

## Modern Aspects and the Basic Principles of Development of Transplantology System in Kazakhstan

<sup>1</sup>A.K. Omarova, <sup>1</sup>A.K. Turgambayeva, <sup>2</sup>A. Mussina, <sup>2</sup>Z.B. Akhmetova and <sup>4</sup>M.O. Ryspekova

<sup>1</sup>Faculty of Medical Science,

<sup>2</sup>Department of Occupational Health and Communal Hygiene,

<sup>3</sup>Department of Neurology, Faculty of Medical Science,

JSC “Astana Medical University”,

<sup>4</sup>Department of Economical Sciences,

Eurasian National University Named after L.N. Gumilev, Astana, Kazakhstan

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**Abstract:** The transplantology is of great importance for patients for whom organ transplantation is necessary and it is represented serious values for public health care. Actuality of the organ transplantation consists in ensuring radical treatment of the patients, having diseases with obviously deadly forecast (such as cirrhosis, chronic renal failure, cardiomyopathy, etc.) and it is a real factor of rescue of active members of society and preservation of health of the nation. Research aim was estimating of the aspects of transplantology and the Kazakhstan donor in the period of 2012-2015 and developing of the basic principles of further activity. In study were applied the general scientific methods of knowledge with application of system and comparative approaches, analytical, historical, the generalizing methods, the content analysis of information sources, a method of factorial and statistical, functional analyses, constructive estimates, induction and deduction, other general scientific methods of knowledge of medical processes. Data were obtained from annual reports of the Republican coordination center of transplantology from 2010 to May, 2015; as it was noted during research in the republic, growth of volumes of an organ transplantation (a liver, kidneys, heart), the results of the study were 14 units with lethal outcomes from 64-523 units. The greatest number of operations on transplantation of kidneys which made 433 operations including from died donors 37; the number of operations on a liver were 74, cadaveric transplantations were made 13 units; heart operations for the considered period were made 16 units. Systematization attempt and the analysis of transplantology data in Kazakhstan is made in this research. Proceeding from chronology of development of this sector of medical services, it is possible to reveal the basic principles of formation and further development of transplantology in RK. In spite of annually, it is performed the operations on organ transplantation, on average to 200 operations, it is generally related transplantations they are organs from alive relatives, spouses, etc. From alive donors, it is possible to carry out a select only from such organs as kidneys or part of a liver but it is possible to take the donor heart only from the died person. The number of needing in transplantation constantly grows and deficiency of donor organs grows every year. In research of this study was assessed, the current modern situation of transplantology, a problem and the basic principles of further development of system of transplantology of organs in Kazakhstan are offered.

**Key words:** Donor, transplantation, coordination center, license, waiting list, patient, innovative medicine, Kazakhstan

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### INTRODUCTION

In modern conditions of development of the organ transplantation by right it is possible to carry the highest achievement of innovative medicine and human thought which gives the only chance for life rescue of fateful patients. Achievement of Foreign medicine in the field of transplantation in many developed countries reached

such level that there is considered as usual medical practice. But, actually, transplantology unique, special, medical science which has the relations with legislative, religious, ethical, national and moral foundations and the principles of society.

Considering of the organ transplantation in Kazakhstan, it is possible to reveal that it is carried out as from living donors, artificial organs, corpses. For today

alternative of the above types of organ transplantation, we haven't. Therefore, it is most particularly we have the question of development of cadaveric donorship and live donorship with the subsequent rehabilitation of recipients.

Assistance by method of transplantation is provided in the country taking into account a state program in two ways: carrying out operations within financing of highly specialized medical care and receiving the help by means of the direction on treatment abroad at the expense of budgetary funds (Anonymous, 2009).

The main aim of this research was to estimate modern transplantological aspects for this offered idea and to offer the basic principles of development of transplantology in Kazakhstan.

### MATERIALS AND METHODS

There were used standard and legal material: the resolution of the Government of the Republic of Kazakhstan from 4th of December, 2009, No. 2016 "About the approval of Rules of the direction of the citizens of the Republic of Kazakhstan on treatment abroad at the expense of budgetary funds" and statistical data of the Republican Coordination Center on transplantation (Anonymous, 2014). Terms are covered by the period with 2012 on May, 2015 and also expert assessment of the leading expert of the coordination center of transplantology (Zhaksylyk, 2014).

There were considered the statistical data of the Republican Coordination Center during 2012-2015 in the given research and also 10 medical institutions and it is possible to carry the following to them:

- JSC "National Scientific Medical Center"
- JSC "Republican Scientific Center of Emergency Medical Service"
- JSC "National Scientific Cardiac Center"
- City Cardiac Hospital on the Right of Enterprise competence "City Clinical Hospital No. 7"
- JSC "National Scientific Center of Surgery Named after A.N. Syzganova"
- JSC "National Scientific Center of Motherhood and Childhood"
- Republican City Cardiac Hospital "Scientific Center of Pediatrics and Children's Surgery"
- City Cardiac Hospital on the Right of Enterprise competence "City Hospital No. 1"
- Government Cardiac Hospital "Shymkent City Hospital emergency"
- Aktyubinsk regional hospital

The attempt of systematization and identification of an actual state of the organization of transplantology in

Kazakhstan, proceeding from the development of this sector of medical services of a ways and the principles of further development of transplantology in RK is made in this research.

According to the law of the Republic of Kazakhstan "About the state statistics" (21), an information in the final report is confidential and can be used for the statistical purposes. Information can be transferred only in the scientific purposes if with a request from the organization provides data SE-dangers and it is assumed all necessary actions in acceptance where it is got the identity of respondents, in accordance with the principles of the World Medical Association (WMA) the Helsinki declaration the Ethical principles of medical researches with participation of the person accepted on the 18th WMA General meeting, Helsinki, Finland (June, 1964).

**In research were used the following methods:** General scientific methods of knowledge with application of system and comparative approaches, analytical, historical, the generalizing methods, the content analysis of information sources, methods of the factorial and statistical analysis of material, constructive estimates, the functional analysis, induction and deduction and other general scientific methods of knowledge of medical processes were applied in the article for the solution of the set research tasks.

Collecting and the analysis of data were reached by the compiling and the data on Microsoft Excel and also the calculations of programs of BioStat for Windows (version 4.03 from Glants).

### RESULTS AND DISCUSSION

At the conducted research, it was noted that for developments of high technologies are given the considerable funds, both for scientific research institute and for regional institutions of medicine. In 2009, for development of high technologies in medicine of RK it was given about 6,826 million tenges and in 2012, 41,747 million tenges that it is exceeded in 6,11 times (Fig. 1). About 9 transplant centers and hospitals have

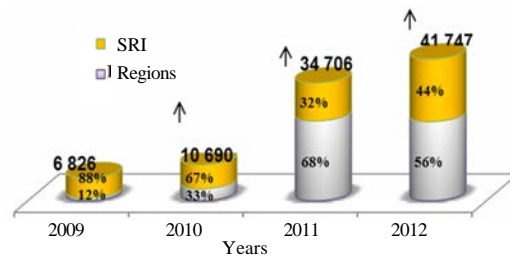


Fig. 1: Development of high technologies in medicine of RK

Table 1: The list and number of the transplant operations, made by separate medical institutions in RK during from 2012 to May 2015

Name of the medical institutions	Type of transplantation units					Total I		Lethality I	
	Kidney		Liver		Heart	Unit	Values (%)	Unit	Values (%)
	R	T	R	T	T				
Syzganov's NCS	70	10	16	6	1	103	20.0	8	57.0
CCH No. 7 of Almaty	99	11	8	1	0	119	22.6	0	0.0
RSCEMS	123	11	5	3	0	142	27.0	3	21.5
NSCM&C (National Scientific Center of Motherhood and Childhood) JSC	19	2	1	0	0	22	4.2	0	0.0
NSCC (National Scientific Cardiac Center) JSC	0	0	0	0	15	15	2.9	0	0.0
CHEMS (City Hospital of the Emergency Medical Service (Shymkent City)	39	0	1	0	0	40	7.6	0	0.0
NSMC	34	3	19	3		59	11.3	3	21.5
CCH No. 1 Astana	7	0	11	0	0	18	3.4	0	0.0
Regional medical center (Kyzylorda)	1					1	0.2	0	0.0
Aktubinsk Regional Hospital	4					4	0.8	0	0.0
Total	396	37	61	13	16	523	100.0	14	100.0

Table 2: The characteristic of the made organ transplantations in Kazakhstan from 2012 to May 2015

Name of transplantation	Type of transplantation units					Total I		Lethality					Total I	
	Kidney		Liver		Heart	Unit	Values (%)	Kidney		Liver		Heart	Unit	Values (%)
	R	T	R	T	T			R	T	R	T	T		
2012	56	1	6	0	1	64	12.2	0	0	2	0	0	2	21.4
2013	136	5	17	3	2	163	31.1	0	1	2	0	1	4	28.6
2014	164	19	25	7	7	222	42.5	2	2	3	0	0	7	50.0
May of 2015	40	12	13	3	6	74	14.2	0		1			1	0.0
Total	396	37	61	13	16	523	100.0	2	3	7	0	1	14	100.0

It was made by the researchers on the basis of statistical data of the Republican Coordination Center of Transplantology (Anonymous, 2014); yellow color related (R); Green color cadaveric (T); Blue, pink colors total (I)

licenses for making of the operations on the organ transplantation of patients and show high professionalism of domestic medical practitioners on an organ transplantation.

The types of the organizations of health care which are carried out innovative medical operations on transplantology are shown in Table 1. Thus, dynamics of the performed operations by the separate organizations is retraced.

Statistical data confirm that risk level at operations fluctuates on average to 3.7% that is insignificant in comparison with the acquired health for people. So, from Table 1, we can see that actually made operations were operated in scientific centers and hospitals in Almaty and Astana cities, i.e., from 523 operations is operated in these institutions where there are 423 units or 81% of total of operations including: RSCEMS (Republican Scientific Center of Emergency Medical Service) was operated about 142 operations that makes 27% (Astana City); CCH (City clinical hospital) no. 7 of Almaty 119 units or 23% (Almaty City); Syzganov's NCS (National center of surgery) 103 units or 20% (Almaty City); NSMC (National scientific medical center) 59 units or 11% (Astana City). Kazakhstan was among 3 countries of the world in 2012 on transplantation of artificial heart after Germany and the USA.

Besides, making of unique operations within the country according to years is characterized by data at

Table 2 below. On the basis of Table 2, we can see that in Kazakhstan from 2012 to May 2015 it was done 523 operations from them:

- The greatest number of operations on transplantation of kidneys which made 433 operations including from the died donors 37
- A number of operations on a liver is made the 74 operations from them the cadaveric transplantation is made 13 units
- Heart operations is made 16 units for the considered period

Besides, it would be desirable to note that 14 operations were made with a lethal outcome for this period or it is about 2.7% of all performed operations, i.e., for 17 million population for 3.5 years donors were died 1.7% or 9 people from them: 2 donors at operation on kidneys; 7 donors at operation on a liver.

The considered indicators once again confirm about practical experience in the field of transplantology in RK and also that in the country operations are generally carried out on transplantation of kidneys which is made 83% on a liver 14% and heart 3%. It was shown in Table 2 as a result of the analysis. Also, we can see that 50 transplantations of cadaveric organs were made and from them 3 lethal cases or 6%.

Table 3: Indicators of donorship and transplantation in RK from 2012-2014

Data of transplantation	2012	2013	2014	Deviations on an absolute value	
				Values (+, -)	Values (%)
Population, on the one million people	16.991	17.20	17.41	+0.41	+2.46%
Number of cadaveric donors, persons	2.000	4.00	33.00	+31.00	5 time
Total of transplantations of a kidney, liver and heart units	64.000	163.00	222.00	+158.00	+246%
On 1 million people the total of transplantations of a kidney, liver and heart	0.001	0.01%	0.02%	+0.01	100%
Total of recipients units	62.000	153.00	189.00	+127.00	204.84%
On 1 million people the total of recipients	0.001				
0.01	0.01%	+0.01	100.00%		

It is made by the researcher

Table 4: Number of the patients who are in the waiting list in the Republic of Kazakhstan for January 2014

Type of transplantation	Kazakhstan	Specific weight from total of transplantation
Kidney	1760	77%
Liver	343	15%
Heart	138	6%
Lungs	5	0.2
Pancreas	37	1.8
In total of number of transplantation	2 283	100%

It was made by the researcher on the basis of the statistical data on Kazakhstan, provided by the Institution "Republican Coordination Center for Transplantation (Anonymous, 2014)

Besides, Table 2 and Fig. 2 testify that annually operations on organs of transplantation are performed on average to 200 operations and generally, it is related transplantations organs from living relatives, spouses, etc. From living donors, it is possible to carry out the taking only of such organs as kidneys or part of a liver but donor heart it is possible to take only from the died person. The number of transplantation needed is grown constantly and deficiency of donor organs becomes more sharply appreciable.

Indicators of dynamics of growth of indicators on transplantation are shown in Table 3. As it was given from the provided table, the greatest number of operations were made 222 operations in 2014, accordingly 163 in 2013 which were shown in Fig. 1 and Table 2-3.

Besides, studying Table 3, it is possible to reveal that the number of transplantations in the country on an absolute value in 2014 in comparison with 2012 grew, so: the number of cadaveric donors was grown in 5 times; the total number of transplantations of a kidney, liver, heart for 246%; total number of recipients 204%.

By the data for 2014, it was done in the highest year of number of operations 222, i.e., the demand for operations in a year for an organ transplantation isn't satisfied on 2061 operations or it is shown that the Kazakh medics can satisfy only 9.7% of the demand on the operations for today.

But, in spite of positive results on this problem the level of cadaveric donorship in Kazakhstan from 2012-2014 grew from 0.1-0.2 by 1 million population that

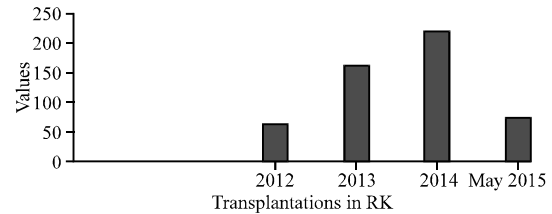


Fig. 2: The made transplantations in Kazakhstan; it was made by the author on the basis of statistical data of RCCT (Republican Coordination Center for transplantation)

is 14.5 times less than in Russia and in 25 time is less than in the European Union countries. Such low indicators of cadaveric donation in our country are result non perfect legislative system in the field of transplantology, absence of the educational donor programs for all population, support from religions and from the population who are morally not ready for the donorship and for the help to close people and relatives (Anonymous, 2013).

From Table 4, we can see that 138 people need in a heart transplantation in a year in Kazakhstan, in a liver transplantation 343, a kidney transplantation 1760, a lung transplantation 3-5, a pancreas 37 and the general demand for a year makes 2283 operations. And on the 1st of September, 2014 in Kazakhstan their quantity increased to 2,430 people who waited in a queue for receiving donor organs. From them 1718 adults and 49 children have been waiting a renal transplantation, 565 adults and 15 children a liver transplantation, 66 adults and 13 children expect donor heart and 4 adults have been waiting for a lung (Zhaksylyk, 2014).

For today in the country except the patients, consisting on a waiting list, the general number of patients makes about 7 thousand people who need organ transplantation including in transplantation of kidneys >3 thousand, hearts >1200 and a liver over 800 patients. Annually, it is died about 80 people who didn't wait for operation on transplantation (Zhaksylyk, 2014).

If to consider the cost of operations on organ transplantation, it is possible to reveal the following price

aspects. So, transplantation of a kidney in Kazakhstan costs to the state about 2-4 million tenge, hearts costs on average 13 million tenge, implantation of “artificial heart” is more expensive in 2.5 times. If to count people who need operations, there is a lot of them and only 10% of patients receive organs due to presence of the related donor and the others who have no living related donor, are died.

Because of an acute shortage of donor organs compels sick people to suffer and slowly die or Kazakhstan citizens are compelled to do these the most difficult and expensive operations abroad which cost many times more expensive. Part of the needing people go abroad at own expense, the part of patients are directed by the State to Belarus and to Russia and there transplantation of one kidney costs from 35-55 thousand dollars, the liver transplantation costs over 100 thousand dollars and hearts costs average about 500 thousand dollars (Fig. 3).

Researches of the medical scientific developed countries confirm that transplantation is effective and it is increased quality of life of recipients at the expense of it, there is improved the indicators of a physical state and working ability of the patient (Goryainov, 1988; Kaabak *et al.*, 2001; Tarabarko, 1997; Bay *et al.*, 1998; Brown *et al.*, 2001; Coriey *et al.*, 2000).

Thus, the prevailing use of lifetime donors it is characteristically for the countries with less developed service of transplantation and deficiency of organs is the main problem of transplantology around the world, the solution of which is lain on the basis of all existing programs of transplantation (Akash, 2013).

If a basis of ensuring the effective transplant help to the population is the effective organization of organ donorship, a basis of effective organ donorship is the system of transplant coordination. Transplant coordination the medical activity provide effective

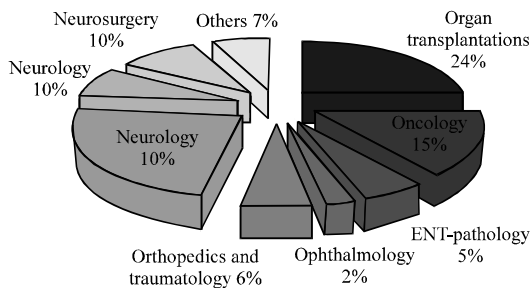


Fig. 3: Distribution of the patients who were directed on treatment abroad at the expense of budgetary funds in 2013 according to nosology; it is made by the researcher on the basis of statistical data of RCCT (Anonymous, 2014)

functional interrelation between hospitals donor bases and the transplant centers for ensuring availability and quality of the transplant help (organ transplantation). For this purpose 14th of August 2012 it was created the Republican Coordination Organ Transplantation Center (further RCOTC).

Basis of transplant coordination was the effective national system of organ donorship taking into account differentiation of duties of different experts in questions of diagnostics of death of a brain and the organization of activity of donorship and also developments of science of transplantology in the Republic of Kazakhstan.

Thus, transplant coordination, it is a system of the actions, directed on identification of potential donors from among living donors and persons with the certified biological death or death of a brain and also coordination of activities of subjects of health care for removal, preservation, transportation, storage and transplantation of tissues and (or) organs (parts of organs) and also to selection of recipients.

The 3rd level system of transplant coordination on the basis of the Spanish model (Spanish National Transplant Organization (ONT)) is successfully functioned in RCOTC. The Republican coordination center of transplantology, 16 subdivisions of the coordination center of transplantology on regions in 16 regional centers and large cities, also in the cities of republican value as Astana and Almaty, stationary coordinators in 37 donor hospitals of RK are included in our domestic, transplant coordination. Feature of current state and the basic principles of coordination activity in the country are given as follow.

**A coordinating:** It is coordination of activity of the medical organizations in the field of transplantation of tissues and (or) organs (part of organs) in the territory of the Republic of Kazakhstan.

**A delimitation and professionalism:** It is an accurate differentiation of professional duties of experts of different specialties in questions of diagnostics of death of a brain and the organization of practical actions of donorship.

**Stationarity and a dispatching:** It is existence of the paid positions of stationary (hospital) transplant coordinators in donor, the emergency and other hospitals, giving neurologic and neurosurgical help. The stationary coordinator (double jobbing employee of RCOTC) is the dispatcher and the initiator of donorship in treatment-and-prophylactic institutions with a full employment on the main specialty.

**A normativity:** It is participation in development of the normative legal acts, regulating of activity of transplantation service in the Republic of Kazakhstan.

**Eeducability:** It is the organization of training of specialists of the medical institutions and workers, working on the questions of coordination of service of transplantation.

**The principle of monitoring and a registration:** It is creation of monitoring and conducting the United National register of donors and recipients which automates processes of formation of the electronic list of donors, the patients who are in a waiting list and recipients and also business processes of coordination service on transplantation which will simplify the selection of pair “donor-recipient” automatically.

**Scientific character:** It is the organization, coordination and carrying out scientific researches in the field of transplantology and assistance to implementation of other scientific and research activity.

**The principle of cooperation:** It is cooperation with the international organizations in transplantology and adjacent areas.

**The principle of regionality of interrelation:** It is the organizer of interhospital interaction in questions of organ donorship and it is the Regional Coordinator (the employee of RCOTC).

**The principle of a continuity:** It is national coordination service of transplantation which is carried out in the around-the-clock work by workers and its regional representatives.

For today the basic principles of domestic coordination activity has the shortcomings, it hasn't been included yet some principles on which the Spanish model is based and they need to be included for more effective implementation of these medical services, such as below.

**A legislation perfection:** It is the legislative base, directed on support of a posthumous donation and carrying out audit, poor legal regulation of donorship.

**Confidentiality:** It is indistinctly expressed relation of clergy to donation, mistrust to medicine, negative influence.

**A regularity:** It is a vocational education of employees of a national network of coordinators on a regular basis.

**Efficiency:** It is effective system of financing of donor hospitals. The program of improvement of quality, carrying out donor audit allow to establish the reasons, constraining organ donorship among which it is possible to call.

**An informativity:** It is informing on presence of the potential donor of the organizations of health care, who carries out transplant coordination and also fuller and effective promotion of organ donorship with involvement of mass media, representatives of religious confessions and non-governmental public associations.

**The principle of a program ability:** It is organization of the general education programs, devoted to organ donorship.

**The principle of complexity:** It is the organization and improvement of communications of coordination services with all medical institutions and also with the organizations which are connected with risk of human life.

**The principle of interregional:** It is the organization and development of interregional coordination services or divisions.

**The principle of a nationality and statehood:** It is inclusions of transplantology in the list of the main national programs for improvement of the nation and participation in realization of a state policy in the field of health care.

**The principle of statehood:** It is participation in realization of a state policy in the field of health care in development and implementation of the state and industry (sectoral) programs in the field of development of donorship of tissues and (or) organs (parts of organs).

**The principle of monitoring and a registration:** Its improvement and specification, i.e., conducting the National database about will of citizens on posthumous donorship of tissues and (or) organs (parts of organs).

**The principle of donor conditioning:** The correct definition has to be given by experts in resuscitation, i.e., conditioning in essence is process of preparation of the donor for removal.

## CONCLUSION

The carried-out analysis of current state of transplantology in Kazakhstan was shown that there was

a need of inclusion, correction of the basic principles of activities for coordination in transplantology, introductions and reforming of the national program for ensuring organ donorship, development of cadaveric transplantation.

It will give the reductions of a waiting list of patients on organs and it will be possible to reduce by 50% having saved the huge sum of money in the next years, we can provide with organs at least 50% of patients from a waiting list.

Although, annually the operations on organ transplantation on average to 200 operations are made, generally it is related transplantations organs from living relatives, spouses, etc. From living donors, it is possible to do the sampling only of such organs as kidneys or part of a liver but donor heart, it is possible to remove only from the died person. The number of population who need transplantation constantly grows and deficiency of donor organs grows every year.

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