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QUALITY OF CARE FOR PATIENTS WITH MYOCARDIAL INFARCTION WITH ST SEGMENT ELEVATION. REAL CLINICAL PRACTICE OF THE SIBERIAN INVASIVE CENTER

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Background. There are many quality indicators for evaluation of quality of care in patients with myocardial infarction in the USA and Europe, but no such indicators exist in Russia.

Material and Methods. This retrospective study included 475 STEMI patients, admitted within the first 12 hours during 2016. The baseline characteristics and treatment of our STEMI patients were compared with the OPERA register (France). The quality of care in STEMI patients was assessed using the quality criteria of the Association of Acute Cardiovascular Care of the European Society of Cardiology. Thrombolytic therapy, primary PCI, cardiogenic shock, pulmonary edema, acute LV aneurysm, and acute psychotic disorders were endpoints for a comparative assessment of quality of care in different age groups.

Results. The following was more frequent among patients of our center: female, history of MI, hypertension, dyslipidemia and smoker. Our patients were less likely to receive primary PCI and GP IIb/IIIa inhibitor, but more often thrombolytic therapy, LMWH, aspirin, inhibitor P2Y₁₂, beta-blocker, ACEI/ARBs and statins. All eligible STEMI patients received reperfusion and recommended medication, but hospital mortality was higher than in the OPERA register (7.4% versus 4.6%; $p < 0.05$). Senile STEMI patients are less likely to undergo invasive reperfusion due to severe comorbidity, dementia and acute psychotic disorders, which leads to a manifold increase in hospital mortality.

Conclusion. It is necessary to develop new devices for PCI of calcinated lesions, and methods for neuroprotection to overcome the existing barriers to ensure high-tech care in senile STEMI patients.

Keywords: myocardial infarction with ST elevation, senile age, quality of medical care

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КАЧЕСТВО ОКАЗАНИЯ ПОМОЩИ ПАЦИЕНТАМ С ИНФАРКТОМ МИОКАРДА С ПОДЪЕМОМ СЕГМЕНТА ST. РЕАЛЬНАЯ КЛИНИЧЕСКАЯ ПРАКТИКА СИБИРСКОГО ИНВАЗИВНОГО ЦЕНТРА

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Введение. В США и Европе существует много критериев для оценки качества оказания медицинской помощи пациентам с инфарктом миокарда. Российские сравнительные исследования по оценке качества оказания помощи в соответствии с указанными критериями отсутствуют.

Материал и методы. В данное ретроспективное исследование включено 475 пациентов с инфарктом миокарда с подъемом сегмента ST, поступивших в первые 12 ч от начала инфаркта миокарда в 2016 г. Клинико-анамнестические характеристики пациентов отделения неотложной кардиологии и проводимое лечение сравнили с данными регистра OPERA (Франция). Качество оказания медицинской помощи пациентам с инфарктом миокарда с подъемом сегмента ST в нашем центре оценивалось согласно критериям качества Ассоциации специалистов по экстренной сердечно-сосудистой помощи Европейского общества кардиологов. Для сравнительной оценки качества оказания помощи пациентам различных возрастных групп конечными точками были приняты частота использования тромболитической терапии и первичного чрескожного коронарного вмешательства, частота развития кардиогенного шока, отека легких, острой аневризмы левого желудочка и острых психотических расстройств.

Результаты и обсуждение. Среди пациентов нашего отделения чаще встречались женский пол, инфаркт миокарда в анамнезе, гипертоническая болезнь, дислипидемия и курение. У нас реже проводится первичное чрескожное коронарное вмешательство и реже назначаются блокаторы IIb/IIIa рецепторов тромбоцитов, чаще проводится тромболитическая терапия и назначаются *низкомолекулярные гепарины*, аспирин, ингибиторы P2Y₁₂ рецепторов тромбоцитов, бета-адреноблокаторы, иАПФ/АРА и статины. Все подходящие пациенты подверглись реперфузионным вмешательствам и получили оптимальную медикаментозную терапию, однако госпитальная летальность оказалась существенно выше, чем в регистре OPERA (7,4 против 4,6%; $p < 0,05$). Пациенты старческого возраста реже получали реперфузионные вмешательства из-за тяжелой коморбидности, деменции и острых психотических расстройств, что закономерно привело к существенно большей летальности.

Заключение. Необходима разработка новых методик для выполнения чрескожного коронарного вмешательства кальцинированных стенозов и методов нейропротекции для повышения доступности высокотехнологичной помощи пациентам старческого возраста.

Ключевые слова: инфаркт миокарда с подъемом сегмента ST, старческий возраст, качество медицинской помощи

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Introduction

Currently, myocardial infarction (MI) continues to be the main cause of morbidity, mortality and disability of the adult population of most countries in the world [1]. In recent years, there has been a significant progress in the treatment of ACS, mainly due to the modification of treatment strategies, the improvement of methods of invasive intervention, the organization of vascular centers and the development of patient routing [2]. However, according to the Russian registry RECORD, hospital mortality in STEMI in Russian hospitals remains very high — 16.7% [3]. It is significantly higher than in Western Europe. In particular, the hospital mortality in the OPERA register (France) is 4.6% [4]. What is the reason for this difference? To answer this question, it is necessary to compare the clinical and anamnestic characteristics of patients and the quality of care for STEMI in Russian vascular centers and hospitals in Western Europe.

The issues of assessing the quality of medical care were first mentioned in the report of the Institute of Medicine in the USA in 2001. The first set of quality indicators or performance measures for AMI published by the ACC/AHA was released in 2006 and updated in 2008, and a position paper specific to coronary reperfusion published in 2008. The Association of Acute Cardiovascular Care of the European Society of Cardiology in November 2016 also published the criteria developed for assessing the quality of care in patients with MI across Europe [5]. Comparative studies of the quality of

care in accordance with the specified criteria have not been carried out in Russia.

Elderly patients make a predominant contribution to the hospital mortality rate. Senile patients are also less likely to receive invasive intervention. What are the reasons for this? Is it possible to overcome this? It is necessary to analyze the quality of medical care for patients with STEMI in different age groups.

The aim of this work was to compare the clinical and anamnestic characteristics, reperfusion procedures and medication of patients in the Emergency Cardiology Department of the Cardiology Research Institute (Tomsk, Russia) and the OPERA register (France), to assess the quality of emergency medical care for STEMI patients in the Emergency Cardiology Department according to the quality criteria of the Association of Acute Cardiovascular Care of the European Society of Cardiology, to determine the availability of different treatment strategies for patients of different age groups, to identify existing technological barriers in the care of patients with STEMI.

Material and Methods

With a population of around 500 thousand people the city of Tomsk is located in the south of Western Siberia. Our Department of Emergency Cardiology provides emergency medical care to patients with ACS in the 24/7 mode (round the clock and daily) as a tertiary invasive center. The intensive

care unit is designed for 12 patients and is equipped with everything necessary to provide emergency care in case of the development of acute cardiac, respiratory or renal failure. The therapy of shock was performed according to acid-base state and central hemodynamics parameters, which were controlled by direct methods (central venous catheterization with central venous pressure monitoring, radial artery catheterization with blood pressure monitoring). Intra-aortic balloon counterpulsation (Maquet CS 300, Sweden) and artificial lung ventilation (Maquet Servo-s, Sweden) were performed if necessary. Coronary angioplasty is performed on the Artis One (Siemens, Germany). The blood flow in coronary arteries is determined by TIMI [6].

This retrospective study included 475 patients with myocardial infarction with ST elevation (STEMI), admitted within the first 12 hours from the onset of myocardial infarction (MI) in 2016. The quality of care in patients with STEMI was evaluated according to the quality criteria of the Association of Acute Cardiovascular Care of the European Society of Cardiology [5]. For a comparative assessment of the quality of care in patients of different age groups, the endpoints were the frequency of use of thrombolytic therapy and primary PCI, the incidence of cardiogenic shock, pulmonary edema, acute LV aneurysm, and acute psychotic disorders.

To estimate the normality of the distribution, the Kolmogorov-Smirnov and Lilliefors criteria were used. Qualitative data are presented as frequency of occurrence (in percent),

quantitative data are presented as mean \pm standard deviation (in the case of a normal distribution) or as the median and interquartile range. The processing of the received data was carried out using the Statistica 10.0 software package. To compare the groups by qualitative characteristics, chi-square, Pearson's criterion and Fisher's exact test were used. Quantitative data were analyzed using Mann-Whitney U-test for comparison of two independent groups and Kruskal-Wallis test with multiple comparisons procedure for comparison of multiple independent groups. The difference was considered statistically significant when p was below 0.05.

Results

Clinical and anamnestic characteristics of patients with STEMI, reperfusion therapy, medication and hospital mortality in our center versus OPERA register are presented in Table 1.

There were fewer men among the patients of Tomsk center whereas history of MI, hypertension, dyslipidemia and smoking were more frequent indicators. Patients did not differ in age, frequency of diabetes and received adequate recommendations for secondary prevention at discharge. Patients of Tomsk center are less likely to have primary PCI, more often thrombolytic therapy, fewer GP IIb/IIIa inhibitor (probably due to rarer primary PCI), but LMWH, aspirin, inhibitor P2Y₁₂, beta-blocker, ACE inhibitors / Angiotensin II antagonist and statin were more often prescribed.

Table 1

Clinical and anamnestic characteristics of patients with STEMI, reperfusion therapy and secondary prevention at discharge

Indicator	Tomsk ($n=475$), n (%)	OPERA ($n=1476$), n (%)
Age (years)	63.5 \pm 12.4	64 \pm 14
Male*	320 (67.4)	1137 (77.0)
History of MI*	129 (27.2)	159 (10.8)
Hypertension*	440 (92.6)	649 (44.0)
Dyslipidemia*	365 (76.8)	731 (49.5)
Current smoker / previous smoker*	280 (58.9)	583 (39.6)
Diabetes	86 (18.1)	255 (17.3)
Thrombolytic therapy*	236 (49.7)	426 (28.9)
Primary PCI*	124 (26.1)	1047 (71.0)
Indirect signs of spontaneous reperfusion at admission	79 (16.6)	
Neither reperfusion therapy nor indirect signs of spontaneous reperfusion at admission	36 (7.6)	
GP IIb/IIIa inhibitor*	54 (11.4)	358 (24.3)
Low molecular weight heparins*	384 (80.8)	611 (41.4)
Aspirin*	454 (95.6)	1340 (90.8)
Inhibitor P2Y ₁₂ *	466 (98.1)	1152 (78.0)
Beta-blocker*	430 (90.5)	1188 (80.5)
ACE-inhibitor / Angiotensin II antagonist*	383 (80.6)	884 (59.9)
Statin*	462 (97.3)	1209 (81.9)
atorvastatin (30,8 \pm 10,8 mg)	358 (77.5)	
rosuvastatin (14,6 \pm 6,8 mg)	104 (22.5)	
Hospital mortality*	35 (7.4)	70 (4.6)

Note: * $p<0.05$.

Thus, patients received medication according to the current recommendations. Necessary drugs were not prescribed or administered in a smaller dose because of contraindications or undesirable effects. At the same time, hospital mortality in our department was significantly higher: 7.4% compared to 4.6% ($p < 0.05$) in the OPERA register.

The mean time from the onset of symptoms to admission was 177 (120; 275) minutes. Among patients with ST elevation at pre-hospital, 16.6% patients ($n=79$) had indirect signs of spontaneous reperfusion at admission (relief of pain and return of ST to isoline without the use of thrombolytic therapy). Thrombolytic therapy was performed pre-hospital in 208 of 236 patients (88.1%). Tenecteplase was used in 86.9% ($n=205$). Thrombolytic therapy in the hospital was performed if it was impossible to perform a primary PCI ($n=28$), and the average door-to-needle interval was 26.7 ± 10.3 minutes. The reperfusion of infarct-related coronary artery (indirect signs) was observed in 78.8% after 90 (60; 90) minutes. Rescue PCI was performed in 43 out of 50 patients without reperfusion after thrombolytic therapy. The remaining 7 patients without signs of reperfusion did not undergo PCI because of an extremely severe condition ($n=1$), technical difficulties (diagnostic angiography did not lead to PCI in 5 patients) or patient refusal ($n=1$).

Most patients (229 of 265) with indirect signs of coronary reperfusion (both after thrombolytic therapy and spontaneous) were sent to coronary angiography within 24 hours. PCI was performed in 182 (79.5%) of 229 patients. The main reasons for refusing to undergo invasive intervention were severe cognitive impairment, active gastrointestinal bleeding and patient refusal. The door-to-balloon interval for primary PCI was 62 (55; 80) minutes.

Thus, 419 (88.2%) of 475 STEMI patients hospitalized in the first 12 hours from the onset of myocardial infarction were subjected to coronary angiography. PCI was performed in 349 (73.5%) of STEMI patients with stenting in 327 (93.7%). It should be noted that in 70 patients diagnostic angiography did not lead to percutaneous revascularization of the myocardium. The most common cause of failure to perform PCI was multivessel diffuse coronary artery disease with severe calcification with a TIMI 2–3 blood flow in the infarct-related coronary artery or a small diameter of the artery. Only 10 of these patients underwent CABG surgery within 2 weeks after admission.

The results of the assessment of the quality of emergency medical care for STEMI patients in the Emergency Cardiology Department according to the quality criteria of the Association of Acute Cardiovascular Care of the European Society of Cardiology are presented in Table 2.

One of the goals of this work was to determine the availability of reperfusion in patients of different age groups.

All patients were divided into 3 groups:

- Group 1 — patients up to 65 ($n=277$),
- Group 2 — patients between 65 and 75 ($n=86$),
- Group 3 — patients 75 years and older ($n=112$).

Clinical and anamnestic characteristics of patients with STEMI from different age groups are presented in Table 3.

The groups differed by gender and number of smokers (current smokers or previous smokers). In group 3 hypertension, a prior myocardial infarction, and anteroposterior myocardial damage were more common. Obesity was more common in group 2, and diabetes was less common in group 1.

The reperfusion interventions and the results of treatment of patients of different age groups with STEMI are presented in Table 4.

Elderly patients were less likely to receive TLT and PCI, patients in this group more often developed a severe left ventricular failure (cardiogenic shock, pulmonary edema) and psychotic disorders. All this naturally led to a significantly greater mortality.

Discussion

The Department of Emergency Cardiology serves as a tertiary invasive cardiovascular center and is a part of the network organization. It has a single emergency telephone number and prescribed algorithms for immediate transfer of STEMI patients to a center with catheterization laboratory facilities. The register of patients with ACS treated in the department is maintained, the door-to-needle and door-to-balloon intervals are recorded, and the employees of the department take part in the National registers (RECORD) and in the European register of the EURObservational Research Program Surveys and Registries. Thus, only the pre-hospital activation of the angiographic laboratory is absent in terms of the first quality criterion (organization of the Tomsk center). The door-to-balloon interval for primary PCI is 62 which does not meet the recommended [7]. Recently, relevant regulatory documents have been prepared that will allow the introduction of prehospital activation of the angiographic laboratory in order to reduce the door-to-balloon interval to the recommended value.

All eligible STEMI patients received reperfusion interventions and adequate medication. The risk of ischemic events development, risk of bleeding, the rate of glomerular filtration, the functional class of heart failure, and the LV ejection fraction are determined in all STEMI patients.

It should be noted that statins were not prescribed to all patients and not always in high doses due to the development of side effects or because of intolerance. Attention is drawn to the rare use of ticagrelor (37.9%). Even taking into account contraindications to ticagrelor in some patients, the frequency of prescribing this drug in the invasive center with PCI in 73.5% of patients should be significantly higher.

The sixth quality indicator concerns patient satisfaction, including pain control, the completeness of the information provided by doctors and nurses (about the disease, the risks and benefits of the prescribed therapy, available rehabilitation programs, modifiable risk factors and information regarding what to do in case of recurrence of symptoms). This information should be collected regularly from all patients. Such surveys will help identify and eliminate existing defects at various stages of management and make it patient oriented.

The frequency of primary PCI in our center was significantly lower than in the OPERA register, but the overall rate

Table 2

Indicators of quality of care for STEMI patients

Quality indicator	Recommended by ESC	Tomsk
1.1. Centre organisation. Main quality indicator: the centre should be part of a network organisation with written protocols for rapid and efficient management	Single emergency phone number for the patient to be connected with a medical system for triage	Yes
	Pre-hospital interpretation of ECG for diagnosis and decision for immediate transfer to a centre with catheterisation laboratory facilities	Yes
	Pre-hospital activation of the catheterisation laboratory	No
1.2. Centre organisation. Secondary quality indicator: routine assessment of relevant times for the reperfusion process in STEMI patients	call to first medical contact	Yes
	first medical contact to door	Yes
	door to arterial access	Yes
1.3. Centre organisation. Secondary quality indicator:	the centre should participate in a regular registry or programme for quality assessment	Yes (RECORD registry, EURObservational Research Programme Surveys and Registries))
2.1. Reperfusion-invasive strategy. Main quality indicator: proportion of STEMI patients reperfused among those eligible (onset of symptoms to diagnosis <12h without contraindications or patient refusal)	100%	92.4%
2.2. Reperfusion-invasive strategy. Main quality indicator: proportion of patients with timely reperfusion	For patients treated with fibrinolysis: <30 min from First Medical Contact FMC to needle	Yes
	For patients treated with primary PCI and admitted to centers with catheterization laboratory facilities: <60 min from door-to-arterial access for reperfusion with PCI	No (62 min)
3. In hospital risk assessment. Main quality indicator: proportion of patients admitted with STEMI who have bleeding risk assessment using the CRUSADE bleeding score at admission and assessment of LVEF before discharge	The CRUSADE bleeding score should be assessed and the numerical value of the score recorded for all patients admitted with STEMI	Yes
	LVEF should be assessed and the numerical value recorded for all patients admitted with STEMI	Yes
4.1. Anti-thrombotics during hospitalization. Main quality indicator: proportion of patients with 'adequate P2Y12 inhibition'	For ticagrelor: AMI patients without a previous haemorrhagic stroke, high bleeding risk, fibrinolysis or oral anticoagulation	Yes
	For clopidogrel: no indication for ticagrelor and no high bleeding risk	Yes
4.2. Anti-thrombotics during hospitalization. Secondary quality indicator: proportion of patients discharged on dual antiplatelet therapy	All STEMI patients should be discharged on dual antiplatelet therapy (if there are no clear and documented contraindications)	Yes
5.1. Secondary prevention-discharge treatment. Main quality indicator: proportion of patients with AMI discharged on statins, unless contraindicated, at high intensity	atorvastatin ≥ 40 mg rosuvastatin ≥ 20 mg	Yes
5.2. Secondary prevention-discharge treatment. Secondary quality indicator: proportion of patients with AMI and clinical evidence of heart failure or a LVEF 0.40 who are discharged on ACEI (or ARBs if intolerant of ACEI) unless contraindicated	All STEMI patients with clinical evidence of heart failure or a LVEF ≤ 0.40 should be discharged on ACEI / ARBs (if there are no hypotension, acute renal failure, hyperkalaemia, contraindications, refusal, side effects or allergy)	Yes
5.3. Secondary prevention-discharge treatment. Secondary quality indicator: proportion of patients with AMI and clinical evidence of heart failure or an LVEF 0.40 who are discharged on beta-blockers, unless contraindicated	All STEMI patients with clinical evidence of heart failure or a LVEF 0.40 should be discharged on beta-blockers (if there is no evidence of a low output state, increased risk for cardiogenic shock, PR interval >0.24 s, second- or third-degree heart block, active asthma, or reactive airways disease)	Yes
6.1. Patient satisfaction. Main quality indicator: feedback regarding the patient's experience systematically collected in an organized way from all patients. It should include the following points:	Pain control.	Partially
	Explanations provided by doctors and nurses (about the coronary disease, the benefit/risk of the discharge treatment, and medical follow-up). Discharge information regarding what to do in case of recurrence of symptoms and recommendation to attend a cardiac rehabilitation programme (including smoking cessation and diet counselling)	

Table 3

Clinical and anamnestic characteristics of patients with STEMI from different age groups

Indicator	Quantity (n=475), n (%)		
	Group 1 (n=277)	Group 2 (n=86)	Group 3 (n=112)
Male*	230 (83.0)	51 (59.3)	39 (34.8)
Inferior MI	136 (49.1)	47 (54.7)	47 (42.0)
Anterior MI	136 (49.1)	36 (41.9)	51 (45.5)
Antero-Inferior MI [†]	5 (1.8)	3 (3.5)	14 (12.5)
History of MI [§]	65 (23.5)	24 (27.9)	40 (35.7)
Risk factors:			
Hypertension [§]	247 (89.2)	82 (95.3)	111 (99.1)
Dyslipidemia	217 (78.3)	66 (76.7)	82 (73.2)
Current smoker / previous smoker*	220 (79.4)	41 (47.7)	19 (17.0)
Obesity [†]	97 (35.0)	36 (41.9)	30 (26.8)
Diabetes [‡]	38 (13.7)	25 (29.1)	23 (20.5)

Note: * $p < 0.05$ between 1 and 2, between 2 and 3, between 1 and 3; [†] $p < 0.05$ between 3 and 1, between 3 and 2; [§] $p < 0.05$ between 3 and 1; [‡] $p < 0.05$ between 2 and 3; [‡] $p < 0.05$ between 1 and 2.

Table 4

The reperfusion interventions and the results of treatment of patients of different age groups with STEMI

Indicator	Quantity (n=475), n (%)		
	Group 1 (n=277)	Group 2 (n=86)	Group 3 (n=112)
Thrombolytic therapy [†]	153 (55.2)	41 (47.7)	42 (37.5)
All PCI*	216 (78.0)	66 (76.7)	67 (59.8)
Primary PCI	66 (23.8)	26 (30.2)	32 (28.6)
Diagnostic angiography without PCI	43 (15.5)	10 (11.6)	17 (15.2)
Without thrombolytic therapy and PCI*	13 (4.7)	5 (5.8)	18 (16.1)
Complications of MI:			
Cardiogenic shock [†]	20 (7.2)	10 (11.6)	16 (14.3)
Pulmonary edema [‡]	16 (5.8)	11 (12.8)	24 (21.4)
Acute aneurysm of the left ventricle	18 (6.5)	6 (7.0)	11 (9.8)
Psychotic disorders*	3 (1.1)	2 (2.3)	17 (15.2)
Recurrent MI	14 (5.1)	7 (8.1)	7 (6.25)
Hospital mortality*	11 (4.0)	6 (7.0)	18 (16.1)

Note: * $p < 0.05$ between 1 and 3, между 2 and 3; [†] $p < 0.05$ between 1 and 3; [‡] $p < 0.05$ between 1 and 2, between 1 and 3.

of reperfusion measures was quite high — 92.4%. Therefore, it is likely that the higher hospital mortality in our center was due to severe comorbidity background of patients at admission, that is, the more frequent hypertension, dyslipidemia, smoking and history of MI.

It should be recognized that the treatment of senile age patients with STEMI is a really difficult task. Hypertension, prior myocardial infarction, and anteroposterior myocardial damage are more common in senile patients, which leads to severe left ventricular failure and acute psychotic disorders. Psychotic disorders make it impossible to identify the onset of myocardial infarction and possible contraindications for PCI or TLT. It seems to us that it is psychiatric disorders that limit the scope of reperfusion interventions in senile patients.

In this regard, the development of techniques for neuroprotection may help in the reduction of psychoses and increase the accessibility of PCI for the elderly.

Limitations. This study is retrospective. Evaluation of quality of care patients with myocardial infarction using the quality criteria of the Association of Acute Cardiovascular Care of the European Society of Cardiology can be recommended only to invasive centers with 24/7 operating mode.

Conclusion

In comparison with the French OPERA register, our patients more frequently had hypertension, dyslipidemia, smoking, and history of MI; they less often received primary PCI and more often TLT. The total rate of reperfusion meas-

ures was 92.4%. Hospital mortality in our center was higher than in the OPERA register: 7.4% versus 4.6% ($p < 0.05$).

Our STEMI patients received all the high quality emergency medical care necessary in a timely manner, according to the quality criteria of the Association of Acute Cardiovascular Care of the European Society of Cardiology.

STEMI patients of senile age were less likely to undergo invasive reperfusion interventions due to severe comorbidity background, including dementia and acute psychotic disorders, which lead to a manifold increase in hospital mortality.

It is necessary to develop new devices or techniques for PCI in case of severe multivessel coronary lesions with severe calcification, as well as the development of techniques for neuroprotection in order to overcome the existing barriers in providing emergency high-tech medical care to senile STEMI patients.

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References/Интерпретация

1. Roger V. L., Go A. S., Lloyd-Jones D. M., Benjamin E. J., Berry J. D., Borden W. B., Bravata D. M., Dai S., Ford E. S., Fox C. S., Fullerton H. J., Gillespie C., Hailpern S. M., Heit J. A., Howard V. J., Kissela B. M., Kittner S. J., Lackland D. T., Lichtman J. H., Lisabeth L. D., Makuc D. M., Marcus G. M., Marelli A., Matchar D. B., Moy C. S., Mozaffarian D., Mussolino M. E., Nichol G., Paynter N. P., Soliman E. Z., Sorlie P. D., Sotoodehnia N., Turan T. N., Virani S. S., Wong N. D., Woo D., Turner M. B.; American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Heart Disease and Stroke Statistics 2012 Update: A Report from the American Heart Association. *Circulation*. 2012; 125(1): 2–220. DOI: 10.1161/CIR.0b013e31823ac046.
2. Markov V. A., Ryabov V. V., Maximov I. V., Vyshlov E. V., Demianov S. V., Syrkina A. G., Belokopytova N. V., Shurupov V. S., Oynarov E. O., Maximov A. I., Vasilyev A. G. Yesterday, today, tomorrow in the diagnosis and treatment of myocardial infarction. *Siberian Medical Journal*. 2011; 2: 8–13 (In Russ).
3. Erlikh A. D., Gratsiansky N. A., Participants of the RECORD registry. Independent registry of acute coronary syndromes RECORD. In hospital patients characteristic. *Atherothrombosis*. 2009; 1: 105–119.
4. Montalescot G., Dallongeville J., Belle E. V., Rouanet S., Baulac C., Degrandart A., Vicaut E., STEMI and NSTEMI: are they so different? 1 year outcomes in acute myocardial infarction as defined by the ESC/ACC definition (the OPERA registry) *Eur. Heart J.* 2007; 28(12): 1409–1417. DOI: 10.1093/eurheartj/ehm031.
5. Schiele F., Gale C. P., Bonnefoy E., Capuano F., Claeys M. J., Danchin N., Fox K. A. A., Huber K., Iakobishvili Z., Lettino M., Quinn T., Gimenez M. R., Bøtker H. E., Swahn E., Timmis A., Tubaro M., Vrints Ch., Walker D., Zahger D., Zeymer U., Bueno H. Quality indicators for acute myocardial infarction: A position paper of the Acute Cardiovascular Care Association. *Eur. Heart J.: Acute Cardiovasc. Care*. 2017 Feb; 6(1): 34–59. DOI: 10.1177/2048872616643053. Epub 2016 Sep 20.
6. Cannon C. P., McCabe C. H., Diver D. J., Herson S., Greene R. M., Shah P. K., Sequeira R. F., Leya F., Kirshenbaum J. M., Mago-rien R. D., Palmeri S. T., Davis V., Gibson C. M., Poole W. K., Braunwald E. Comparison of front-loaded recombinant tissue-type plasminogen activator, anistreplase and combination thrombolytic therapy for acute myocardial infarction: results of the Thrombolysis in Myocardial Infarction (TIMI) 4 trial. *J. Am. Coll. Cardiol.* 1994; 24: 1602–1610.
7. ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. *Eur.*

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