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Estimation of State and Efficiency of Using Medical Equipment in Medical Institutions of Sakha Republic (Yakutia)

Estimation of state and efficiency of using medical equipment in medical institutions of Sakha Republic over the period from 2005 till 2009 years is presented. Changes of indices of medical equipments' state in dynamic was revealed: a rise of balance cost and deterioration of medical equipment; reduction of indices of replenishing and increasing medical equipments; doctor's fund index provided with medical equipment; a rise of index of using the medical equipment.

Keywords: medical equipment, deterioration, fund- provision index, growth factor, factor of use.

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Introduction. At present the material provision of medical-diagnostic process in medical institutions of the region is a necessary link of the Russian health care service management [5].

In modern conditions the problem of perfection of medical and technical policy becomes of great significance, as the development of local health care institutions is appreciably defined by a degree of technical equipment of medical and prophylactic institutions [1].

The problem of material provision in health care institutions can be solved not only by equipping and profitable acquiring of a new equipment, but also by its effective application [3].

Such indices as deterioration and fund-provision are noted to be of greatest value in the characteristic of using the basic funds. In combination to the factors reflecting degree of loading of the medical equipment, these indices of using the basic means give a full and objective picture of the state of medical equipment recourses, efficiency of its use on corresponding sites of the work [2, 4].

Aim of the research is the estimation of state and efficiency of using the medical equipment in health care institutions of Republic Sakha (Yakutia) from 2005 for 2009.

Materials and methods. The estimation of state of the medical equipment included the analysis of its balance cost; the analysis of deterioration degree of the medical equipment and intensity of its updating; the analysis of the doctor's fund-provision with the medical equipment, the analysis of efficiency of using the medical equipment. Indices of deterioration, fund-provision, factors of updating, timing off, indices of increase of the medical equipment, a ratio of the installed medical equipment are calculated by standard methods.

Results and discussion. According to the total cost of the basic means a part of cost of the medical equipment in municipal medical institutions of the republic remains at 20.9-18.6 %. Among the medical institutions of the republic a part of cost of the medical equipment is higher than in municipal ones and for the studied period it has increased from 31.1 % to 39.3 %. In 2009 52.3% of the total cost of the medical equipment of the republic is for municipal ME and the rest 47.7 % is a share of republican medical institutions (MI).

The rise of balance cost of the medical equipment for 2005-2009 has made 92.9 %, the residual cost of the medical equipment – 49.8 %, and index of deterioration – 132.8 % (Table 1)

Table 1

Balance, residual costs of the medical equipment and its deterioration for 2005-2009 (thousand roubles)

Index	2005	2006	2007	2008	2009	The rise in 2005-2009 гг., %
Balance cost	2 557 688.1	3 557 333.5	4 304 685.1	4 675 902.7	4 934 060.8	92.9
Residual cost	1 228 557.4	1 696 386.0	1 988 406.2	1 997 730.2	1 839 906.0	49.8
Deterioration	1 329 130.7	1 860 947.5	2 316 278.9	2 678 172.5	3 094 154.8	132.8

The deterioration of the medical equipment all over the republic was estimated at 62.7% in the late 2009 and increased up to 10,7% as compared with 2005. In municipal ME the level of deterioration increased up to 11.3%, in republican ME up to 10.2% (Table 2).

Table 2

A level of deterioration of the medical equipment in Sakha Republic (Yakutia) for 2005-2009 (in percents)

	2005	2006	2007	2008	2009
All over the republic	52,0	52,3	53,8	57,3	62,7
Municipal MI	53,0	50,7	54,1	59,0	64,3
Republican MI	50,8	54,1	53,4	55,4	61,0

For the studied period only 11 from 35 administrative territories had a level of deterioration of the medical equipment lower than 60 %: Allaihovskiy, Verhneviljujskiy, Verhnekolymskiy, Mountain, Zhiganskiy, Mirninskiy, Srednekolymskiy, Suntarskiy, Tattinskiy, Ust-Janskiy regions and Yakutsk city.

High levels of deterioration of the medical equipment are noted in 11 regions : Bulunskiy, Verkhoyansk, Lenskiy, Momskiy, Namskiy, Nerjungriyskiy, Nizhnekolymskiy, Njurbinskiy, Tomponskiy, Ust-Aldan, Churapchinskiy.

Of all state health care institutions a high percent of deterioration of the medical equipment (over 60 %) for 2005-2009 is estimated in SE «Republican hospital №2 - the Center of Emergency Medical Aid», SE «Bureau of Forensic Medical Examination of MH RS (Ya), SME RS («Republican hospital №3», SME «Yakutsk republican ophthalmologic hospital».

When analyzing the technical equipment of the medical institutions of Sakha Republic (Yakutia) it has been revealed that approximately 80 % of the maintained medical equipments has fulfilled their resources by 2004 in most central regional hospitals and town institutions of Yakutsk. The most part of medical devices and equipments have been operated for 15-20 years and more. The deterioration was estimated as follows: 77% of X-ray devices, 67% of ultrasonic equipment, 63% of endoscopic equipment, 83 % of labware .

By 2007 the medical diagnostic equipment had been provided by the priority national project within the decree of the Government of Sakha Republic (Yakutia) № 450 from October 1st, 2004 « Urgent measures on replacement of worn out medical equipment in the National Centre of Medicine, republican and regional medical institutions », in the field of the state purpose-oriented program “Health protection of the population of Sakha Republic” and federal programs, and this process caused the reduction of indices of the deterioration.

The table 3 demonstrates that from 2007 to 2009 the most expressed increase of deterioration was revealed among ultrasonic devices (19,6 %), labware (17,9 %), devices for functional diagnostics (15,8 %), endoscopic devices (14,4 %). Decrease in the level of deterioration were marked among LOR apparatus (15,3 %) and operational equipments (6,7 %).

Table 3

Deterioration of groups of the medical equipment for 2007-2009 (%)

Groups of medical equipment	2007	2008	2009	Dynamics, 2007-2009 (%)
X-ray devices	40,6	45,6	50,1	+ 9,5
USD devices	49,3	59,6	68,9	+ 19,6
Endoscopic devices	54,5	59,6	68,9	+ 14,4
Labware	41,0	47,2	58,9	+ 17,9
Devices for functional diagnostics	48,9	55,5	64,7	+15,8
Devices for reanimation and anaesthesia	64,7	62,2	63,6	- 1,1
Operational equipment	58,5	51,1	51,8	- 6,7
Physiotherapy devices	64,5	70,3	73,2	+ 8,7
Disinfecting and sterilizing equipment	43,6	40,5	47,1	+ 3,5
Ophthalmological equipment	58,1	50,7	55,5	- 2,6
Otolaringologic equipment	67,2	62,7	51,9	- 15,3
Equipment of obstetric and gynecologic departments	50,7	54,5	57,2	+ 6,5
Stomatological equipment	57,4	58,7	59,3	+ 1,9

For the studied period the factor of updating of the medical equipment, characterizing a share of the new medical equipment in its general sum, has dynamically decreased in 74,1 % all over the republic. According to the table 4, the maximum indicators of the updating in municipal ME are noted from 2005 to 2007 (accordingly 0,16; 0,26; 0,16), in republican ME in 2005 (0,40) and in 2007 (0,17), as a whole on the republic from 2005 to 2007 (accordingly 0,27; 0,18; 0,16), these parameters connected with deliveries of the expensive medical equipment (x-ray and magnet-resonant tomographic devices, fluorography, USD devices, labware). In 2008 and 2009 the parameter of updating of the medical equipment was 0,09 and 0,07 accordingly on the average in the republic by the standard of its updating in 0,12 (Table 4).

Table 4

Indices of updating factors of the medical equipment for 2005-2009

	2005	2006	2007	2008	2009	Decrease rate for 2005-2009, %
Municipal MI	0,16	0,26	0,16	0,06	0,06	- 62,5
Republican MI	0,40	0,08	0,17	0,12	0,08	- 80,0
All over the republic	0,27	0,18	0,16	0,09	0,07	- 74,1

The factors of discarding of the medical equipment, reflecting relative reduction of the cost at the expense of their discarding, in dynamics have decreased equally in 33,3 % as a whole in the republic, in municipal ME and republican ME (Tab. 5).

Table 5

Indices of discarding factors of the medical equipment in 2005-2009

	2005	2006	2007	2008	2009	Decrease rate in 2005-2009 гг, %
Municipal MI	0,03	0,03	0,02	0,03	0,02	- 33,3
Republican MI	0,03	0,08	0,02	0,03	0,02	- 33,3
All over the republic	0,03	0,06	0,02	0,03	0,02	- 33,3

The growth factor of the medical equipment, characterizing a relative increase in the basic means at the expense of their updating, in dynamics has decreased in 85,3 % as a whole in the republic, 75,0 % in municipal, 90,5 % in the republican ME. The maximum ratio of the rise is noted in municipal ME since 2005 to 2007 (accordingly 0,16; 0,34; 0,17), in the republican ME in 2005 (0,63) and in 2007 (0,19), as a whole in the republic since 2005 to 2007 (accordingly 0,34; 0,19; 0,18) connected with deliveries of the expensive medical equipment (Table 6).

Table 6

Indices of growth factor of the medical equipment in 2005-2009

	2005	2006	2007	2008	2009	Decrease rate 2005-2009, %
Municipal MI	0,16	0,34	0,17	0,03	0,04	- 75,0
Republican MI	0,63	0,03	0,19	0,09	0,06	- 90,5
All over the republic	0,34	0,19	0,18	0,06	0,05	- 85,3

The doctor's fund provision with the medical equipment is considered one of the indicators, characterizing efficiency of use of the basic means. The fund provision with the medical equipment per one doctor in 2009 has averaged at 845,6 thousand roubles in the republic, 625,1 thousand roubles in municipal ME, 1375,5 thousand roubles in the republican

ME. The fund provision with the medical equipment in republican ME is 2,2 times higher as compared with municipal ME and 1,6 times higher than the average territorial index. The indicator increase for the studied period has been 88,8 % in the republic, 89,2 % in the republican ME, 88,3 % in municipal ME. These parameters have been caused by the growth of balance cost for the medical equipment at the expense of increasing the volume of purchases of the medical equipment with relatively stable staff of doctors (Tab. 7).

Table 7

Indices of fund provision with medical equipment per one doctor in 2005-2009 (thousand roubles).

	2005	2006	2007	2008	2009	Growth rate, %
Municipal MI	331,9	473,3	569,7	603,6	625,2	88,3
Republican MI	727,0	984,6	1181,2	1305,6	1375,5	89,2
All over the republic	447,9	625,6	751,5	809,4	845,7	88,8

High indices of the fund provision per one doctor are marked in Gorniy, Olekminsky, Tattinsky, Verhnekolymsky, Mirninsky, Viljujsky, Ust-May, Eveno-Bytantajsky regions. Low indices are in Allaihovskiy, Ojmjakonsky, Zhigansky, Abyjsky and Kobjajsky regions.

Among the republican ME high indicators of the fund provision with the medical equipment are revealed in 2009 in the SME RS (Y) «Blood Transfusion Station», SE «Republican hospital №1 - the National Centre of Medicine», SME RS (Y) «Republican Hospital №3», SE «Yakut Republican Oncological Clinic», SE NPC "Phthysiology" of MH RS, SME «Yakutsk Republican Ophthalmologic Hospital».

The operating ratio of park of the established medical equipment, defined by the relation of amount of the actually working equipment to amount of the established equipment on the balance has been 0,94 all over the republic in 2005, 0,94 in 2006, 0,95 in 2007, 0,96 in 2008, 0,97 in 2009, these parameters showing the efficiency growth in use of the medical equipment and reduction of the equipment downtimes.

The conclusion. Thus, the basic characteristics of the estimation of state and efficiency of using the medical equipment in the health care system RS(Y) are as follows: the growth rate of balance cost of the medical equipment for 2005-2009 has amounted 92,9 %, the residual cost of the medical equipment has been 49,8 %, and deterioration has been 132,8 %; the deterioration of the medical equipment all over the republic at the end of 2009 has amounted 62,7 % and in comparison with 2005 it has increased up to 10,7 %; the updating factor of the medical equipment in dynamics all over the republic has decreased on 74,1 %; the discarding factor of

the medical equipment in dynamics has decreased on 33,3 %; the growth factor of the medical equipment has decreased on 85,3 %; the indicator increase of the fund provision has been estimated at 88,8 %; the operating ratio of park of the established medical equipment in dynamics all over the republic has increased from 0,94 to 0,97.

The balance cost growth of the medical equipment and doctor's fund provision with the medical equipment in dynamics is connected with the financing growth for acquiring and delivering the expensive medical equipment. But at the same time, the updating and growth factors of the medical equipment have decreased, and the deterioration of the medical equipment has been of a higher rate that is connected with the reduction of financial expenses for updating of the medical equipment in dynamics for years. The operating growth ratio of park of the established medical equipment testifies to the efficiency growth of using the medical equipment.

The analysis of state of the medical equipment and efficiency of its use as an active part of the basic funds, allows to make administrative decisions on rational use and reproduction, and also reveals the priority directions and expenses for reproduction of the medical equipment in health care institutions of Sakha Republic (Yakutia).

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