INTRODUCTION
The current paradigm of cardiovascular disease management, including myocardial infarction, emphasizes the importance of risk assessment when making decisions about their prevention and treatment [1]. The study of predictors of the risk of developing cardiovascular diseases and their prevention is the main focus of the modern health care system [2-10]. The combination of individual predictors in one patient creates a multiplier effect and increases the risk of death from diseases of the circulatory system by a factor of 5 to 7 [11]. The results of 18 cohort studies conducted in the United States show that only 3% of people aged 55 have the optimal level of risk factors [12].

Global, national, regional initiatives, programs, strategies for reducing the medical, economic and social burden of myocardial infarction are being introduced in the world. One of their components is the introduction of optimal treatment methods and a reduction in the length of inpatient treatment for myocardial infarction (MI) patients.

THE AIM
The aim was to study the impact of predictors on the duration of inpatient treatment of MI patients.

MATERIALS AND METHODS
We copied data of 462 inpatient medical records of myocardial infarction patients who underwent hospital treatment by different methods (coronary artery stenting, thrombolytic therapy, conventional drug therapy). We determined basic predictors and duration of inpatient treatment of MI patients. Impact of the parameters was studied using Cox regression.

RESULTS
Groups of MI patients with different treatments were significantly different by age. Regression analysis with a single predictor – patient’s age – showed that it increases the treatment duration by 19.0% (Figure 1).

In-depth analysis of age groups found that age reduces, with statistical significance, the hospital treatment duration by 35% in the second group, and increases by 26% in the third group (Table I).

Aggregate curves that characterize the impact of age groups on the duration of in-patient treatment for MI patients suggest that patients under the age of 44 are least likely to be hospitalized (up to 15 bed-days), and an increase in age leads to prolonged treatment especially in patients over 60 (Figures 2, 3).

The analysis showed that the age of patients significantly affects the increase in treatment duration regardless of the chosen treatment and can be a confounder in treatment of myocardial infarction patients.
IMPACT OF CERTAIN PUBLIC HEALTH FACTORS ON THE DURATION OF INPATIENT TREATMENT OF MI PATIENTS

**Fig. 1.** Impact of age of MI patients on the duration of inpatient treatment

**Fig. 2.** Impact of age groups of myocardial infarction patients on the duration of hospital stay (Age=1 – up to 44, Age=2 – 45-59, Age=3 – over 60)

**Fig. 3.** Impact of age of MI patients over 60 on the duration of hospital stay (Age3=1 – over 60, Age3=0 – other age groups)
We studied the main risk factors of development of MI and analyzed them as variables in regression analysis. Namely, tobacco smoking (HR=0.89, [95% CI 0.67-1.18], p=0.421), family history of CVD burden (HR=1.22, [95% CI 0.91-1.64], p=0.193), atrial fibrillation (HR=0.88, [95% CI 0.56-1.38], p=0.579), preinfarction angina pectoris (HR=0.83, [95% CI 0.65-1.07], p=0.150) do not have a statistically significant effect on the treatment duration.

Social status of MI patients (HR=0.97, [95% CI 0.90-1.05], p=0.447) also has no statistically significant effect on the treatment duration.

According to the Unified Clinical Protocol, MI patients must be delivered to ICU or specialized department within the first 12 hours of MI onset. Given the heterogeneity of the groups regarding the treatment methods for this parameter, this predictor was studied using the Cox regression method. Our analysis did not reveal any statistically significant effect of hospitalization timing on treatment duration, regardless of the treatment method, both up to 2 hours (HR=0.92, [95% CI 0.83-1.03], p=0.144) and up to 12 years (HR=1.19, [95% CI 0.91-1.55], p=0.202) from the onset of the disease.

The next predictor was clinical features, depending on localization and spread of the area of ischemia and necrosis as well as the presence of relapsing MI. Patients usually have relapsing MI with the development of a more severe clinical presentation and complications. 20.5% of the patients we examined had a relapsing myocardial infarction. Regression analysis did not reveal a statistically significant correlation between clinical symptoms and duration of inpatient treatment, both generally and in individual symptom-complexes (Table II).

Comorbid pathology significantly complicates the course of MI (Type 2 diabetes) and contributes to its development (essential hypertension). However, treatment duration is not significantly affected by the presence of Type 2 diabetes (HR=0.94, [95% CI 0.72-1.23], p=0.655).

According to our research, EH is diagnosed in 77.1% of MI patients. The Cox regression analysis found no statistically significant impact of the presence of EH (HR=0.97, [95% CI 0.74-1.28], p=0.834) and its duration (HR=0.94, [95% CI 0.85 -1.04], p=0.215) on MI patients’ treatment duration.

More detailed analysis of the course (presence of hypertensive crises) and severity (level of arterial hypertension) of EH showed no statistically significant effect on patients’ stay in the hospital (Table III).

Another important factor that affects the course of EH is the use of antihypertensive therapy. According to our research, less than half (48%) of patients with EH take antihypertensive drugs regularly, others remain under increased risk of complications and aggravation of EH course. However, the Cox regression analysis did not reveal a statistically significant correlation between the use of antihypertensive therapy in MI patients with concomitant EH and duration of inpatient treatment (Table IV).

Therefore, the comorbidity of MI patients does not affect treatment duration.

An important clinical prognostic syndrome is the presence of heart failure, depending on its degree. The analysis of this predictor showed a statistically significant increase in the treatment duration by 22.0% (p=0.026) at heart failure Stage 2A (Figure 4) compared with heart failure stage 1.

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### Table I. Impact of age of MI patients on the duration of inpatient treatment by different treatment methods

<table>
<thead>
<tr>
<th>Age groups</th>
<th>HR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 44</td>
<td>1.10</td>
<td>0.61-1.96</td>
<td>0.758</td>
</tr>
<tr>
<td>45-59</td>
<td>1.35</td>
<td>1.05-1.72</td>
<td>0.018</td>
</tr>
<tr>
<td>over 60</td>
<td>0.74</td>
<td>0.59-0.95</td>
<td>0.016</td>
</tr>
</tbody>
</table>

### Table II. Impact of localization and depth of heart muscle damage in MI patients on duration of inpatient treatment by different treatment methods

<table>
<thead>
<tr>
<th>Indicator</th>
<th>HR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertensive crisis</td>
<td>0.97</td>
<td>0.67-1.41</td>
<td>0.885</td>
</tr>
</tbody>
</table>

### Table III. Impact of level of arterial hypertension in MI patients on duration of inpatient treatment by different treatment methods

<table>
<thead>
<tr>
<th>Indicator</th>
<th>HR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of AH</td>
<td>1.24</td>
<td>0.94-1.63</td>
<td>0.134</td>
</tr>
<tr>
<td>incl.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 1</td>
<td>1.04</td>
<td>0.75-1.45</td>
<td>0.805</td>
</tr>
<tr>
<td>Level 2</td>
<td>0.81</td>
<td>0.62-1.05</td>
<td>0.117</td>
</tr>
<tr>
<td>Hypertensive crisis</td>
<td>1.06</td>
<td>0.94-1.19</td>
<td>0.361</td>
</tr>
<tr>
<td>- regularly</td>
<td>0.85</td>
<td>0.65-1.10</td>
<td>0.214</td>
</tr>
<tr>
<td>- irregularly</td>
<td>1.05</td>
<td>0.80-1.39</td>
<td>0.713</td>
</tr>
<tr>
<td>- no therapy</td>
<td>1.22</td>
<td>0.88-1.70</td>
<td>0.234</td>
</tr>
</tbody>
</table>

### Table IV. Effect of taking antihypertensive drugs in patients with MI and hypertension on duration of inpatient treatment by different treatment methods

<table>
<thead>
<tr>
<th>Indicator</th>
<th>HR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taking antihypertensive therapy:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- regularly</td>
<td>0.85</td>
<td>0.65-1.10</td>
<td>0.214</td>
</tr>
<tr>
<td>- irregularly</td>
<td>1.05</td>
<td>0.80-1.39</td>
<td>0.713</td>
</tr>
<tr>
<td>- no therapy</td>
<td>1.22</td>
<td>0.88-1.70</td>
<td>0.234</td>
</tr>
</tbody>
</table>
Fig. 4. Effect of heart failure Stage 2A on the duration of stay of MI patients on inpatient treatment.

Fig. 5. Impact of heart failure Stage 1 and 2 on duration of inpatient treatment of MI patients (CH23=0 – heart failure Stage 1, CH23=1 – heart failure Stage 2A-2B).

Fig. 6. Impact of sex on inpatient treatment duration of MI patients (sex=1 – men, sex=0 – women).
The comparison of effects of heart failure Stage 2A and 2B, unlike Stage 1, shows a statistically significant increase in treatment duration by 25.0% (HR=0.75, [95% CI 0.59-0.95], p=0.015), confirmed by the regression curve (Figure 5).

Cox regression analysis revealed a statistically significant effect of sex on treatment duration – men had a 37.7% (p=0.023) shorter inpatient treatment than women (Figure 6).

Thus, the study of behavioral, social, biological and clinical predictors in MI patients showed a statistically significant impact on the increase in inpatient treatment duration of variables such as feminine sex, age over 60 and presence of heart failure Stage 2A and 2B, which can be confounders in the process of treating such patients.

**DISCUSSION**

One of the objectives of our study was to compare the effectiveness of treatment methods in MI patients. Cox regression analysis showed that the use of CAS with balloon angioplasty significantly reduced the duration of treatment duration by 25.0% (HR=0.75, [95% CI 0.59-0.95], p=0.015), confirmed by the regression curve (Figure 5).

Cox regression analysis revealed a statistically significant effect of sex on treatment duration – men had a 37.7% (p=0.023) shorter inpatient treatment than women (Figure 6).

Thus, the study of behavioral, social, biological and clinical predictors in MI patients showed a statistically significant impact on the increase in inpatient treatment duration of variables such as feminine sex, age over 60 and presence of heart failure Stage 2A and 2B, which can be confounders in the process of treating such patients.

**Table V.** Model of hazard ratios of impact of coronary artery stenting with balloon angioplasty on MI patients’ treatment duration (Model 1)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>HR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS with BAP</td>
<td>1.30</td>
<td>1.00-1.70</td>
<td>0.048</td>
</tr>
<tr>
<td>Sex</td>
<td>1.25</td>
<td>0.92-1.68</td>
<td>0.149</td>
</tr>
<tr>
<td>Heart failure</td>
<td>0.78</td>
<td>0.62-0.98</td>
<td>0.030</td>
</tr>
</tbody>
</table>

**Table VI.** Model of hazard ratios of impact of coronary artery stenting with balloon angioplasty on MI patients’ treatment duration (Model 2)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>HR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS with BAP</td>
<td>1.31</td>
<td>1.01-1.71</td>
<td>0.046</td>
</tr>
<tr>
<td>Age over 60 years old</td>
<td>0.87</td>
<td>0.67-1.13</td>
<td>0.289</td>
</tr>
<tr>
<td>Heart failure</td>
<td>0.79</td>
<td>0.62-1.00</td>
<td>0.050</td>
</tr>
</tbody>
</table>

The comparison of effects of heart failure Stage 2A and 2B, unlike Stage 1, shows a statistically significant increase in treatment duration by 25.0% (HR=0.75, [95% CI 0.59-0.95], p=0.015), confirmed by the regression curve (Figure 5).
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**Fig. 9.** Comparative analysis of the impact of sex and CAS with BAP on duration of inpatient treatment of MI patients

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**Fig. 10.** Comparative analysis of the effect of age over 60 and CAS with BAP on duration of inpatient treatment of MI patients

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**Fig. 11.** Comparative analysis of heart failure Stage 2A and 2B, and CAS with BAP on duration of inpatient treatment of MI patients

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inpatient treatment by 36.0% (HR=1.36, [95% CI 1.05-1.77]), p=0.021) compared to conventional drug therapy (Figure 7), as opposed to thrombolytic therapy where no such difference was detected (HR=0.74, [95% CI 0.46-1.19], p=0.216) (Figure 8).

To confirm the results, we built models with several predictors that have a statistically significant impact on the increase of treatment duration, and CAS with BAP.

In the analysis that included sex, age over 60 years, heart failure Stage 2A and 2B, CAS with BAP significantly reduced treatment duration (p=0.041, p=0.048, p=0.020 respectively) (Figures 9-11).

At multiple combination of variables like sex and heart failure, CAS with BAP reduced treatment duration by 30.0% (p=0.048) (Table V), age over 60 and heart failure – by 31.0% (p=0.046) (Table VI).

CONCLUSIONS
The results we obtained indicate a statistically significant effect of CAS on MI patients’ treatment duration, both separately and combined with multiple effects of confounders, indicating its medical effectiveness and the need for widespread introduction of this treatment method in medical practice in every region of Ukraine.

REFERENCES

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Conflict of interest:
The Authors declare no conflict of interest.

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