Comorbid Conditions and Percutaneous Coronary Intervention in Elderly Patients with Acute Coronary Syndrome

Gilyarov M.Yu.[1,2,3], Konstantinova E.V.[1,2]*, Atabegashvili M.R.[1], Solntseva T.D.[4], Anichkov D.A.[2], Kostina A.N.[3], Polybin R.V.[3], Udovichenko A.E.[1,2,3], Svet A.V.[1,3]

[1] City Clinical Hospital №1 n.a. N.I. Pirogov, Moscow, Russia

[2] Pirogov Russian National Research Medical University, Moscow, Russia

[3] I.M. Sechenov First Moscow State Medical University (Sechenov University), Moscow, Russia

[4] Research Institute of Cardiology named after A.L. Myasnikov, National Medical Research Center of Cardiology, Moscow, Russia

Aim. To assess the severity of comorbid conditions in elderly patients with acute coronary syndrome (ACS) and to analyze subgroups with different treatment strategies for patients in the daily work of the Regional Vascular Center (RVC).

Material and methods. The prospective study included 205 patients aged 75 years and older with a confirmed diagnosis of ACS, and if they signed an informed consent. The average age of the patients included in the study was 81.6±4.9 years, among them there were 65 (32%) men and 140 (68%) women. 46 patients (22.4%) were diagnosed with ACS with ST-segment elevation (ST-ACS), and 159 (77.6%) – ACS without ST-segment elevation (NST-ACS). Comorbidity index (CCI) was calculated. The immediate results of treatment were assessed during the period of hospitalization, and the long-term results of treatment were assessed 6 months after the patient was discharged from the hospital by phone calls and/or clinic visits.

Results. Interventional treatment was performed in 42% of cases (n=86). Percutaneous coronary intervention (PCI) was performed in 69.6% of patients with ST-ACS, and in 32% of patients with NST-ACS. The average CCI was 7.9 points, for men – 7.6 points, for women – 8.04 points. A higher CCI was noted in the group of patients with ST-ACS, which was 8.1, compared with the group of NST-ACS, where the average value in the group was 7.1 ($p < 0.01$). The group of patients with the invasive strategy noted a lower CCI of 7.2 compared with patients without PCI, where the mean CCI was 8.2 ($p < 0.05$), patients with ST-ACS in the same groups also noted a statistically significant difference CCI values of 7.4 and 8.4, respectively ($p < 0.05$). The average CCI among patients who died in hospital was 8.5, and among discharged patients - 7.6 points ($p < 0.01$). After 6 months from the onset of the disease, 13 patients (6.3%) died, their average age was 84.9 years, the mean CCI value in this group was 9 points, PCI was performed in 3 (23%) patients.

Conclusion. Elderly patients with ACS have a significant severity of comorbid pathology, which was assessed using the CCI. The CCI value is correlated with the failure to perform PCI in elderly patients with ACS in real clinical practice. Senile patients with NST-ACS have a higher CCI value compared to patients with ST-ACS, which significantly correlates with their failure to perform PCI. In patients who died in hospital and after 6 months from the development of ACS, there are higher CCI values in comparison with other elderly patients with ACS.

Key words: acute coronary syndrome, elderly, comorbid conditions, percutaneous coronary intervention, comorbidity index.

For citation: Gilyarov M.Y., Konstantinova E.V., Atabegashvili M.R., Solntseva T.D., Anichkov D.A., Kostina A.N., Polybin R.V., Udovichenko A.E., Svet A.V. Comorbidity and Percutaneous Coronary Intervention in Elderly Patients with Acute Coronary Syndrome. *Rational Pharmacotherapy in Cardiology* 2021;11(1):221-227. DOI:10.20996/1819-6446-2021-04-10.

*Corresponding Author: katekons@mail.ru

Received: 17.12.2020
Accepted: 15.01.2021

Introduction

The demographic processes observed in recent years are accompanied by an increase in the number of elderly patients, including among patients with acute coronary syndrome (ACS) [1]. The importance of comorbid pathology, which can affect the course of the disease and treatment tactics, naturally increases with age [2,3]. Tools are needed to assess comorbid pathology and its impact on the course of the disease [4]. The M. Charlson Comorbidity Index (CCI – Charlson Comorbidity Index) is a scoring scale that has been repeatedly tested and validated in clinical studies with different patient populations [5-7].

The invasive strategy is preferable for patients with ACS regardless of age in accordance with the current clinical guidelines, which are based on the data of randomized trials [8-10]. An example of a clinical study of elderly patients with ACS that confirmed the advantages of an invasive strategy is the After Eighty study (all included patients were 80 years of age and older), but almost 90% of patients after screening were not included in the study for various reasons, including the presence of concomitant pathology [11].

The purpose of this study is to assess the severity of comorbid conditions in elderly patients with ACS and to analyze the subgroups identified depending on the treatment strategy of patients in the daily work of the regional vascular center (RVC).

Material and methods

The prospective study included 205 patients aged 75 years and older, who were consecutively hospitalized in the Moscow City Clinical Hospital №1 named after N.I. Pirogov for the period from March to September 2018.

Percutaneous coronary interventions (PCI) were performed using a Toshiba Infinix CC angiographic device. Doctors (cardiologists, resuscitators, and vascular surgeons) made decisions about performing PCI as part of their daily clinical practice.

Patients were included in the study sequentially in the presence of a confirmed diagnosis of ACS and the signing of an informed consent to participate in the study, which was approved by the local Ethics Committee.

The clinical and demographic characteristics of the patients included in the study are presented in Table 1.

Data on comorbid conditions were obtained on the basis of history, physical examination and analysis of medical records.

The Comorbidity Index (CCI) was chosen as a tool for assessing comorbidity, covering a wide and varied spectrum of medical conditions. The points corresponding to concomitant diseases were summed up when calculating it, and 1 point is added for every 10 years of life [5].

The immediate results of treatment were assessed during the period of hospitalization, long-term results of treatment were assessed 6 months after the patient was discharged from the hospital by phone calls and/or clinic visits for the development of such events as: death from cardiovascular diseases, repeated admission to the hospital for ACS , stable condition of the patient (absence of repeated hospitalizations and/or visits to a doctor due to a worsening of the course of the disease).

The data were statistically processed using the IBM SPSS Statistics 22 and EpiInfo 7.2 programs. Average values are presented as M±SD. Confidence intervals with 95% confidence level (95% CI) calculated by the exact Clopper-Pearson method. Chi-square test or Fisher's exact test was used to identify associations between qualitative characteristics, odds ratio (OR) was used to quantify association associations. Spearman's rank correlation coefficient was used to assess the relationship between quantitative indicators. Logistic regression was used to assess the relationship between PCI failure and nervous system complications. The results were considered statistically significant at $p<0.05$.

Results

Performing PCI

Interventional treatment was carried out in 42% of cases (n=86) among 205 elderly patients included in the study. Revascularization was performed in ST-ACS patients more often than in the NST-ACS group (32 [69.6%] versus 54 [34%]; $p<0.01$).

Comorbidity index

The mean CCI value in 205 patients with ACS included in the study was 7.9 points (7.6 points in men, 8.04 points in women), in patients with ST-ACS 6.6 points were in men, 7.3 points was in

Table 1. Main characteristics of patients included in the study (n=205)

Parameter	Value
Age, years	81,6±4,9
Female, n (%)	140 (68,3)
Arterial hypertension, n (%)	179 (87,3)
Diabetes, n (%)	74 (36,1)
Atrial fibrillation, n (%)	72 (35,1)
History of myocardial infarction, n (%)	114 (55,6)
History of acute cerebrovascular accident, n (%)	64 (31,2)
Chronic kidney disease, stage C3a or more, n (%)	114 (55,6)
Anemia, n (%)	78 (38)
ST-ACS, n (%)	46 (22,4)
NST-ACS, n (%)	159 (77,6)

Data are presented as M±SD, unless otherwise indicated

ST-ACS – acute coronary syndrome with ST-segment elevation, NST-ACS – acute coronary syndrome without ST-segment elevation

women (p>0.05), in patients with NST-ACS 7.6 and 8.1 (p>0.05) points were respectively.

NST-ACS patients had a higher CCI in comparison with the ST-ACS group (8.1 versus 7.1; p <0.01). The comorbidity index was ⩾11 with the maximum possible value (14) among patients with NSTE-ACS in 28 (51.9%) cases.

The severity of comorbidity in terms of CCI was statistically significantly lower in patients with PCI, both in the general cohort of examined elderly patients with ACS and in the NST-ACS subgroup (Fig. 1). Among patients with NST-ACS, revascularization was performed less frequently in patients with a higher CCI (95% CI 1.04-1.35, p<0.05).

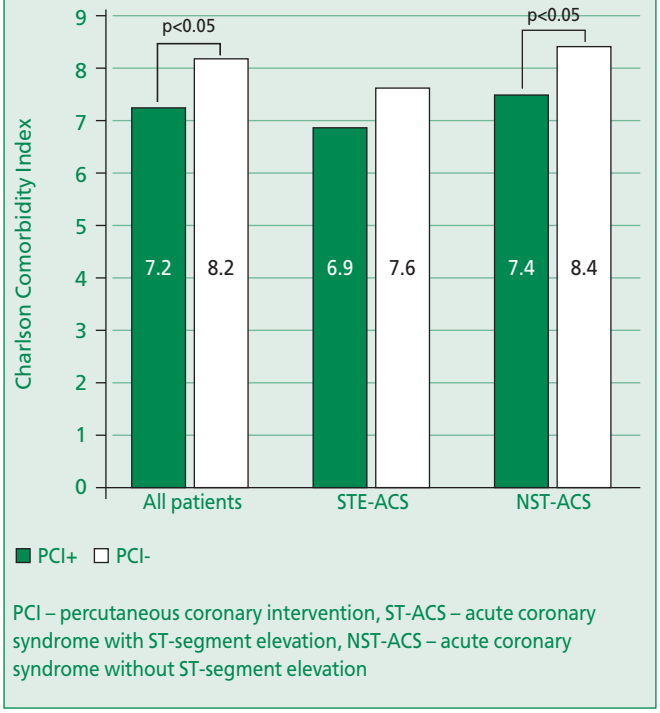
A connection only with the presence of cerebrovascular pathology in a patient with logistic regression was established when assessing the association of non-PCI with various factors, in particular, a history of stroke (OR 2.483, 95% CI 1.31-4.7, p<0.01) and the presence of cognitive impairments (OR 2.036, 95% CI 1.13-3.63, p<0.01). There were no significant correlations with the fact of performing PCI for the other diseases isolated separately, and the most common among them turned out to be peptic ulcer disease, which occurred in 66% of patients without PCI.

Disease outcome, PCI performance and comorbidity index value in different subgroups

Death in the hospital occurred in 20 patients (9.8%) among the patients included in the study. The average age of the deceased patients was 84.6 years, which was significantly more than the average for all patients discharged from the hospital during this hospitalization (81.4 years; p <0.05).

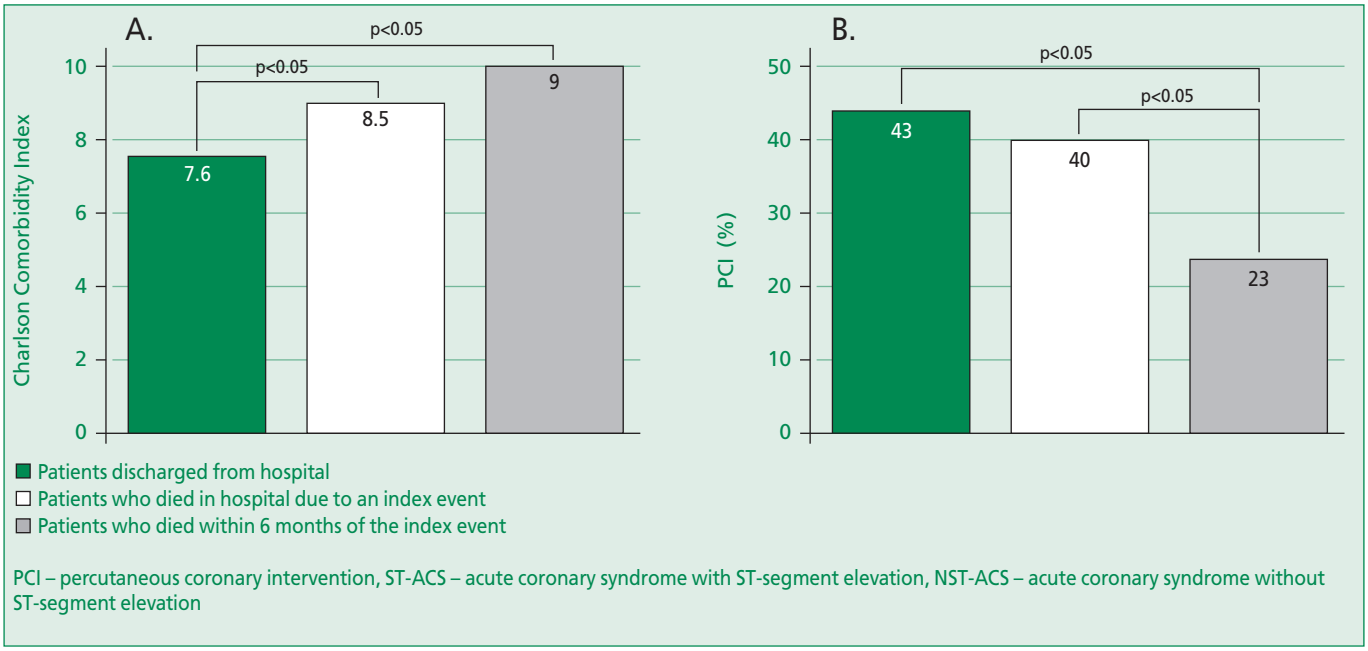
The mean CCI among inpatient deaths was higher than in hospital discharges (Fig. 2A). Among patients who died within six months of the index event, PCI was performed less frequently compared to all other patients included in the study (Fig. 2B). The incidence of PCI among patients who died in the hospital during this hospitalization was comparable to that in those discharged from the hospital (Fig. 2B) and in general among all patients included in the study (43%).

Revascularization was performed 7.3 times more often (p<0.01) among elderly patients with ST-ACS who were discharged from the hospital with an index event, compared with patients with ST-ACS who died in the hospital in this hospitalization. The relationship between revascularization and CCI value was absent among patients who died in the hospital in this hospitalization, both in NST-ACS and ST-ACS.



PCI – percutaneous coronary intervention, ST-ACS – acute coronary syndrome with ST-segment elevation, NST-ACS – acute coronary syndrome without ST-segment elevation

Figure 1. Charlson Comorbidity Index in ST-ACS and NST-ACS groups depending on the PCI strategy



PCI – percutaneous coronary intervention, ST-ACS – acute coronary syndrome with ST-segment elevation, NST-ACS – acute coronary syndrome without ST-segment elevation

Figure 2. Charlson Comorbidity Index (A) and frequency of percutaneous coronary intervention (B) in elderly patients with ACS, depending on outcomes

In the group of patients discharged from the hospital, the performance of revascularization was inversely correlated with the CCI value (OR 0.805, 95% CI 0.671-0.966, p <0.05), which was statistically significant for patients with NST-ACS (OR 0.857, 95% CI 0.763- 0.963, p<0.01), but was not significant in the ST-ACS group.

13 patients (6.3%) died 6 months after the onset of the disease, their average age was 84.9 years, the mean CCI value in this group was 9 points, PCI was performed in 3 (23%) patients.

Discussion

In recent years, the number of elderly people has been increasing, including among patients with ACS, for whom age is the leading factor in poor outcomes [1,2,8-10]. Geriatric syndromes, expressed in varying degrees, including comorbidity, are inherent in the population of elderly patients.

The strategy of interventional treatment of ACS is optimal in patients with ST-ACS and takes an increasingly important place in the treatment of patients with NST-ACS [8-10]. However, there are no unequivocal recommendations for elderly patients, especially if they have geriatric syndromes [8,12].

According to the literature, the frequency of PCI in patients with ACS of old age is significantly lower than in general in patients with ACS not only in real clinical practice, but also in specially organized randomized trials [11,13-15]. For example, in the above-mentioned study by N. Tegn [11], the advantages of an invasive strategy for treating patients aged 80 years and older with NST-ACS were shown in comparison with a conservative strategy. However, we can assume that these data can't be interpolated for the entire given age population. In this study, 4187 patients with ACS were screened, but a total of 457 patients were randomized; 3730 patients were not included in the study for various reasons, including various comorbid pathologies [11].

In our study, interventional treatment was performed in 42% of cases in hospitalized patients aged 75 years and older with ACS, which is less than the frequency of revascularization performed in the Russian RECORD-3 registry (47%), the average age of patients in this registry was 62 years [16]. The proportion of patients aged 75 years and older was 24% in the registry [17]. At the time of this writing, data on the subanalysis of treatment of elderly patients have not been published, so we were unable to make appropriate comparisons.

A pronounced influence on the tactics of treating a patient in old age can be exerted by the severity of comorbid pathology, the assessment tools of which

are comorbidity indices, but many of them are laborious and redundant, which makes it difficult to use them in real clinical practice [4]. The CCI index is currently the most widely used, as it has been validated in many studies on different patient populations, including patients with ACS [6,7].

In our study, the mean CCI value was 7.9 among the included elderly patients with ACS, which exceeds similar indicators in recently published foreign studies [6,18]. The CCI values we obtained indicate a significantly pronounced comorbidity in elderly patients with ACS in the daily work of the Moscow regional vascular center, which is probably reflected not only in the choice of treatment tactics, but also in the outcome of the disease.

It's known that in the population of patients with ACS of any age, women in comparison with men are relatively more often admitted to the Moscow regional center with an atypical clinical picture of the disease and greater comorbidity [19, 20]. In our study, there were slightly higher CCI values in women compared to men, regardless of the type of ACS. It turns out that gender differences in the presence of comorbidity become less pronounced, regardless of the type of ACS, in elderly people, however, further research is necessary to confirm these results.

In our study, the CCI value was significantly higher in elderly patients with NST-ACS compared with ST-ACS. If we consider the population of patients with ACS of any age, we will find that NST-ACS patients are more likely to suffer from underlying and concomitant diseases. For example, this was demonstrated in a large Italian study "BLITZ 4 Qualita", which included 5854 patients with ST-ACS and 5852 patients with NST-ACS [21]. Our findings correlate with the data from the Spanish registry of patients with acute myocardial infarction conducted by J.E. Nunez et al. [22]. The authors demonstrated that the higher the CCI value was, the lower the number of patients with ST-ACS was. The average age of the examined patients in this registry was 68 years, with the CCI value being the highest for patients aged 65 and over.

According to our data, a higher CCI was observed in elderly patients with ACS with a non-invasive strategy. The statistical significance of the differences was noted in patients with NST-ACS, which probably reflects more stringent recommendations for revascularization in patients with ST-ACS, especially in the context of the capabilities of the Regional Vascular Center [10]. Australian study A.M. Chuang et al showed that the higher the CCI value in NST-ACS patients, the less often PCI was performed [18]. In our study, the factor most pronouncedly associated with non-PCI was the presence of cerebrovascular pathology in the patient, in particular, a history of stroke and the presence of cognitive impairments.

In the group of elderly patients with ACS discharged from the hospital, revascularization was inversely correlated with the CCI value. At the same time, the frequency of revascularization was the lowest, and the CCI value was the highest in patients who died within 6 months after the development of the index event.

Sanchis J. et al. conducted a randomized clinical study comparing the results of an invasive approach and a conservative strategy in comorbid elderly patients with NST-ACS [23]. The invasive strategy was shown to be advantageous in the short term - within three months after the event, but with a long follow-up period (2.5 years), the group of elderly patients with the invasive strategy did not observe a decrease in mortality and recurrent ischemic events compared with the conservative treatment group.

We can assume that the pronounced comorbid pathology not only influences the failure to perform PCI in improving the short-term prognosis, but this pathology itself affects the elderly patient with ACS.

Elderly patients and severe comorbid pathology are the most frequent «exclusion criteria» for enrolling patients in randomized clinical trials on which evidence-based medicine is based. Apparently, elderly patients will increasingly arouse the keen interest of researchers, since it's not yet clear whether it's possible to unconditionally extrapolate the current recommendations to these categories of patients.

Limitations of the study

A limitation of this study was the relatively small cohort of enrolled patients. The study was pilot in nature.

The study made it possible to highlight important points in the treatment of this category of patients, but the results require confirmation in further studies.

The study showed a significant effect of the presence of comorbidity in general, a history of stroke and the presence of cognitive impairments, in particular, on the performance of PCI in elderly patients with ACS in real clinical practice, which, apparently, may affect the development of special protocols for the treatment of such patients.

Conclusion

Elderly patients with ACS admitted with a diagnosis of ACS to the Moscow Regional Vascular Center have a significant severity of comorbid pathology, assessed using CCI, in comparison with patients included in published similar foreign studies, which apparently affects the indicators of treatment outcomes patients.

Elderly patients with NST-ACS have a higher CCI value compared to patients with ST-ACS, which significantly correlates with failure to perform PCI.

Treatment of elderly patients with ACS requires further study and development of specialized treatment protocols, and especially patients with cognitive impairment or previous stroke require attention.

Relationships and Activities: none.

References / Литература

1. Beard JR, Officer A, de Carvalho IA, et al. The world report on ageing and health: a policy framework for healthy ageing. Lancet. 2016;387(10033):2145-54. DOI:10.1016/S0140-6736(15)00516-4.
2. Petrosyan Y, Kuluski K, Barnsley J, Liu B, Wodchis W. Evaluating quality of overall care among older adults with diabetes with comorbidities in Ontario, Canada: a retrospective cohort study. BMJ Open. 2020;10(2):e033291. DOI:10.1136/bmjopen-2019-033291.
3. Bourgeois FT, Orenstein L, Ballakur S, et al. Exclusion of elderly people from randomized clinical trials of drugs for ischemic heart disease. J Am Geriatr Soc. 2017;65(11):2354-61. DOI:10.1111/jgs.14833.
4. Huntley AL. Measures of multimorbidity and morbidity burden for use in primary care and community settings: A Systematic review and guide. Ann Fam Med. 2012;10:134-41. DOI:10.1370/afm.1363.
5. Charlson ME, Charlson RE, Peterson JC, et al. The Charlson comorbidity index is adapted to predict costs of chronic disease in primary care patients. J Clin Epidemiol 2008;61(12):1234-40. DOI:10.1016/j.jclinepi.2008.
6. Sanchis J, Soler M, Núñez J, et al. Comorbidity assessment for mortality risk stratification in elderly patients with acute coronary syndrome. Eur J Intern Med. 2019;62:48-53. DOI:10.1016/j.ejim.2019.01.018.
7. Skvortsova NV, Kovynev IB, Khalzov KV, et al. Comorbidity and Personalized Treatment of Multiple Myeloma in Real Clinical Practice. Clinical Oncohematology. 2020;13(3):322-34 (In Russ.). DOI:10.21320/2500-2139-2020-13-3-322-334.
8. Acute coronary syndrome without ST segment elevation electrocardiogram. Russian clinical guidelines (2020). Available from: https://scardio.ru/content/Guidelines/2020/Clinic_rekom_OKS_bST.pdf (In Russ.).
9. Ibanez B, James S, Agewall S, et al 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). Eur Heart J. 2018;39:119-177. DOI:10.1093/eurheartj/ehx393.
10. Staroverov II, Shakhnovich RM, Gilyarov MYu, et al. Eurasian clinical guidelines on diagnosis and treatment of acute coronary syndrome with ST segment elevation (STEMI). Eurasian Heart Journal. 2020;1:4-77 (In Russ.). DOI:10.24411/2076-4766-2020-10001.
11. Tegn N, Abdelnoor M, Aaberge L, et al. Invasive versus conservative strategy in patients aged 80 years or older with non-ST-elevation myocardial infarction or unstable angina pectoris (After Eighty study): an open-label randomised controlled trial. Lancet. 2016;387(10023):1057-65. DOI:10.1016/S0140-6736(15)01166-6.
12. Collet JP, Thiele H., Barbato E, et al. 2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. Eur Heart J. 2021;42(14):1289-1367. DOI:10.1093/eurheartj/ehaa575.
13. Kim JY, Jeong MH, Choi YW, et al. Korea Acute Myocardial Infarction Registry Investigators. Temporal trends and in-hospital outcomes of primary percutaneous coronary intervention in nonagenarians with ST-segment elevation myocardial infarction. Korean J Intern Med. 2015;30:821-8. DOI:10.3904/kjim.2015.30.6.821.
14. Schoenenberger AW, Radovanovic D, Windecker S, et al. AMIS Plus Investigators. Temporal trends in the treatment and outcomes of elderly patients with acute coronary syndrome. Eur Heart J. 2016;37:1304-11. DOI:10.1093/eurheartj/ehv698.
15. Numasawa Y, Inohara T, Ishii H et al. Comparison of Outcomes After Percutaneous Coronary Intervention in Elderly Patients, Including 10 628 Nonagenarians: Insights From a Japanese Nationwide Registry (J-PCI Registry). J Am Heart Assoc. 2019;8:e011017. DOI:10.1161/JAHA.118.011017.
16. Barbarash OL, Kashtalap VV, Kochergina AM, et al. Management of patients with ST-segment elevation acute coronary syndrome in interventional cardiology units: RECORD-3 registry data. Fundamrntal and Clinical Medicine. 2016;1(3):6-13 (In Russ.).
17. Erlikh A, Gratsiansky N. Registry of Acute Coronary Syndromes «RECORD-3». Characteristics of Patients and Treatment During Initial Hospitalization. Kardiologiia. 2016;56(4):16-24 (In Russ.). DOI:10.18565/cardio.2016.4.16-24.
18. Chuang AM, Hancock DG, Halabi A, et al. Invasive management of acute coronary syndrome: interaction with competing risks. Int J Cardiol. 2018;269:13-8. DOI:10.1016/j.ijcard.2018.07.078.
19. Barbarash OL, Kashtalap VV, Bykova IS, et al. Gender specifics of clinical course and in-patient stage of management in ST elevation acute coronary syndrome patients (by the Russian registry of acute coronary syndrome "RECORD-3"). Russian Journal of Cardiology. 2017;6:122-31 (In Russ.). DOI:10.15829/1560-4071-2017-6-122-131.
20. Stahli BE, Gebhard C, Yonekawa K, et al. Gender-Related Differences in Patients Presenting with Suspected Acute Coronary Syndromes: Clinical Presentation, Biomarkers and Diagnosis. Cardiology. 2015;132:189-98. DOI:10.1159/000435908.
21. Olivari Z, Steffenino G, Savonitto S, et al. The management of acute myocardial infarction in the cardiological intensive care units in Italy: the 'BLITZ 4 Qualità' campaign for performance measurement and quality improvement. Eur Heart J Acute Cardiovasc Care. 2012;1(2):143-52. DOI:10.1177/2048872612450520.
22. Nunez J, Nunez E, Facila L, et al. Prognostic value of Charlson Comorbidity Index at 30 days and 1 year after acute myocardial infarction. Rev Esp Cardiol. 2004;57(9):842-9. DOI:10.1016/s1885-5857(06)60649-x.
23. Sanchis J, Nunez E, Barrabes JA, et al. Randomized comparison between the invasive and conservative strategies in comorbid elderly patients with non-ST elevation myocardial infarction. Eur J Intern Med. 2016;35:89-94. DOI:10.1016/j.ejim.2016.07.003.

About the Authors/Сведения об авторах:
Mikhail Yu. Gilyarov
eLibrary SPIN 7713-6726, ORCID 0000-0002-2870-3301
Ekaterina V. Konstantinova
eLibrary SPIN 3156-9983, ORCID 0000-0003-4918-3795
Maria R. Atabegashvili
eLibrary SPIN 4975-1866, ORCID 0000-0002-2420-6543
Tatiana D. Solnceva
eLibrary SPIN 6073-1072, ORCID 0000-0002-7381-7818
Dmitrii A. Anichkov
eLibrary SPIN 2891-6763, ORCID 0000-0001-5610-4819
Roman V. Polibin
eLibrary SPIN 1831-0444, ORCID 0000-0003-4146-4787
Anna N. Kostina
eLibrary SPIN 4064-5691, ORCID 0000-0002-7625-5697
Anna E. Udovichenko
eLibrary SPIN 5135-0453, ORCID 0000-0002-4627-3499
Alexey V. Svet
eLibrary SPIN 3401-5653, ORCID 0000-0002-2278-7292