S.A. Bogachevskaia, A.N.Bogachevskiy

The Level of Availability of High-tech Medical care for Acquired Heart Defects in the RF and the FEFD. Trends over the Last 10 Years

ABSTRACT

The analysis of statistical data on morbidity and surgical treatment of acquired heart defects in Russia and the Far Eastern Federal District for the 2004-2013 to assess the dynamics and the potential development of this type of care was done. From 2004 to 2009 there was a trend decrease in the etiology of rheumatic valvular heart disease in the Far East and Russia, and from 2012 patients from this group for the first time accounted for less than half of the all operated with valvular heart disease. The growth rate of the number of prosthetics and renovations increased significantly in 10 years, as well as the number of simultaneous use of prosthetic valves and reconstruction, combined with coronary bypass surgery. The growth of operational activity in the Far East has not led to significant changes in its position among the regions of the Russian Federation. The revealed ambiguity of postoperative mortality indicators points to the contradictions in the principles of evaluation in various institutions of the country.

Keywords: acquired heart diseases, high-tech medical assistance, cardiovascular surgery, endovascular interventions.

INTRODUCTION

The prevalence of cardiovascular diseases requiring the use of surgical and endovascular treatments determines the need for this kind of assistance, well beyond the level of security of the population in our country. Meanwhile, the possibilities of cardiovascular surgery in morbidity and mortality reducing are proven an experience of the developed countries of Europe and the United States [2].

Valve surgery is a kind of high-tech medical care that dependson high cost, appropriate technical equipment and implantable materials. However, the profitability of cardiac surgery is very high and is 15: 1 for each ruble invested in the industry [5]. As one of the most significant trends in cardiac surgery, surgical treatment of acquired heart disease (AHD) requires a special approach to the organization and functioning of this service.

The world statistics are now prevalent degenerative valvular etiology. Decrease in rheumatic etiology among the others (infection, syphilitic, degenerative, ischemic, post-infarction and traumatic genesis) is particularly clearly seen on the background of a life expectancy increasing and the overall aging of the population in the developed countries of

Europe. However, in developing countries, according to the World Heart Federation (WHF), especially those with low and extremely low standard of living, rheumatic etiology of AHD is still leading: from 20 to 30 cases per 1,000 patients undergoing an annual medical examination with the use of diagnostic ultrasound and is the most common cause of valvular insufficiency in developing countries [7,8,9,10,11,13].

Thus, the main factors influencing the high prevalence of AHD varying etiology are socio-economic situation and changes in life expectancy [10].

The analysis of statistical information on AHD surgery could allow to evaluate their opportunities objectively and to plan activities for the improvement and development of medical service [2].

MATERIALS AND METHODS

The data of dynamics of morbidity and surgical treatment of AHD in the Russian Federation (RF) and the Far East Region (FER) for the period 2004-2013 years calculated on 100,000 adult population were analyzed. The calculated parameters were compared to the corresponding period. The growth rate of surgical activity for the population of the FER and in Russia as a whole and was detected and their year dynamics was estimated. A comparative analysis of the dynamics of postoperative mortality in surgical treatment of AHD among Russian hospitals over the past 10 years was performed. Statistical processing was performed using the statistical software package Microsoft Excel Statistic. Statistical significance was based on the results of reliability indices due to error of representativeness of intensive indicator and confidence intervals of the relative data of the universal set. Indicators were evaluated as valid at the level of statistical significance of $p < 0.001$ (CI: 99.7%).

RESULTS AND DISCUSSION

The Russian Ministry of Health annual reports (reporting form № 12) contained information about rheumatic valvular disease and the clinical examination of these patients up to 2009 (Table 1).

Table 1

Acquired valvular disease of rheumatic origin in Russia and the Far East Region in 2004-2009 (cases per 100 thousand population of corresponding age) [1, 3, 4]

Year	Adults				Children 15-17 years				Children up to 14 years			
	Total		Revealed for the first time		Total		Revealed for the first time		Total		Revealed for the first time	
	RF	FER	RF	FER	RF	FER	RF	FER	RF	FER	RF	FER
2004	185,2	140,1	7,7	8,4	29,3	29,1	5,8	8,7	11,4	11,3	2,0	3,3
2005	181,2	137,4	7,8	8,7	26,8	31,8	4,6	6,8	11,6	9,9	2,5	2,7
2006	174,8	135,3	8,7	6,6	25,9	20,6	4,3	2,2	12,6	9,6	2,6	3,3
2007	165,9	126,5	8,7	8,3	25,7	21,1	4,9	4,8	12,5	10,6	2,6	2,0
2008	160,8	121,0	8,3	8,1	27,8	23,5	4,8	5,4	11,1	9,2	2,0	1,6
2009	150,9	122,8	7,4	8,4	29,8	27,1	4,7	6,6	10,9	8,9	1,9	1,9

The tendency to reduce rheumatic etiology of AHD similar to the global one was observed in Russia from 2004 to 2009 (except total cases in adolescents 14-15 years). The trend of decreasing in the total number of cases and new cases was observed in all age groups in the FER.

In 2007-2009 the proportion of patients with valvular defects due to chronic rheumatic heart disease in adults was 80.8% among all patients, in children 15-17 years - 47.7%, in children up to 14 years - 46.5%. In 2009 this figure rose in all age groups respectively to 82.7%, 55.2%, 50.0%, and number of cases of rheumatic heart disease was 178623. Unfortunately, since 2010 any information on the incidence of AHD (including post-infarction ones) in Russia has been absent. And it is doubtful these data are totally missing in statistical reports of the Ministry of Health will be available in the near future. Only details are available to find in the health authorities of subjects of the RF (e.g. the waiting lists for the provision of high-tech medical care). But the algorithm for creating these registers must be fundamentally different from the existing clinical practice of the advisory opinions of specialists [2, 6]. At the moment an approximate idea of the prevalence of AHD is available to get based on the information of surgical activity and the number of hospitalized patientsonly. The need of the population in the surgical treatment of AHD in this case is difficult to assess.

Note that in 2012 patients with surgical correction of rheumatic valvular diseases first made less than half of all operated (47.2% compared with 52.9% in 2011 and 50.4% in 2010). In

view of the genesis of valvular disease in 2013 surgery of AHD in the ratio of "the total number of cases: degenerative defects: infective endocarditis" was 8.9: 3.5: 1.0 (16351: 6455: 1843). There were recorded 48.1% prosthetics and 46.7% reconstructions in 2013 (Table 2).

Table 2

Surgery of acquired heart disease in Russia (the number of patients)

Type of correction	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Prosthetic valve*	5642	6154	6881	7892	8818	9421	9357	10164	10157	10534
Incl. 2-3 prosthetic valves	873	1020	1179	1346	1322	1267	1453	1348	1310	1236
Reconstructions	1526	1616	1937	2382	2672	3009	3379	3920	3920	3038
Incl. combined valve surgery	1254	1317	1593	1856	2039	2205	2331	2676	2503	2360
Commissurotomy	310	238	246	175	132	103	155	66	43	70
Incl. operations on "open heart"	119	141	127	109	65	59	104	54	35	65
Total operations on 2-3 valves	2036	2199	2522	2968	3165	3356	3576	3847	3709	3692
Total cases combined with coronary bypass	441	652	721	1023	1238	1510	1550	1847	2001	2226
Total cases of infective endocarditis**	721	815	979	1090	1410	1470	1464	1585	1520	1407
Endovascular interventions	24	28	10	25	30	42	71	123	210	267
Total cases with AHD	6542	6990	7855	9077	9828	10637	10822	11812	11921	12624

*operation on valves by complications of myocardial infarction, aneurysms of the ascending aorta are not included; **the cases of infective endocarditis of prosthetics are included [1].

According to the received data for 10 years the number of patients operated for AHD increased almost two times (92.97%), both due to valve replacement - by 86.71%, and valve reconstruction - 2 times (by 99.08%). The frequency of the combined applications of valve replacement and reconstruction increased 3.2 times.The growth rate of the total number of annually patients operated for AHD in the country for 10 years was 92.97%,valve replacement - 86.71%, valve reconstruction - 99.08%.

The introduction of multi-component reconstruction allowed to carry out correction of the defects of two or three valves to minimize the use of replacement (when it is indicated) [2]. Such dynamics is due to certain advantages of the method and a lower cost. However, from 2010 the number of reconstruction decreased slightly by 10.09% and from 2011 the number of reconstruction combined with the correction of the other valves decreased by 11.81%. The increase in the simultaneous multiple valve replacements was observed from 2004 to 2010 (873 to 1453) with a gradual reduction of their number to 1,236 by the year 2013. The overall increase

in surgery for 10 years was 41.58%, and the proportion of patients with combined valve intervention (replacement + reconstruction) increased by 81.34%. At the same time in 2013 the operations for AHD 5 times more often combined with coronary bypass grafting (CABG) than in 2004: the proportion of such cases increased from 6.74% to 17.63% of the total number of operations forAHD. According to the register maps' data the proportion of patients with AHD who need CABG in Russia ranged from 4.69% in 2006 to 6.39% in 2013, an average for 10 years it was 5.66%. If we take into account that the minimum number of needing CABG is 500 per 1 million population, the minimum requirement for combined surgery (CABG + AHD correction) will be more than 28 per 1 million population. However, in 2013 compared to 2004 the application of the technique of commissurotomy (mainly in mitral position) decreased significantly 4.4 times, while the proportion of such patients decreased 8.5 times.

Total in 2013 in Russia there were conducted 11416 cases of AHD surgery (88 operations, including 74 replacements per 1 million population) and 12,288 manipulations on the different valves, the ratio "replacement / reconstruction" on average for the mitral valve (MV), aortic valve (AV) and tricuspid valve (TV) was 72.7: 27.3; for MV - 76.5: 23.5; AV - 98.5: 1.5; TV - 13.3: 86.7 [1].

The number of the substituted valves for 10 years increased by 83.39% (from 6478 to 11880) and 79.58% based on 100,000 adult population, includingincrease of biological prostheses 3.5 times, mainly due to the increase in implantations in mitral and aortic position: 1.44 times and 2.25 times (per 100,000 adults) respectively. The replacement of TV increased 2 timescompared with 2004. In 2004 the ratio of kinds of prostheses TV: AV: MV was 1: 13: 16.8 and changed by 2013 upward the AV implantations - 1: 14.7: 12.1. These surgeries (replacement + reconstruction) reflect the predominant involvement of the AV degenerative processes almost 1.5 times more in 2013 (3313 AV cases vs 2228 MV cases). In 2013 infective endocarditis of AV with impaired function occurred 1.15 times more often than MV (776 vs 677).

The growth of valve reconstruction (per 100,000 adult population) from 2007 by 72.97% has been recorded because of increasing of the MV reconstructions 2.27 times and the TVreconstructions- 1.5 times, when the number of the AV reconstructions was constant (0.8 per 100,000 adult population). As a result, the ratio of AV: MV: TV in the country in 2013 changed due to a significant increase in the number of patients with the reconstruction of TV and MV (1: 16.7: 29.2) compared to 2007 (1: 6, 4: 18.8). In 2013 the ratio "reconstruction / valve replacement" was: total - 1: 2.6; MV - 1: 3.3; AV - 1: 66.0; TV - 1: 15.9. At the same time the most

frequent combination of simultaneous reconstruction was MV and TV (16.7% - 637 cases) with the mortality of 1.88%.

The clinical effect of surgical treatment depends on the individual patient's comorbidities and surgery-related factors. Surgical risk and early postoperative mortality is mainly determined by the patient's age, reconstructive operations, the use of combined surgery with prolonged cardiopulmonary bypass time (CABG; reconstruction /replacement of TV, treatment or prevention of atrial fibrillation etc.) [12].

The postoperative mortality from AHD surgery in the country in 2013 was averaged 4.63%, in 2012 - 4.59%, in 2011 - 4.6%, in 2010 - 4.7%, in 2009 - 4.7%, in 2008 - 5.6%. Only in comparison with 2008 (5 years) decrease in the overall postoperative mortality from AHD surgery can be mentioned by 17.32%.

In 2013 the average level of the postoperative mortality in patients with prosthetic valve amounted to 4.61% and was higher than in 2012 - 4.45% (in 2011 - 5.0%, in 2010 - 4.7%, in 2009 - 4.9%). Over 4 years the mortality decreased by 5.92%. The mortality from surgery on two or three valves over 4 years increased by 31.77% (in 2013 - 8.17%, in 2012 - 8.24%, in 2011 - 8.01%, in 2010 -7, 7%, in 2009 - 6.2%), which cannot be explained by an increase in the number of operations (Table 2). The mortality in the most frequent combination of MV and AV replacement in 2013 was 8.1%, in 2012 - 7.3%. In addition, if the correction of defects with two and three valves in different ways shows the positive dynamics in mortality reductionfor five years (in 2013 - 5.28%, in 2012 - 5.69%, in 2011 - 5.9%, in 2010 – 6.1%, in 2009 - 6.3%), the average mortality in isolated reconstructive operations is rather contradictory: the lowest rate was observed in 2011 - 1.53% (in 2013 - 1.73%, in 2012 - 1.83%, in 2010 - 2.1%, in 2009 - 1.6%, in 2008 - 2.7%).

Last time the methods of endovascular correction of valve diseases are actively developing, indications for their useare expanding, that leads to the increasein the number of such interventions. Transluminal balloon valvuloplasty of the mitral and aortic valves and transcatheter implantation of AV are used very little in Russia, but interventions such as transcatheter implantation of MV and endovalvuloplasty of valve failure are not still used. In 2013 the register maps noted 267 cases of endovascular interventions. The availability of this treatment strategy (especially in high-risk surgery) is no doubt. The main obstacle to develop it is the high cost of the endoprostheses (it is 5-6 quotas of high-tech medical care).

The rate "valvuloplasty / transcatheter implantation" in 2013 was 108:159 (in 2012 - 81:129, in 2011 - 63:60 cases). The index of postoperative mortality in transcatheter implantation

from 2013 to 2012 decreased more than 4 times (in 2013 - 1.89%, in 2012 - 7.75%), whereas the same index in balloon valvuloplasty decreased by 25.10% (in 2013 - 1.85%, in 2012 - 2.47%). From 2011 the number of transcatheter implantations actually increased (2.65 times). We suppose that a reduction in mortality is a result of development inimplantdesign, as well as the participation of technical advisers (proctors) in most operations, which obviously reduces the risk of complications in the hospitals mastering this method of treatment.

Infectious genesis of corrected valves occurredfrom 11.0% (in 2004) to 14.3% cases(up to 2013) on the background of the growth of the number of operations almost 2 times (1.95) that in 2013 was 9.82 cases per 1 million population [2]. In 2013 the mortality rate from valve replacement on the background infectiousendocarditis was an average 6.0%, decreased over the 6 years 2.26 times (in 2012 - 6.4%, in 2011 - 8.4%, in 2010 - 12.7%, in 2009 - 11.3%, in 2008-13,6%). In 2013 the mortality from reconstruction was 1.0%, but the one from intervention of several valves was 9.0% (for comparison, in 2010 - 0% and 10.5% respectively).

On average, the surgical mortality rate on the background of degenerative valve over the past year decreased to 3.7% (in 2012 - 4.3%). In 2013 the mortality for replacement (4.47%) was at the level of 2009 (4.5%), in 2011 - 3.1%, 2010 - 4.3%; for reconstruction it decreased slightly to 3.4% (in 2011 -3.8%, in 2009 – 3.9%). Most significantly and gradually the mortality decreased in interventions on several valves (2.27 times for five years compared to 2009): in 2013 - 5.1%, in 2012 - 5.6%, in 2011 - 5.9%, in 2010 - 6.9%, in 2009 – 1.6 %.

In 2013 the average level of mortality from combined CABG and AHD correction increased to 6.46% (in 2012 - 6.1%, in 2011 - 5.0%), which can probably be explained by an increase in the mortality from CABG and simultaneous surgery of multiple valves by almost 50% (46.89%): in 2013 - 13.22%, in 2012 - 9.0%, in 2011 - 8.0%, in 2009 - 9.0%.

Thus, the analysis of the dynamics of postoperative mortality for AHD noticed ambiguity of the indicators that definitely points to the contradictions in the principles of calculating the data in different hospitals in the country.

Table 3 presents the surgical treatment and postoperative mortality in AHD in the Russian regions.

Table 3

Surgical treatment of acquired heart disease and postoperative mortality in Russia

Region	Total operations for AHD						Valve replacement (number of operations)						Mortality in 2013	
	2011		2012		2013		2011		2012		2013		FromtheRelevantcommittee**	From the Ministry of Health of Russia
	Abs.	Per 100,000 adults	Abs.	Per 100,000 adults	Abs.	Per 100,000 adults	Abs.	Per 100,000 adults	Abs.	Per 100,000 adults	Abs.	Per 100,000 adults		
Central	3437	10,61	3745	11,56	3521	10,86	5,7	6,23	3282	10,13	2943	9,08	5,7	6,23
North-Western	1304	11,42	1156	10,12	1812	15,87	4,4	4,82	885	7,75	1491	13,04	4,4	4,82
South	1325	11,70	1247	11,00	1323	11,67	2,2	2,89	1104	9,74	1131	9,98	2,2	2,89
North-Caucasian	26	0,38	47	0,68	31	0,45	0,0	0,0	24	0,35	24	0,34	0,0	0,0
Privolzsky	2296	9,43	2275	9,37	2400	9,88	3,5	4,24	1929	7,94	2012	8,32	3,5	4,24
Uralsky	1213	12,44	1109	11,37	1100	11,28	3,5	3,29	943	9,67	890	9,13	3,5	3,29
Siberian	1989	12,92	2039	13,27	2090	13,60	3,5	4,44	1758	11,40	1746	11,40	3,5	4,44
Far East	222	4,41	303	6,03	347	6,91	4,6	3,90	232	4,62	297	5,94	4,6	3,90
Total in Russia	**11812**	**10,13**	**11921**	**10,23**	**12624**	**10,83**	**3,43**	**3,73**	**10157**	**8,72**	**10534**	**9,05**	**3,43**	**3,73**

* The calculations are performed on the data directed to the Relevant committee for Cardiovascular Surgery by p <0.001 (CI: 99.7%). ** Data received by the Relevant committee from the regions of the Russian Federation.

The most number of clinics performing the implantation of heart valves was noted in the Central region (24), but 0.07 per 100,000adult population, that 2 timeslower than in the North-WesternRegion (0.15 per 100,000adult population).The average index for the country is 0.08.

The increase in the total number of operations for AHD for the past 3 years is noted in four regions (Table 3). The North-Western Region showed the highest rates (15.87 per 100,000 adult population with an increase by 38.97%) and the FER (with the highest increaseby 56.69%, but at the much smaller number of operations - 6.91 per 100,000 adult population). An average index in 2013 in the country was 10.83 per 100,000 adult population.

The most number of valve implantation for 3 years was conducted in the Siberian Region (11.53-11.4-11.4 per 100,000 adult population), but in 2013 the North-Western Region was the leader: 13.04 per 100,000 adult population. The lowest number of operations carried out in the North Caucasus Region (0.25-0.35).

Different data of mortality from a variety of sources (Table 3) point to the lack of a unified approach to its assessment in different hospitals of the country once again.

In the FER from 2004 to 2013 a total of 5 hospitals have surgical care for patients with AHD. The number of replacements in the region is more than two times higher than the number of reconstructions (Table 4). At the same time, the share of reconstructions increased from 22.03% in 2008 to 35.43% in 2013 (by 60.82%).

Table 4

Correction of AHD in the Far East Region in 2004-2013 (the number of patients)

Type of surgery/year		RKH 1, Khabarovsk	RKH 1, Vladivostok	CSC ASMA, Blagoveshchensk	RH №1 NMC, Yakutsk	FCCVS, Khabarovsk	Total
Replacements	2004	10	8	25	30		73
	2005	23	8	19	55		105
	2006	50	8	19	59		136
	2007	32	10	15	81		138
	2008	38	19	1	80		138
	2009	42	14	1	88	-	145
	2010	36	13	16	85	6	156
	2011	22	1	15	54	100	193
	2012	10	0	8	72	142	232
	2013	4	0	13	72	208	297
Reconstructions							
	2008	7	0	0	32		39
	2009	6	0	0	33	-	39
	2010	13	0	1	35	0	48
	2011	5	0	0	27	27	59
	2012	6	0	1	23	101	141
	2013	0	0	1	23	77	101

NOTE: RCH - Regional Clinical Hospital №1, RH №1 NMC - Republican Hospital №1 of the National Medical Center, FCCVS - Federal Center for Cardiovascular Surgery, CSC ASMA - Cardiac Surgery Center of the Amur State Medical Academy.

Over the past 3 years the share of FCCVS, Khabarovsk, is the most essential, and by 2013 it has shown a progressive increase in replacement (in 2011 - 51.81%, in 2012 - 61.21%, in 2013 - 70, 03%). The chain growth rate for the period of 2011-2012 was 20.21%; for the period of 2012-

2013 it was 28.02%. The base growth rate forthe period of 2011-2013 was 53.89%. From 2004 to 2010 the growth rate of valve replacements in the FERamounted to + 113.70%, and for 10 years the base growth rate was almost three times higher (+ 306.85%). The share of FCCVS in valve reconstruction in the FER pointed to the more indicative dynamic: in 2011 - 45.76%, in 2012 - 71.63%, in 2013 - 76.24%. The chain growth rate increased significantly for the period of 2011-2012 (+138.98%), which was likely to determine a certain decrease for the period of 2012-2013 (-28.37%); the base rate of growth over the past 3 years (2011-2013) has been+71.19%, over the past 6 years (since 2008) it has been +158.97%. However, if in surgery of AHD the Far East showed a definitely positive trend in the whole according to the number of operations per 100,000 adult population it is still ranks one of the lowest positions among the regions of the RF.

CONCLUSIONS and RECOMMENDATIONS

Rheumatic etiology of AHD is losing the leading position in Russia that reflects the trend of redistribution of etiological factors for developed countries.

By 2013 in the Russia not only the total number of operations for AHD has increased, but the share of reconstructive surgery compared with replacement and the proportion of patients with simultaneous myocardial revascularization and correction of AHD have increased too, as well as combined operations on several heart valves. That reflects not only the overall growth of surgical activities, but also increase the level and quality of surgical treatment for AHD. However, these figures are still lower than the estimated needs in such kind of surgery that dictates the necessities for its further development in Russia.

One of the significant problems in surgery for AHD is that the level of need for surgical correction in the regions and in the country as a whole is not defined. The information about epidemiology (incidence and etiology) of AHD and patients who are under medical observation are unfairly ignored in the annual reports of the Ministry of Health (it's completely absent since 2009). Indirect understanding of the need for certain types of prostheses (the aortic, mitral and tricuspid prostheses) can be obtained only in the evaluation of the number of replacements in this or that position.The same situation is observed with age-contingent and etiology of the pathological process in operated patients (biological or mechanical device). To use this information in assessing the actual need for AHD surgery is rather difficult.

Contradictory data of postoperative mortality from AHD correction notes to the absence of a common approach in the evaluation of mortality, which complicates its dynamic comparative analysis.

According to the high social significance of AHD the data on prevalence of AHD and dispensary observation of patients should be included in the annual statistical reports of the Ministry of Health of Russia.

The real need for surgical interventions cannot be extrapolated even from one region of the country to the other, and determining the need for specific types of surgery should be based on the local situation [6]: the individuality of population, climatic and geographical peculiarities, the level of development of preventive medicine in the regions, etc.

It is necessary to define a common approach to the assessment of postoperative mortality in cardiac surgery in different hospitals in Russia.

REFERENCES

1. Bokeriya L.A., Gudkova R.G. Serdechno-sosudistaja hirurgija. Bolezni i vrozhdennye anomalii sistemy krovoobrashhenija. 2006-2013 [Cardiovascular surgery. Diseases and congenital anomalies of the circulatory system. 2006-2013]. Statisticheskiy sbornik. Moscow: Nauchnyj centr serdechno-sosudistoj hirurgii im. A.N. Bakuleva, 2007-2014.
2. Bokeriya L.A., Stupakov I.N., Gudkova R.G. Uspehi i problemy rossijskoj kardiohirurgii [The successes and problems of the Russian heart surgery] Zdravoohranenie, 2012, № 3, pp. 1-3. URL: http://www.zdrav.ru/articles/practice/detail.php?ID=77477(checked by 20.06.2015).
3. Zabolevaemost' naselenija Rossii v 2010 g. Statisticheskie materialy [Morbidity of Russian population in the year 2010. Statistical materials] Moscow, 2011 pp.
4. Zdorov'e Rossii: Atlas / under edition L.A. Bokeriya, I.N. Stupakov [Health of Russia: Atlas] Moscow: Nauchnyj centr serdechno-sosudistoj hirurgii im. A.N. Bakuleva, 2007.
5. Karas'kov A.M. Problemy kardiohirurgii Sibiri i Dal'nego Vostoka [Problems of cardiac surgery of Siberia and the Far East]. Patologija krovoobrashhenija i kardiohirurgija. 2001; №1, pp. 4-9.
6. Fufaev E.N. K voprosu o metodike kliniko-social'nyh issledovanij po izucheniju potrebnosti v kardiohirurgicheskoj pomoshhi [On the question of methodology of clinical and social research on the need for cardiac care Good clinical practice]. Kachestvennaja klinicheskaja praktika. 2003, №2, pp. 108-113.
7. Andrus B.W., Baldwin J.C. Valvular Heart Disease. London: Manson Publishing Ltd., 2010, 176 p.

8. ESC/EACTS guidelines. Guidelines on the management of valvular heart disease (version 2012). European Heart Journal. 2012, №33, pp. 2451-2496.
9. Iung B., Vahanian A. Epidemiology of acquired valvular heart disease. Canadian Journal of Cardiology. 2014, №30 (9), pp. 962-970. ULR: http://www.ncbi.nlm.nih.gov/pubmed/24986049 (checked by 20.06.2015).
10. Lilly L.S. Braunwald's Heart Disease Review and Assessment. Philadelphia: Elsevier - Health Sciences Division, 2012, 320 p.
11. Mendis S., Puska P., Norrving B. Global Atlas on Cardiovascular Disease Prevention and Control. World Health Organization (in collaboration with the World Heart Federation and World Stroke Organization), Geneva, 2011. URL: http://www.world-heart-federation.org/press/fact-sheets/rheumatic-heart-disease(checked by 20.06.2015).

Author: Svetlana A. Bogachevskaia, PhD (Candidate of Medical Sciences)

Company: Federal Centre for Cardiovascular Surgery, Khabarovsk, Russia

Position: Head, Department of functional and ultrasound diagnostics

Contact Information: Krasnodarskaya str. 2 v, Khabarovsk, Russia, e-mail: bogachevskayasa@gmail.com

Co-author: Alexander N. Bogachevskiy

Degree: none

Company: Federal Centre for Cardiovascular Surgery, Khabarovsk, Russia

Position: doctor - cardiovascular surgeon

Contact Information: Krasnodarskaya str. 2v, Khabarovsk, Russia, e-mail: bogachevskiy@gmail.com.