47**	**47**	47	0	**0**	0	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**	**0**	**0**	0	0	**0**	0	0	**0**	**0**	**0**	**0**	**0**
52	Volga District Medical Center, **Nizhny Novgorod, Volga Federal District**	**20**	**14**	8	6	**6**	5	1	**0**	**0**	**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**	**60**	**40**	34	6	**20**	20	0	**0**	**0**	**0**	**0**	**0**
55	Interregional Clinical Diagnostic Center, **Kazan, Volga Federal District**	**4**	**0**	0	0	**0**	0	0	**4**	**0**	**0**	**0**	**0**
56	Republican Clinical Hospital, **Ufa, Volga Federal District**	**44**	**38**	38	0	**6**	6	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**	**2**	**2**	0	2	**0**	0	0	**0**	**0**	**0**	**0**	**0**
59	Ulyanovsk Regional Clinical Center for Specialized Types of Medical Care, **Ulyanovsk, Volga Federal District**	**1**	**1**	0	1	**0**	0	0	**0**	**0**	**0**	**0**	**0**
60	City Clinical Hospital for Emergency Medical Care No. 1, **Orenburg, Volga Federal District**	**4**	**4**	2	2	**0**	0	0	**0**	0	0	0	0
Total		**1960**	**1124**	**967**	**157**	**559**	**390**	**169**	**249**	**16**	**9**	**2**	**1**

Ulyanovsk Oblast and Saratov Oblast, only living-related donor kidney transplants were performed.

There was a total of 564 effective deceased donors (3.9 per million population) in 2020. See Table 5.

In 2020, some of the hospitals involved in donor support for transplantation centers reassigned their intensive care units to provide medical care to patients with severe COVID-19.

The past year continued the trend of increase in the proportion of effective organ donors over 60 years of age; it exceeded 20% in 2020. Male donors were 73.0%, female donors were 27%. The age structure of effective organ donors is shown in Fig. 5.

Donor activity per population of the regions implementing donor programs (95.9 million) amounted to 5.9 per million population. See Tables 6 and 7. The steadily high European level indicator of donor activity was retained in Moscow (20.9), while the indicators in Kemerovo Oblast (10.0), Samara Oblast (7.5), Irkutsk Oblast (6.7) and Leningrad Oblast (6.1) were also stea-

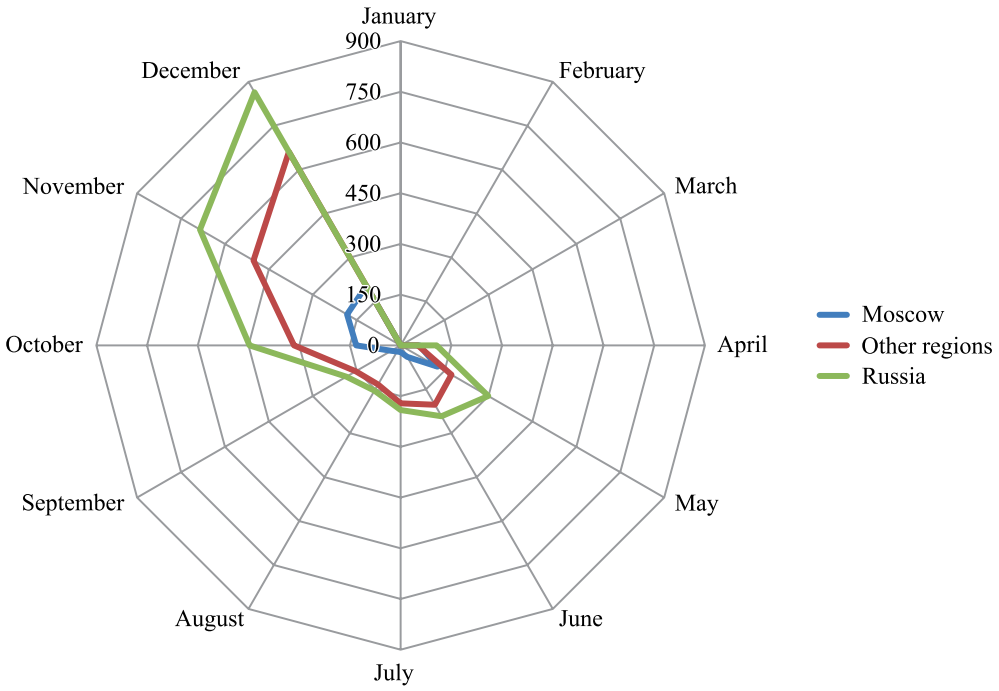

Fig. 3. COVID-19 incidence by months in 2020

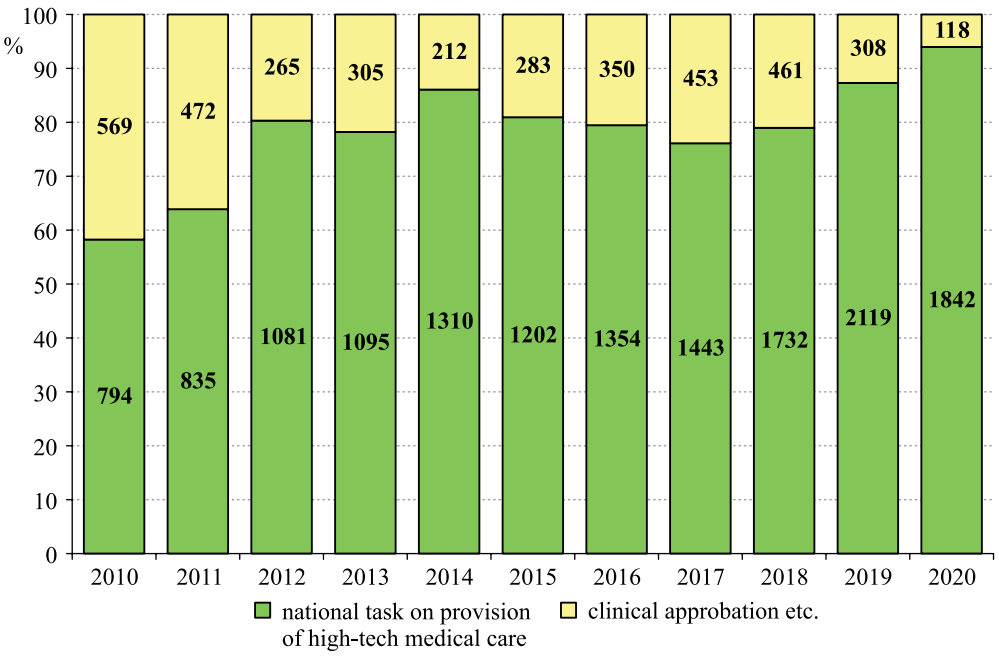

Fig. 4. Funding for Organ Transplants in Russia in 2010–2020

dily high. Moscow and Moscow Oblast accounted for 50.3% (284) of effective donors in 2020.

In 2020, the practice of brain death pronouncement continued to expand in Russia. There were 547 effective brain-dead donors – 97.0% (94.5% in 2019) of the total pool of effective donors. See Fig. 6.

There are no organ donor programs in the country that do not use a protocol to diagnose human death based on diagnosis of brain death. In 24 federal subjects of Russia, organ donor programs worked only with brain-dead donors. Kemerovo Oblast, which lags behind other regions in this indicator, has seen a consistent increase in the proportion of brain-dead donors: 36.7% in 2018, 47.5% in 2019 and 66.7% in 2020.

In 2020, a total of 421 multi-organ procurements were performed, accounting for 74.6%. For comparison, it was 71.8% in 2019. There were 16 organ donor programs involving a high proportion of multi-organ procurements (over 70%). In 4 of the programs, multiple organs were procured from all (100%) the patients.

Moscow and Moscow Oblast accounted for 239 (56.8%) multi-organ donors in the country in 2020.

The average number of organs procured from one donor remained the same with that of 2019 and 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: Tula Oblast (3.7), Moscow (3.3), Ryazan Oblast (3.2), Sverdlovsk Oblast (3.2), and Nizhny Novgorod Oblast (3.2). The lowest number of procurements was recorded in Omsk Oblast (1.5), in Volgograd Oblast (2.0), and in Irkutsk Oblast (2.0).

In 2020, the rate of procurement and use of donor kidneys was 86.7%. In 17 regions, this indicator was in the optimal 90%–100% range, in 7 regions it was between

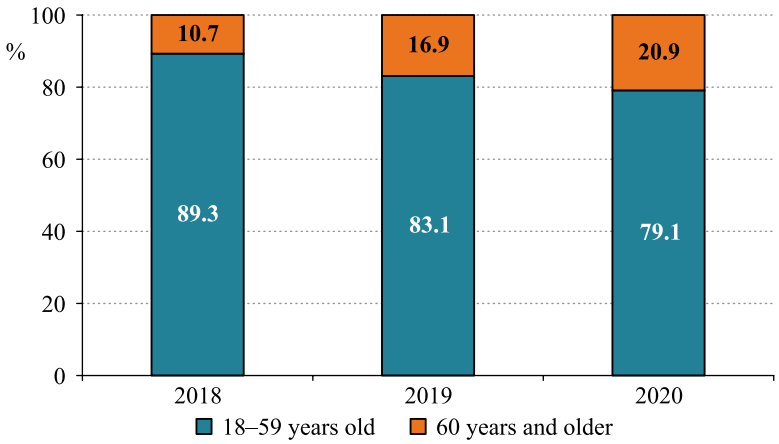

Fig. 5. Age structure of effective organ donors in 2018–2020

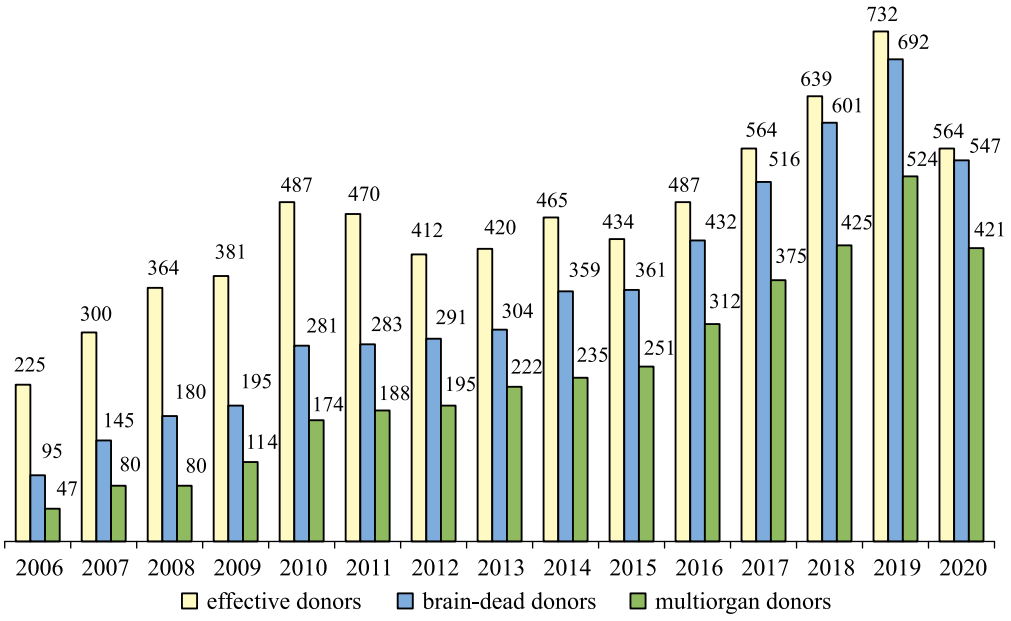

Fig. 6. Structure of effective organ donors in the Russian Federation in 2006–2020

Table 5

Indicators associated with donor activity in Russian regions in 2020

No.	Region	Organ Donation Coordinating Center, region	Population (million)	Number of donor bases	Effective donors (abs., per million population)		including those diagnosed with brain death (abs., %)		including multi-organ donors (abs., %)		Total organs procured	including procured kidneys	Number of organs/number of donors ratio	Percentage of kidneys procured
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	263	20.9	260	98.9	219	83.3	857	457	3.3	86.9
2	Moscow Oblast	Vladimirsky Moscow Regional Research Clinical Institute, Moscow	7.5	33	21	2.8	21	100.0	20	95.2	54	42	2.6	100.0
3	Belgorod Oblast	St. Joasaphus Belgorod Regional Clinical Hospital, Belgorod	1.5	1	2	1.3	2	100.0	1	50.0	5	4	2.5	100.0
4	Voronezh Oblast	Voronezh Regional Clinical Hospital No. 1, Voronezh	2.3	10	4	1.7	4	100.0	1	25.0	9	7	2.3	87.5
5	Tula Oblast	Tula Regional Clinical Hospital, Tula	1.5	1	3	2.0	3	100.0	3	100.0	11	6	3.7	100.0
6	Ryazan Oblast	Ryazan Regional Clinical Hospital, Ryazan	1.1	1	6	5.5	6	100.0	5	83.3	19	12	3.2	100.0
7	Krasnodar Krai	Ochapovsky Regional Clinical Hospital No. 1, Krasnodar	5.6	2	13	2.3	13	100.0	9	69.2	35	22	2.7	84.6
8	Volgograd Oblast	Volzhsky Regional Urological Center, Volzhsky	2.5	11	10	4.0	10	100.0	0	0.0	20	20	2.0	100.0
9	Rostov Oblast	Rostov Regional Clinical Hospital, Rostov-on-Don	4.2	1	18	4.3	18	100.0	14	77.8	53	35	2.9	97.2
10	Stavropol Krai	Stavropol Regional Clinical Hospital, Stavropol	2.8	1	13	4.6	13	100.0	11	84.6	37	26	2.8	100.0
11	St. Petersburg	Center for Organ and Tissue Donation, St. Petersburg (St. Petersburg Dzhanelidze Research Institute of Emergency Medicine)	5.4	14	25	4.6	25	100.0	22	88.0	69	33	2.8	66.0
12	Leningrad Oblast	Leningrad Regional Clinical Hospital, St. Petersburg	1.8	1	11	6.1	11	100.0	7	63.6	29	22	2.6	100.0
13	Arkhangelsk Oblast	Volosevich First City Clinical Hospital, Arkhangelsk	1.1	1	1	0.9	1	100.0	1	100.0	3	2	3.0	100.0
14	Novosibirsk Oblast	State Novosibirsk Regional Clinical Hospital, Novosibirsk	2.8	10	15	5.4	15	100.0	11	73.3	32	15	2.1	50.0
15	Kemerovo Oblast	Belyaev Kemerovo Regional Clinical Hospital, Kemerovo	2.7	15	27	10.0	18	66.7	17	63.0	70	44	2.6	81.5
16	Irkutsk Oblast	Irkutsk Regional Clinical Hospital, Irkutsk	2.4	1	16	6.7	15	93.8	13	81.3	32	19	2.0	59.4
17	Omsk Oblast	Omsk City Clinical Hospital No. 1, Omsk	1.9	2	2	1.1	2	100.0	1	50.0	3	2	1.5	50.0
18	Altai Krai	Regional Clinical Hospital, Altai Krai (Barnaul)	2.3	1	9	3.9	9	100.0	9	100.0	27	18	3.0	100.0

End of table 5

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
19	Krasnoyarsk Krai	Krasnoyarsk Clinical Hospital, Krasnoyarsk	2.9	12	10	3.4	10	100.0	9	90.0	29	17	2.9	85.0
20	Sverdlovsk Oblast	Sverdlovsk Regional Clinical Hospital No. 1, Yekaterinburg	4.3	8	6	1.4	6	100.0	5	83.3	19	11	3.2	91.7
21	Chelyabinsk Oblast	Chelyabinsk Regional Clinical Hospital, Chelyabinsk	3.5	1	3	0.9	3	100.0	2	66.7	9	6	3.0	100.0
22	Tyumen Oblast	Regional Clinical Hospital No. 1, Tyumen	1.5	1	5	3.3	5	100.0	3	60.0	14	10	2.8	100.0
23	Khanty-Mansi Autonomous Okrug – Yugra	District Clinical Hospital, Khanty-Mansiysk	1.7	8	3	1.8	3	100.0	2	66.7	8	6	2.7	100.0
24	Samara Oblast	Samara State Medical University, Samara	3.2	5	24	7.5	20	83.3	4	16.7	52	48	2.2	100.0
25	Saratov Oblast	Regional Clinical Hospital, Saratov	2.4	1	0	0.0	0	–	0	–	0	0	–	–
26	Nizhny Novgorod Oblast	Volga District Medical Center, Nizhny Novgorod	3.2	9	5	1.6	5	100.0	4	80.0	16	8	3.2	80.0
27	The Republic of Tatarstan	Republican Clinical Hospital, Kazan	3.9	2	21	5.4	21	100.0	19	90.5	57	34	2.7	81.0
28	The Republic of Bashkortostan	Republican Clinical Hospital, Ufa	4.1	12	18	4.4	18	100.0	6	33.3	46	36	2.6	100.0
29	Orenburg Oblast	City Clinical Hospital for Emergency Medical Care No. 1, Orenburg	2.0	2	1	0.5	1	100.0	1	100.0	3	2	3.0	100.0
30	The Republic of Sakha (Yakutia)	Republican Hospital No. 1 – National Center of Medicine, Yakutsk	1.0	1	0	0.0	0	–	0	–	0	0	–	–
31	Departmental program of the Federal Medical-Biological Agency of Russia	Burnazyan Federal Medical and Biophysical Center, Moscow, Central Federal District	–	28	1	–	1	100.0	0	0.0	1	0	1.0	0.0
32	Departmental program of the Federal Medical-Biological Agency of Russia	Federal Siberian Research and Clinical Center, Krasnoyarsk	–	5	8	–	8	100.0	2	25.0	17	14	2.1	87.5
		Total	**146.2**	**218**	**564**	**3.9**	**547**	**97.0**	**421**	**74.6**	**1636**	**978**	**2.9**	**86.7**

80% and 90%, and in 4 programs it was less than 80% (66.0% in St. Petersburg, 50.0% in Novosibirsk Region, 59.4% in Irkutsk Region and 50.0% in Omsk Oblast).

Thus, with reduced number of effective donors against the background of the COVID-19 pandemic, the indicators of donor work efficiency, namely the proportion of brain-dead donors, the proportion of multi-organ donors, the average number of organs transplanted from one effective donor, did not worsen. No cases of donor-to-recipient transfer of COVID-19 infection were recorded.

In 2020, the number of organ donations from living related donors was 326 – 36.6% of the total number of procurements (890).

KIDNEY TRANSPLANTATION

In 2020, a total of 1,124 kidney transplantations were performed (7.7 per million population). See Fig. 7.

There were 967 deceased-donor kidney transplants (6.6 per million population) in 2020. There were 157 living-related donor kidney transplants (1.1 per million population) in 2020.

Table 8 and Fig. 8 show the kidney transplant centers with the highest number of kidney transplants in 2020.

The rating primarily demonstrates the leadership and sustainability of the transplantation programs of leading transplant centers in Moscow, which in turn is a consequence of the effective work by the Moscow Coordination Center for Organ Donation. The positive dynamics of transplantation programs in Samara Oblast and Rostov Oblast should also be noted. The negative impact of COVID-19 was largely reflected in the indicators for Kemerovo Oblast, St. Petersburg, and Moscow Oblast. The total transplant activity in the presented 10 leading kidney transplant centers is 750.

Table 6

Rating of regions by donor activity in 2020

Subject of the Russian Federation (Oblast)	Population in 2020, million	Number of effective donors per million population		Rating		Change in rating
		2020	2019	2020	2019	
Moscow	12.6	20.9	22.0	1	1	No
Kemerovo Oblast	2.7	10.0	14.8	2	2	No
Samara Oblast	3.2	7.5	7.8	3	7	+4
Irkutsk Oblast	2.4	6.7	6.7	4	8	+4
Leningrad Oblast	1.8	6.1	3.9	5	19	+14
Ryazan Oblast	1.1	5.5	11.8	6	3	–3
Novosibirsk Oblast	2.8	5.4	8.2	7	6	–1
The Republic of Tatarstan	3.9	5.4	3.8	8	20	+12
Voronezh Oblast	2.3	5.4	3.5	9	22	+13
St. Petersburg	5.4	4.6	9.8	10	4	–6
Stavropol Krai	2.8	4.6	1.1	11	29	+18
The Republic of Bashkortostan	4.1	4.4	5.9	12	9	–3
Rostov Oblast	4.2	4.3	5.0	13	13	No
Volgograd Oblast	2.5	4.0	4.0	14	18	+4
Krasnoyarsk Krai*	2.9	3.4	4.5	15	15	No
Tyumen Oblast	1.5	3.3	8.7	16	5	–11
Moscow Oblast	7.5	2.8	5.5	17	12	–5
Krasnodar Krai	5.6	2.3	4.1	18	17	–1
Tula Oblast	1.5	2.0	1.3	19	27	+8
Khanty-Mansi Autonomous Okrug – Yugra	1.7	1.8	2.9	20	25	+5
The Republic of Sakha (Yakutia)	1	1.7	3.0	21	24	+3
Nizhny Novgorod Oblast	3.2	1.6	3.8	22	21	–1
Altai Krai	2.3	1.6	3.5	23	23	No
Sverdlovsk Oblast	4.3	1.4	5.6	24	10	–14
Belgorod Oblast	1.5	1.3	2.7	25	26	+1
Omsk Oblast	1.9	1.1	1.1	26	30	+4
Arkhangelsk Oblast	1.1	0.9	4.5	27	14	–13
Chelyabinsk Oblast	3.5	0.9	1.1	28	28	No
Orenburg Oblast	2	0.5	5.5	29	11	–18
Saratov Oblast	2.4	0.0	4.2	30	16	–14
Russia (85 federal subjects of the Russian Federation)	146.2	3.9	5.0	–	–	

* Excluding the donor program FSRCC under FMBA, Krasnoyarsk.

Table 7

Deceased organ donors (effective donors) in 2006–2020

No.	Oblast	2006	2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		2020	
		Number of effective donors	Number of effective donors	Change over the year (abs.)	Number of effective donors	Change over the year (abs.)	Number of effective donors	Change over the year (abs.)	Number of effective donors	Change over the year (abs.)	Number of effective donors	Change over the year (abs.)	Number of effective donors	Change over the year (abs.)	Number of effective donors	Change over the year (abs.)	Number of effective donors	Change over the year (abs.)	Number of effective donors	Change over the year (abs.)	Number of effective donors	Change over the year (abs.)	Number of effective donors	Change over the year (abs.)	Number of effective donors	Change over the year (abs.)	Number of effective donors	Change over the year (abs.)	Number of effective donors	Change over the 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	30	31
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	263	–14
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	41	–27	21	–20
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	2	–2
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	4	–4
5	Tula Oblast																										2	+2	3	+1
6	Ryazan Oblast																								2	+2	13	+11	6	–7
7	Krasnodar Krai						3	+3	39	+36	52	+13	42	–10	41	–1	23	–18	25	+2	24	–1	19	–5	20	+1	23	+3	13	–10
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	10	0
9	Rostov Oblast																		1	+1	7	+6	13	+6	19	+6	21	+2	18	–3
10	Stavropol Krai																								2	+2	3	+1	13	+10
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	25	–28
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	11	+4
13	Arkhangelsk Oblast																								5	+5	5	0	1	–4
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	–8
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	27	–13
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	16	0
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	2	0
18	Altai Krai														3	+3	5	+2	4	–1	4	0	8	+4	8	0	8	0	9	+1

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	30	31
19	Krasnoyarsk Krai																3	+3	6	+3	18	+12	27	+9	16	note	13	–3	10	–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	6	–18
21	Chelyabinsk Oblast								6	+6	2	–4	7	+5	6	–1	10	+4	9	–1	11	+2	8	–3	4	–4	4	0	3	–1
22	Tyumen Oblast																						4	+4	13	+9	13	0	5	–8
23	Khanty-Mansi Autonomous Okrug – Yugra																						3	+3	4	+1	5	+1	3	–2
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	24	–1
25	Saratov Oblast														4	+4	7	+3	7	0	7	0	7	0	8	+1	10	+2	0	–10
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	5	–7
27	The 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	21	+6
28	The Republic of Bashkortostan								2	+2	7	+5	14	+7	18	+4	19	+1	14	+5	20	+6	22	+2	20	–2	24	+4	18	–6
29	Orenburg Oblast																		3	+3	8	+5	9	+1	8	–1	11	+3	1	–10
30	The Republic of Sakha (Yakutia)																				2	+2	4	+2	4	0	3	–1	0	–3
31	Federal Medical-Biological Agency, Moscow														6	+6	11	+5	14	+3	16	+2	9	–7	5	–4	1	–4	1	0
32	Federal Medical-Biological Agency, Krasnoyarsk																								24	note	16	–8	8	–8
	TOTAL in the Russian Federation	225	300	+75	364	+64	381	+17	487	+106	470	–17	412	–58	420	+8	465	+45	434	–31	499	+53	565	+78	639	+74	732	+93	564	**–168**

Note. Donor activity of FSRCC under FMBA, Krasnoyarsk, is presented as a separate program.

In 2020, only 3 kidney transplant centers performed more than 50 surgeries per year. These were the Shumakov National Medical Research Center of Transplantology and Artificial Organs (Shumakov Center) (206 kidney transplants), Sklifosovsky Research Institute of Emergency Care (Sklifosovsky Institute) (198) and Botkin City Clinical Hospital (75). Eight centers performed from 30 to 49 operations during the year, another 10 centers performed from 15 to 29, the remaining 23 centers or 52.3% performed less than 15 kidney transplants.

In 2020, 20 centers out of 44 performed related-donor kidney transplants. A total of 157 transplants were performed, 72 of which were done at the Shumakov Center. The average frequency of living-donor kidney transplants in 2020 was 13.4% of the total number of kidney transplants performed (12.4% in 2019).

In 2020, 8 centers carried out pediatric kidney transplants. A total of 119 kidney transplants were done (101 in 2019), of which 114 (94.2%) were in Moscow – Shumakov Center (48), National Medical Research Center for Children's Health (34), and the Russian Children's Clinical Hospital (30). See Fig. 9.

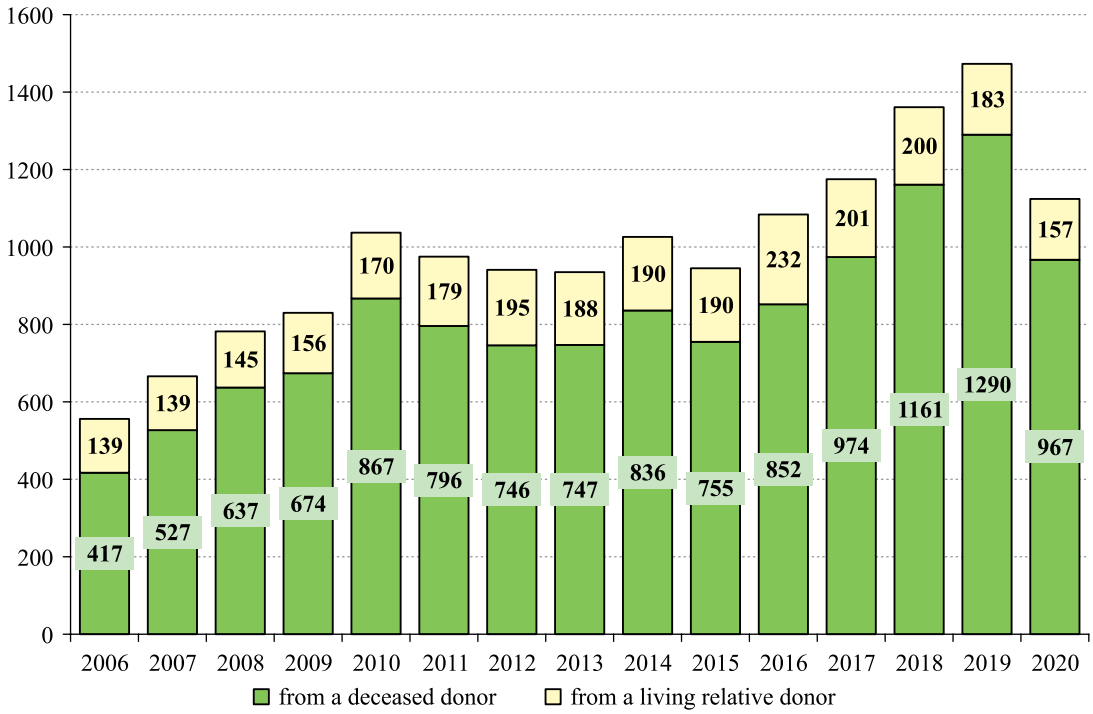

Fig. 7. Kidney transplantation in Russia in 2006–2020

Table 8

Leading medical institutions in terms of number of kidney transplants performed

Rank	Centers – leaders in terms of number of kidney transplants performed	Number of kidney transplants performed in 2020
1	Shumakov National Medical Research Center of Transplantology and Artificial Organs, Moscow	206
2	Sklifosovsky Research Institute of Emergency Care, Moscow	198
3	Botkin City Clinical Hospital, Moscow	75
4	Samara State Medical University, Samara	47
5	Republican Clinical Hospital, Kazan	40
6	Belyaev Kemerovo Regional Clinical Hospital, Kemerovo	39
7	Republican Clinical Hospital, Ufa	38
8	Rostov Regional Clinical Hospital, Rostov-on-Don	37
9	Vladimirsky Moscow Regional Research Clinical Institute, Moscow Oblast	36
10	National Medical Research Center for Children's Health, Moscow, Central Federal District	34
	TOTAL	**750**
	66.7% of the total number of kidney transplants performed in the Russian Federation (1124)	

EXTRARENAL ORGAN TRANSPLANTATION

In 2020, there were 251 heart transplants (1.7 per million population) performed of which 6 were pediatric transplant surgeries. Heart transplants were performed at 16 centers.

The Shumakov Center (Moscow) accounted for 75.7% (190 heart transplant surgeries) of the total number of heart transplants in Russia. The heart transplant program at this center continues to drive the level of availability of this type of transplant care in the country.

While 7 transplant centers performed 10 or more heart transplants in 2019, only 2 did so in 2020 – Shumakov Center (190) and Almazov National Medical Research Centre (18). Meshalkin National Medical Research Center in Novosibirsk, Sklifosovsky Institute in Moscow, Ochapovsky Regional Clinical Hospital No. 1 in Kras-

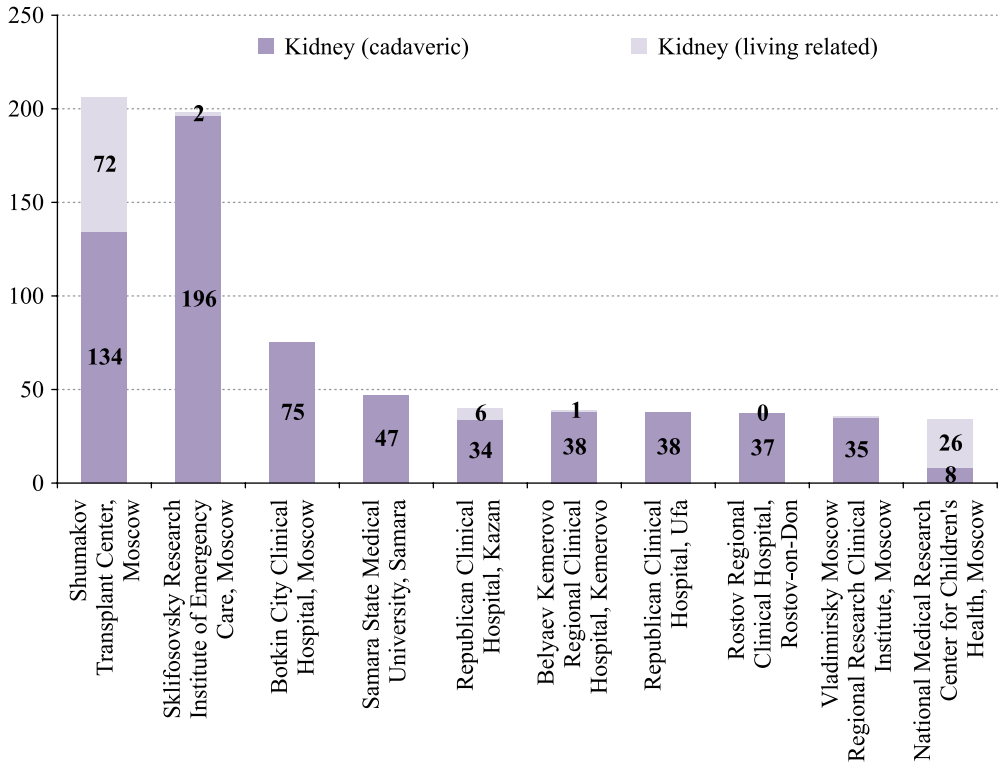

Fig. 8. Leading medical institutions in terms of number of kidney transplants performed

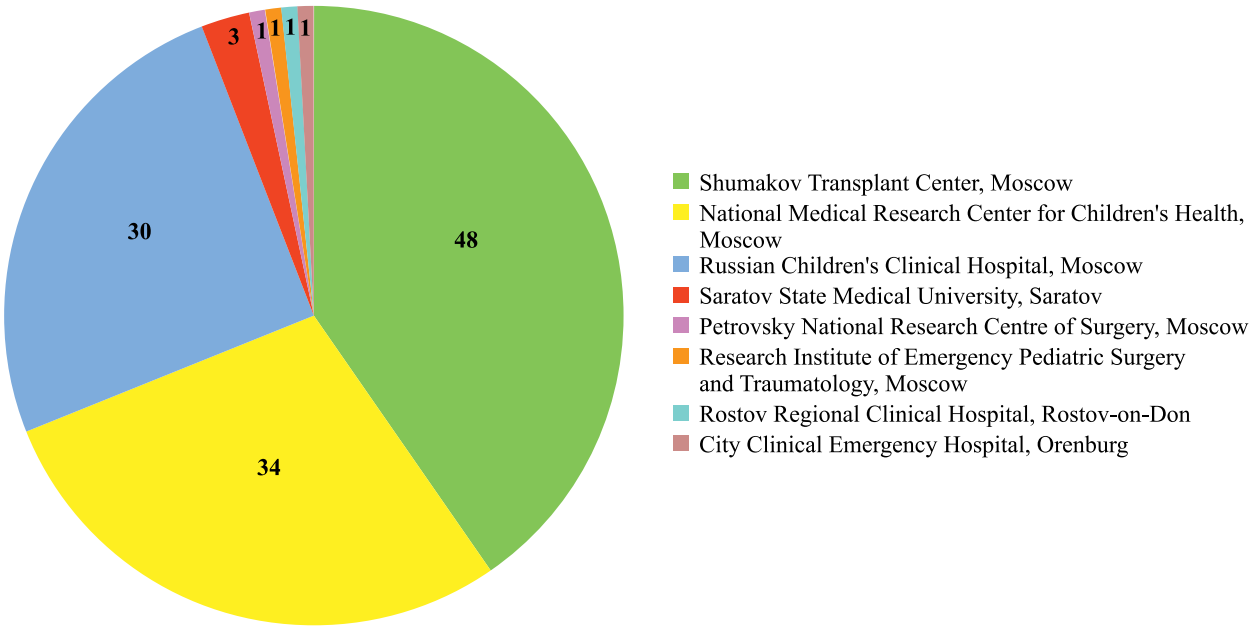

Fig. 9. Pediatric kidney transplantation in Russia in 2019

nodar, Sverdlovsk Regional Clinical Hospital No. 1 in Yekaterinburg, and the Research Institute for Complex Problems of Cardiovascular Diseases in Kemerovo were unable to maintain transplantation activity during the COVID-19 pandemic.

Lung transplantations in 2020 were performed at 3 transplantation centers. A total 9 lung transplants were conducted; Shumakov Center (6 lung transplants), Sklifosovsky Institute (2), and Pavlov First St. Petersburg State Medical University in St. Petersburg (1). The Shumakov Center also performed 2 heart-lung transplants.

Table 9 and Fig. 10 show the thoracic organ transplant centers that performed the highest number of heart and lung transplants in 2020.

Table 9

Leading medical institutions in terms of number of thoracic organ transplantations performed

Rank	Centers – leaders in terms of number of heart transplants performed	Number of kidney transplants performed in 2020
1	Shumakov National Medical Research Center of Transplantology and Artificial Organs, Moscow	190
2	Almazov National Medical Research Centre, St. Petersburg	18
3	Research Institute for Complex Issues of Cardiovascular Diseases, Kemerovo	7
4	Meshalkin National Medical Research Center, Novosibirsk	5
5	Ochapovsky Regional Clinical Hospital No. 1, Krasnodar	4
6	Interregional Clinical Diagnostic Center, Kazan	4
7	Republican Cardiology Clinic, Ufa	4
8	Bakulev Scientific Center of Cardiovascular Surgery, Moscow, Central Federal District	3
9	Rostov Regional Clinical Hospital, Rostov-on-Don	3
10	Krasnoyarsk Clinical Hospital, Krasnoyarsk	3
	Sverdlovsk Regional Clinical Hospital No. 1, Yekaterinburg	3
	TOTAL	**244**
	98.0% of the total number of heart transplants performed in the Russian Federation (249)	

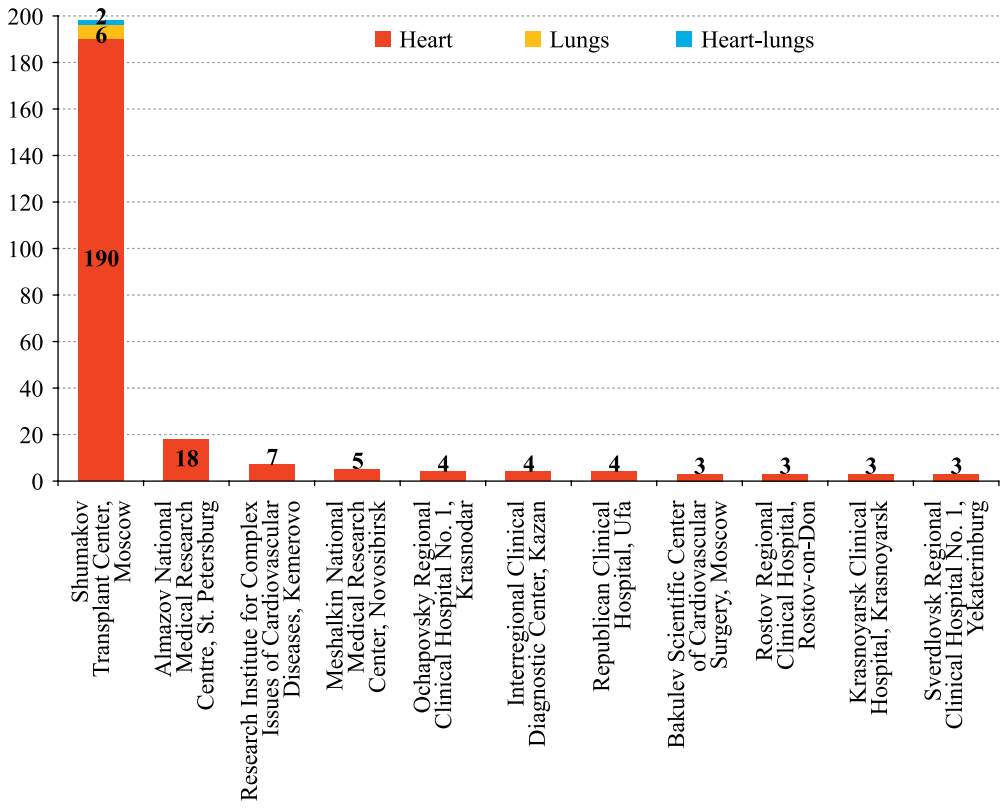

Fig. 10. Leading medical institutions in terms of number of thoracic organ transplantations performed

In 2020, a total of 559 liver transplants (3.8 per million population) were performed. Liver transplants were performed at 29 centers.

A new liver transplant program was launched in 2020 – 3 deceased-donor liver transplants were performed at Tyumen Regional Clinical Hospital No. 1. The liver transplantation program at the Republican Clinical Hospital in Kazan has become more active, the number of transplants in 2020 compared to 2019 increased by 53.8% to 20. In 2020, 6 transplantation centers performed 20 or more liver transplants each: Shumakov Center (165), Sklifosovsky Institute (118), Burnazyan Federal Medical and Biophysical Center (47), Botkin City Clinical Hospital (35); State Novosibirsk Regional Clinical Hospital (34), Republican Clinical Hospital, Kazan (20).

Moscow-based transplant centers (6) accounted for 69.8% (390 transplants) of liver transplantation in 2020 and 64.4% (376 transplants) in 2019.

Table 10 and Fig. 11 show the liver transplant centers with the highest number of liver transplants in 2020.

Table 10

Leading medical institution in terms of number of liver transplantations performed

Rank	Centers – leaders in terms of number of liver transplants performed	Number of kidney transplants performed in 2020
1	Shumakov National Medical Research Center of Transplantology and Artificial Organs, Moscow	165
2	Sklifosovsky Research Institute of Emergency Care, Moscow	118
3	Burnazyan Federal Medical and Biophysical Center, Moscow	47
4	Botkin City Clinical Hospital, Moscow	35
5	State Novosibirsk Regional Clinical Hospital, Novosibirsk	34
6	Republican Clinical Hospital, Kazan	20
7	Vladimirsky Moscow Regional Research Clinical Institute, Moscow Oblast	17
8	Granov Russian Research Center of Radiology and Surgical Technologies, St. Petersburg	17
9	Rostov Regional Clinical Hospital, Rostov-on-Don	15
10	Irkutsk Regional Clinical Hospital, Irkutsk	14
	TOTAL	**482**
	86.2% of the total number of liver transplants performed in the Russian Federation (559)	

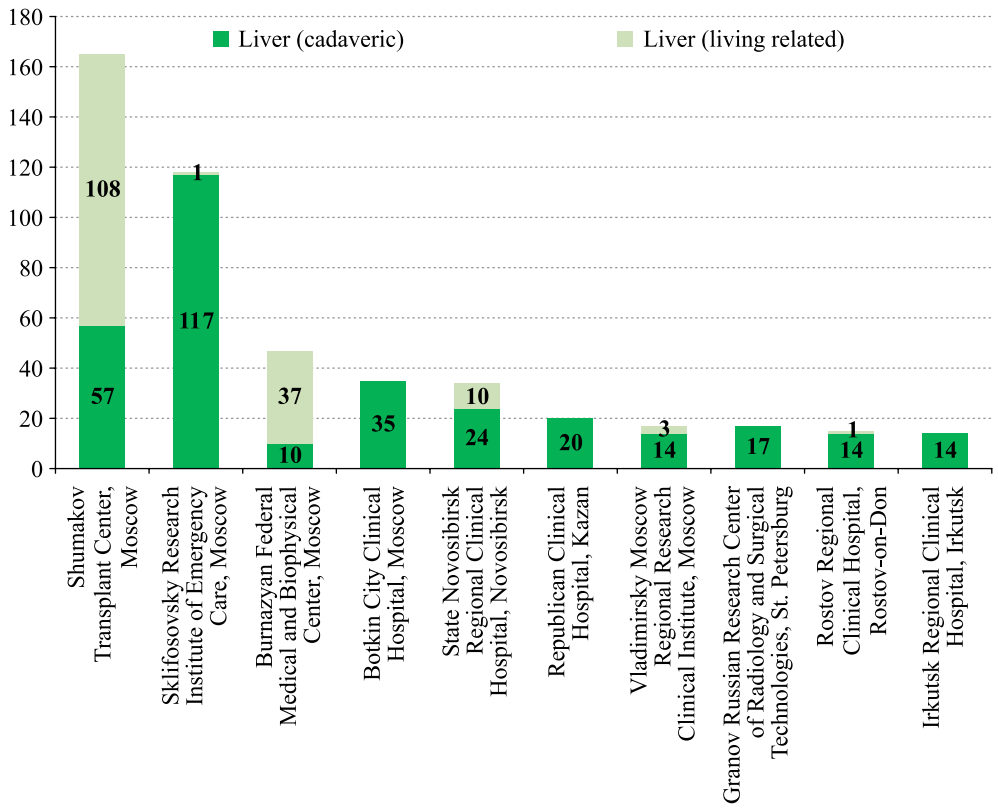

Fig. 11. Leading medical institution in terms of number of liver transplantations performed

The rating demonstrates the relative sustainability of the programs at the leading liver transplant centers presented; the negative impact of COVID-19 affected transplant activity at Sverdlovsk Regional Clinical Hospital No. 1 (Yekaterinburg) the most. The total transplant activity was 482, which was more than that of 2019 (474, +8).

Related liver transplants were performed at 9 centers. Living-related transplants accounted for 169 surgeries (30.2%). In 2019, there were 8 centers that performed 147 related liver transplants (25.2%).

In 2020, 131 pediatric (mostly young children) liver transplants were carried out; 113 in 2019. The liver transplants were performed at three centers: Shumakov Center (120), Petrovsky National Research Centre of Surgery (8), and State Novosibirsk Regional Clinical Hospital (3).

Pancreas transplantations in 2020 were performed at 3 centers: Shumakov Center (2), N.V. Sklifosovsky Institute (13), and Rostov Regional Clinical Hospital in Rostov-on-Don (1). A total of 16 pancreas transplant surgeries were performed (10 in 2019), all of them being kidney-pancreas transplants.

Thus, there were 836 extrarenal transplants performed in 2019 – 42.6% of the total number of transplants (1960). During the follow-up period from 2006 (106), the number of extrarenal organ transplants in Russia increased by 730 (7.9-fold). See Fig. 12. The proportion of extrarenal transplants in the total number of transplants increased by 26.7%.

Transplant centers in Moscow and Moscow Oblast accounted for 605 extrarenal organ transplants (72.4%) in 2020, which remains decisive.

Table 11 presents information on the number of organ transplants performed in Russia from 2006 to 2019.

ORGAN TRANSPLANT RECIPIENTS

According to information from the Federal Registry, there were 19,097 organ transplant recipients in Russia in 2020 (130.6 per million population). Among these recipients, 12,563 (85.9 per million population) received kidney, 3,489 (23.9 per million population) received liver, while 1524 (10.4 per million population) were heart transplant recipients. Since 2013 (for 7 years of observation), the number of organ recipients in Russia has increased by 1,044 (123.3%).

Data on the number of organ recipients in Russia from 2013 to 2020 from the Federal Registry of the Russian Ministry of Health (see Order No. 2323-r of the Russian Government dated October 23, 2017; Resolution No. 404 of the Russian Government dated April 26, 2012) are presented in Table 12.

CONCLUSION

Last year, transplant care came under the strong negative influence of a fundamentally new problem, the COVID-19 outbreak. The peculiarities and results of transplant centers in 2020 were influenced by this factor. The main conclusion to be drawn from 2020 results is that COVID-19 should not generally be considered as a reason to stop organ transplant and donor programs. The COVID-19 pandemic imposes certain limitations and complicates the activities of transplant surgeons, but does not make transplant activities impossible.

In 2020, the number of organ donors and the number of organ transplants in Russia declined. However, most centers did not stop their activities, organ transplants

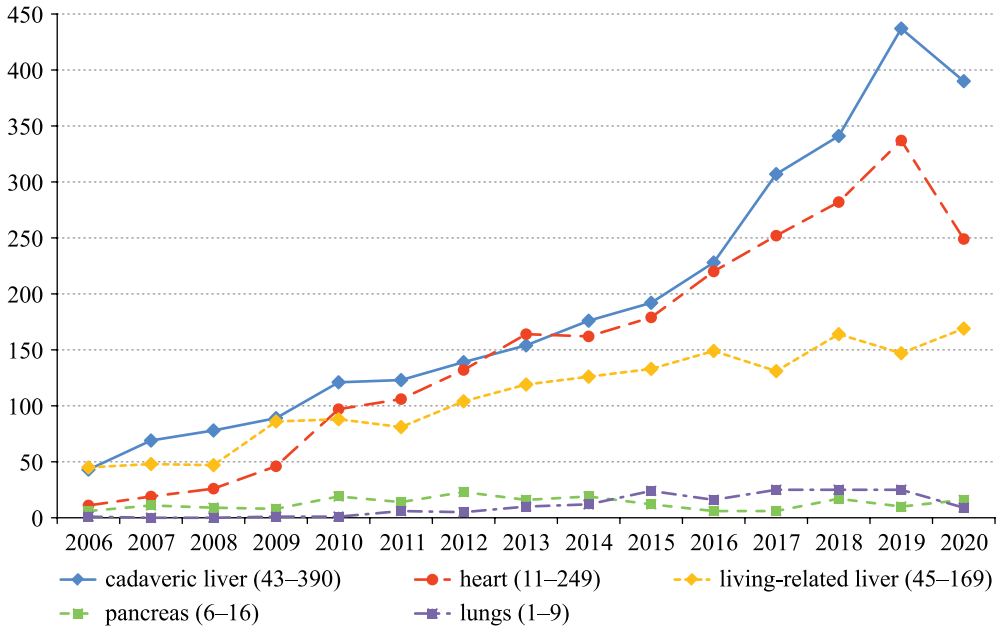

Fig. 12. Extrarenal solid organ transplantation in 2006–2020

Table 11

Organ transplantation in the Russian Federation in 2006–2020

No.	Organ	2006	2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		2020	
		Abs. number	Abs. number	Change over the year	Abs. number	Change over the year	Abs. number	Change over the year	Abs. number	Change over the year	Abs. number	Change over the year	Abs. number	Change over the year	Abs. number	Change over the year	Abs. number	Change over the year	Abs. number	Change over the year	Abs. number	Change over the year	Abs. number	Change over the year	Abs. number	Change over the year	Abs. number	Change over the year	Abs. number	Change over 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	1473	+112	1124	–349
2	including cadaveric	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	967	–323
3	from 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	183	–17	157	–26
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	584	+79	559	–25
5	including cadaveric	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	390	–47
6	from 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	147	–17	169	+22
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	249	–86
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	16	+6
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	9	–14
10	Heart-lungs										2	+2	2	0	1	–1	0	–1	0	0	0	0	0	0	3	+3	2	–1	2	0
11	Small intestine														1	+1	1	0	0	–1	0	0	0	0	0	0	0	0	1	+1
	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	1960	–467

Table 12

Number of organ recipients in Russia in 2013–2020

ICD-X code	Number of patients in the registry, persons													
	2013	2014		2015		2016		2017		2018		2019		2020	
		abs.	change (%)	abs.	change (%)	abs.	change (%)	abs.	change (%)	abs.	change (%)	abs.	change (%)	abs.	change (%)
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	12,563	5.7
Z94.1 Heart transplant status	416	520	25.0	639	22.9	803	25.7	952	18.6	1164	22.3	1355	16.4	1524	12.5
Z94.2 Lung transplant status	2	3	50.0	4	33.3	5	25.0	8	60.0	28	250.0	26	-7.1	24	-7.7
Z94.4 Liver transplant status	1150	1406	22.3	1649	17.3	1948	18.1	2152	10.5	2632	22.3	3032	15.2	3489	15.1
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	1344	18.4	1497	11.4
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	19,097	8.3

were performed when possible. Waiting lists continued to be maintained, as well as follow-up for transplant recipients.

Moscow demonstrated the sustainability of the regional system of organ donation coordination to the COVID-19 factor, which largely mitigated the drop in the final indicators of donor and transplantation activity in the country as a whole.

Of the positive trends in the development of transplant care in Russia, which persisted in 2020, the following should be noted:

– Increase in the number of pediatric organ transplants (+13.6%);
– Increase in the proportion of effective brain-dead donors (97.0%);
– Increase in the number of living-related donor kidney transplants (+15.0%);
– Expansion of the geography of organ donor and transplantation programs (Tula Regional Clinical Hospital – deceased-donor kidney transplantation; Regional Clinical Hospital No. 1 in Tyumen – deceased-donor liver transplantation);
– Opening of a branch of Shumakov National Medical Research Center of Transplantology and Artificial Organs in Volzhsky (Volgograd Oblast).

As for the prognosis, it is obvious that implementation of organ donor and transplant programs in 2021 depends on the level of COVID-19 coronavirus infection and on the effect of vaccination of the population. The number of waitlisted candidates at transplantation centers continues to increase year by year. Therefore, the basic task for 2021 and subsequent years will be to restore and further increase the number of organ transplants in order to meet the needs of the population and the donor potential. It should be noted that departmental target program "*Organ Donation and Transplantation in the Russian Federation*", approved under Order No. 365 of the Russian Ministry of Health on June 4, 2019, continues to exist. The program provides for an increase in the number of organ transplants to 25.2 per million population by 2024, an increase in the number of regions where transplants are performed to 42, and an increase in the number of transplant centers to 80. The COVID-19 factor should

not be considered by health care organizers and health specialists as a reason to ignore this document.

Under such conditions, a special responsibility lies with chief freelance transplant surgeons working at healthcare bodies across Russia. It is their task to draw the attention of healthcare managers and leaders to the transplant program, justify its necessity and expediency, and protect the rights of potential organ recipients to affordable and quality healthcare.

In 2021, the Shumakov National Medical Research Center of Transplantology and Artificial Organs will continue to provide comprehensive methodological assistance to healthcare bodies and transplant centers, train specialists from across Russia, perform on-site audits, conduct telemedicine consultations 24/7, and monitor donor and transplantation programs.

The authors declare no conflict of interest.

REFERENCES

1. Organ donation and transplantation in Russian Federation in 2009. *Transplantology 2009: results and prospects*. Vol. I / Ed. by S.V. Gautier. M.–Tver: Triada, 2010: 8–20.
2. Organ donation and transplantation in Russian Federation in 2006–2010. *Transplantology: results and prospects*. Vol. II. 2010 / Ed. by S.V. Gautier. M.–Tver: Triada, 2011: 18–32.
3. Organ donation and transplantation in Russian Federation in 2011 (IV report of National Registry). *Transplantology: results and prospects*. Vol. III. 2011 / Ed. by S.V. Gautier. M.–Tver: Triada, 2012: 14–37.
4. Organ donation and transplantation in Russian Federation in 2012. (V report of National Registry). *Transplantology: results and prospects*. Vol. IV. 2012 / Ed. by S.V. Gautier. M.–Tver: Triada, 2013: 8–28.
5. Organ donation and transplantation in Russian Federation in 2013 (VI report of National Registry). *Transplantology: results and prospects*. Vol. V. 2013 / Ed. by S.V. Gautier. M.–Tver: Triada, 2014: 32–57.
6. Organ donation and transplantation in Russian Federation in 2014 (VII report of National Registry). *Transplantology: results and prospects*. Vol. VI. 2014 / Ed. by S.V. Gautier. M.–Tver: Triada, 2015: 44–75.
7. Organ donation and transplantation in Russian Federation in 2015 (VIII report of National Registry). *Transplantology: results and prospects*. Vol. VII. 2015 / Ed. by S.V. Gautier. M.–Tver: Triada, 2016: 38–71.
8. Organ donation and transplantation in Russian Federation in 2016 (IX report of National Registry). *Transplantology: results and prospects*. Vol. VIII. 2016 / Ed. by S.V. Gautier. M.–Tver: Triada, 2017: 33–66.
9. Organ donation and transplantation in Russian Federation in 2017 (X report of National Registry). *Transplantology: results and prospects*. Vol. IX. 2017 / Ed. by S.V. Gautier. M.–Tver: Triada, 2018: 26–63.
10. Organ donation and transplantation in Russian Federation in 2018 (XI report of National Registry). *Transplantology: results and prospects*. Vol. X. 2018 / Ed. by S.V. Gautier. M.–Tver: Triada, 2019: 46–85.
11. Organ donation and transplantation in Russian Federation in 2019 (XII report of National Registry). *Transplantology: results and prospects*. Vol. XI. 2019 / Ed. by S.V. Gautier. M.–Tver: Triada, 2020: 52–93.

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