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Effective assessment model for improving capacity of diagnosis and early treatment of st-advanced miscellaneous immediate patients: The case in Vietnam

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A B S T R A C T

We conducted an initial evaluation of the effectiveness of the application of the model of capacity building for early diagnosis and treatment with PCI in STEMI patients in Nghe An to contribute to solving the problems and to be able to replicate the model. STEMI patients received PCI from 7/2018 - 8/2020 at Nghe An General Hospital. Retrospective and prospective cross-sectional study, intervention with comparison before and after intervention included 280 patients, mean age 71.9 ± 14.59 (years); men accounted for 69.3%. After implementing the model, the number of patients increased by 135%, the time of the door - the ball decreased (71.3 ± 71.8 compared to 152.29 ± 167.3 minutes), the length of hospital stays, and the mortality rate decreased significantly.

1. Introduction

Accounting for more than 30% of myocardial infarctions, ST-segment elevation myocardial infarction occurs when a coronary artery is completely blocked, leaving most of the heart muscle with insufficient blood supply. This is a serious form of heart attack that can be life-threatening. ST-Elevation myocardial infarction (STEMI)[1-3] is the most severe acute coronary syndrome, occurring when a coronary artery is completely blocked, excised, and cut. cut off blood supply to the heart. As a result, the heart muscle dies slowly without being able to repair or regenerate itself. If the heart muscle is damaged too much, this leads to a state called cardiogenic shock, which is often fatal. In addition, myocardial ischemia has the potential to cause a dangerous heartbeat (ventricular tachycardia or ventricular fibrillation), which can lead to cardiac arrest and sudden death. The disease is characterized by ST-segment elevation on the electrocardiogram and does not improve with nitroglycerin. The mechanism leading to a STEMI myocardial infarction is: (1) Atherosclerotic plaque builds up in the coronary arteries that supply blood to the heart. (2) The accumulation of atherosclerotic plaque is the cause of coronary artery stenosis. (3) When the atherosclerotic plaque ruptures, creating favorable conditions for the formation of a blood clot causes a complete blockage of the coronary artery. (4) When there is a blockage, the part of the heart muscle that is supplied with blood by that artery becomes rapidly deprived of oxygen, also known as ischemia. (5) Some heart muscle begins to die, leading to a heart attack. Some common symptoms of ST-segment elevation myocardial infarction vary from person to person. Some common symptoms include: (1) Pain around shoulder blades, arms, chest, jaw, upper abdomen. (2) Pain or feeling of heaviness around the chest area, also known as angina. (3) Sweating, shortness of breath. (4) Discomfort or heaviness in the neck/arm. (5) Indigestion, upset stomach and chest. (6) heartburn. (7) Nausea and vomiting. (8) Tired, exhausted. (9) Dizziness. (10) Fast or irregular heartbeat.

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Acute myocardial infarction with STEMI is one of the most acute emergencies. The most important treatment goal in patients with myocardial infarction with STEMI is early reperfusion to reduce mortality, length of hospital stay, and treatment costs. Primary Percutaneous coronary intervention (PPCI) may vary across regions of the world, with regard to facility conditions, technical logistics, experience of cardiovascular intervention centers, and patient characteristics[4]. The importance of prompt reperfusion in patients with STEMI is well established. If performed by experienced physicians, PPCI is the preferred method of reperfusion, with an absolute 2% reduction in mortality compared with thrombolytic therapy. However, the benefit of PPCI over fibrinolytic therapy is clearly time dependent and faster reperfusion of the culprit artery is measured, as measured by a shorter Door to Balloon Time: DBT), it is associated with reduced mortality, improved left ventricular dysfunction, reduced infarct size, etc. Reflection on adverse consequences of delay in PPCI, Heart Association The American College of Cardiology/American College of Cardiology has released guidelines for STEMI, recommending a goal of <90 min (class IA recommendation)[5-6].

There are a number of treatment methods for myocardial infarction with ST elevation such as: (1) percutaneous coronary intervention, (2) drug use, (3) coronary artery bypass surgery. When experiencing a STEMI, the patient should be taken to the hospital as soon as possible. Timely emergency treatment during the "golden hour" will increase the chance of revascularization, reduce myocardial damage and reduce the risk of sequelae after treatment. Some commonly used methods to give emergency treatment to patients with ST-segment elevation myocardial infarction are: (1) Percutaneous coronary intervention. This is a method of angiography and stenting (metal support) to re-open the blockage and restore blood flow to the heart muscle. The doctor will insert an instrument (with a balloon attached to inflate the balloon) through a peripheral blood vessel (usually the wrist or thigh) through the heart and into the damaged blood vessel. When it reaches the correct location of the blockage in the lumen, the balloon is inflated to dilate the blood vessel. The doctor can then place a stent here to keep the artery wide open, preventing a re-blockage. (2) Use of drugs. Drug therapy is an important foundational treatment along with intervention or surgery to treat myocardial infarction. These drugs are usually: (i) Beta-blockers: they work to decrease the speed at which the heart pumps blood and slow the heart rate, thereby improving irregular heartbeats and reducing damage to the heart. (ii) Statins: help lower blood cholesterol. This is important because bad cholesterol is a major component of plaque, which clogs arteries. (iii) Aspirin and antiplatelet agents: These drugs help reduce clot formation in damaged blood vessels as well as on the stent surface. (iv) Anticoagulants: also work to prevent the risk of blood clots forming.

Nitroglycerin: very effective in vasodilating (causing blood vessels to widen), thereby helping to relieve chest pain caused by blood vessel blockage. (v) Pain relievers: When the patient has severe chest pain, morphine or other pain relievers will be considered by the doctor. (3) Coronary artery bypass surgery. For severely blocked heart arteries, doctors cannot place stents and need to perform another method, which is coronary artery bypass surgery. In this procedure, a blood vessel from another part of the body is removed to replace the narrowed blood vessel. Next, the doctor creates a new path for blood through this new blood vessel, increasing blood flow to the heart.

2. Audience and methods

2.1 Audience

All patients with myocardial infarction with STEMI admitted to the hospital received percutaneous coronary intervention during the period from 7/2018 to 7/2020 at Nghe An General Friendship Hospital. The elevation of the STEMI segment in at least two contiguous leads is observed on a standard 12-lead ECG: limb leads ≥ 0.1 mV, precordial leads ≥ 0.2 mV. Excluding patients with STEMI without an indication for PCI due to another objective cause, patients without acute myocardial infarction (MI) such as diabetic patients with suspected pericarditis, myocarditis, pulmonary embolism.

3. Methods

Retrospective and prospective cross-sectional descriptive study, intervention with comparison before and after intervention. Convenience sampling with the number of STEMI patients appearing during 7/2018 - 7/2020. Sampling criteria were all patients with confirmed MI with STEMI who agreed to participate in the study with coronary angiography and coronary stenting. The subjects in our study were selected in chronological order, regardless of age, sex as well as hemodynamic status at hospital admission.

2.1. The methods of DiD (Difference in Differences)

This method is also known as the double difference (DiD) method [World bank, 2010], which is increasingly widely used in studies of analyzing the effectiveness of policy effects. Difference-within-difference DiD is a way to estimate the impact of new policies. To use diff-in-diff, we need the observed results of intervention (treated) and non-intervention (control) exposure, both before and after intervention. Estimating the difference in difference is a common method in natural experimentation.

Essentially, DiD compared the control and effect groups based on differences in outcomes for each observation period. Specifically, after the initial survey of both nonparticipants and (subsequent) participants, a follow-up survey of both groups after the impact could be carried out. From this information, the difference between the median outcomes observed in the control and control groups before and after the program action was calculated.

Differences of difference is a statistical technique used in econometrics and quantitative research in the social sciences

that attempts to mimic an experimental research design using significant research data. observed, by investigating the differential effect of a treatment on a "treatment group" and on a "control group" in a natural experiment. It measures the impact of a treatment (i.e an. independent or explanatory variable) on an outcome (i.e., a dependent or response variable) by calculating the mean change over duration of the outcome variable for the treatment group with mean change over time for the control group. Even though it is intended to minimize the effects of outliers and selection bias, depending on the way of selecting the treatment group, this approach may still be subject to certain biases, e.g. median regression mean, inverse causality and variable bias are ignored. In respect to time series estimates of treatment effect across subjects (analysis of differences over time) or cross-sectional estimates of treatment effects (measurement of differences between control and treatment groups). Difference in difference requires data to be measured from a control group and a treatment group at least different time periods, namely at least one period before "treatment" and at least one period of time after "treatment".

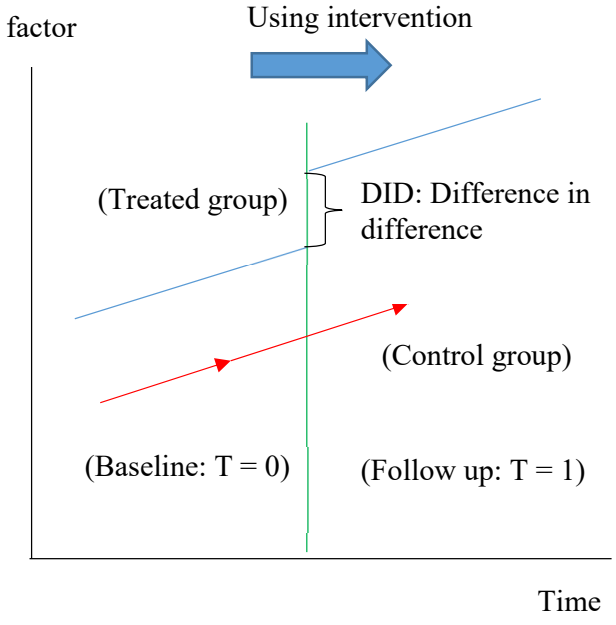

Fig. 1. The proposed study

Source: Authors' compilation

The advantage of DiD is that it reduces the assumption of a conditional extrapolation or selection of observed features, and provides an intuitive, easy-to-use method for calculating the selection of features. not observed. However, a major drawback also lies in this assumption: the concept of constant selection error over time is unwarranted for many target programs in developing countries. The statistical representation of the expression that computes the double difference is:

$$\mathrm{DD} = E\left(Y_1^T - Y_0^T \middle| T_1 = 1\right) - E\left(Y_1^C - Y_0^C \middle| T_1 = 0\right) \quad (1)$$

$$E\left(Y_1^T - Y_0^T \middle| T_1 = 1\right) = \left(\alpha + \mathrm{DD} + \rho + \gamma\right) - \left(\alpha + \rho\right) \quad (2)$$

$$E\left(Y_1^C - Y_0^C \middle| T_1 = 0\right) = \left(\alpha + \gamma\right) - \alpha \quad (3)$$

$$\mathrm{outcome\_var}_i = \beta_0 + \beta_1 * \mathrm{period}_i + \beta_2 * \mathrm{treated}_i + \varepsilon_i \quad (4)$$

2.2. Research indicators

Research information and indicators:

+ Total number of STEMI patients treated, mean age, sex.

+ Rate of patients with fatal or severe STEMI returning home.

+ Time of hospital transfer (if the patient is transferred)

+ Time from patient admission to diagnosis of STEMI

+ Time from diagnosis of STEMI to intervention

+ Total ball door time

+ Factors related to intervention time, if any: administrative procedures, patient and family consent...

+ Length of hospital stay

2.3. Research process

The subjects were divided into 2 groups based on time before and after implementing the capacity improvement model for early diagnosis and treatment of STEMI patients in Nghe An.

Step 1: Collecting data of STEMI patients undergoing percutaneous coronary intervention at Nghe An General Hospital in 1 year 7/2018-7/2019. Exploring the factors affecting PCI delay time in patients with STEMI[3].

Step 2: Build a model to shorten the time of myocardial ischemia.

Step 3: Deploy the model[7]

Step 4: Collect data during and after model deployment. Evaluate the model on how it works and how effective it is. Finalize the model and apply it on a large scale[8].

2.4. Data processing methods

- Qualitative variables are presented as percentages, quantitative variables are presented as mean ± standard deviation. Compare mean values using T-student tests, compare % values with $\chi 2$ test. The difference was statistically significant when $p < 0.05$.

- Research results are presented in the form of tables, graphs, mean ± standard deviation.

2.5. Time and place of study

Data collection time from 7/2018-8/2020

The study was carried out at the Cardiovascular Center of Nghe An Friendship General Hospital. Nghe An General Friendship Hospital was established, and the hospital now supports thousands of patients each year; with a capacity of more than 1300 beds for patients to examine and treat. Currently, the hospital has specialties such as: Department of Gastroenterology, Obstetrics - Gynecology, Kidney, Urology, Nutrition and Dietetics, Musculoskeletal - Joint, General, Ear - Nose - Throat, Neurology, Endocrinology, Cardiology and Diagnostic Imaging. At the same time, it is the cooperation of a team of doctors and medical staff who have a lot of experience, good expertise and are always enthusiastic in medical examination and treatment. Especially, the hospital is invested with a system of modern and high-tech medical equipment to support the diagnosis and treatment of diseases more effectively. Thanks to that, the people in Vinh city, Nghe An and neighboring localities of Vietnam always believe in choosing the hospital as a place for medical examination and treatment. In which, the cardiovascular department was established in 1991. The initial equipment was very rudimentary, with only 1 ECG machine and 1 needing aid from Poland. Examination, treatment and consultation of cardiovascular diseases such as: (1) Coronary artery disease: (i) Treatment of myocardial infarction with coronary stenting; (ii) Treatment of stable and unstable angina with medical therapy and coronary stenting. (2) Hypertension and its complications. (3) Heart failure. (4) Chronic Heart Disease. (5) Arterial pathology. (6) Congenital heart disease. (7) Heart valve disease and complications.

3. Research ethics

- Subjects voluntarily participated in the study and kept confidential information.

- This study does not aggravate the situation and is only intended to serve the patient's health, public health, and does not violate social ethics.

- The study was approved by the Biomedical Research Ethics Council (IRB) on February 14, 2019, the research ethics approval letter No. NCS15/BB-HDĐD.

4. Study overview

Acute ST-elevation myocardial infarction (STEMI) is a matter of medical interest and an interesting topic of research. Timothy et al.[9] analyzed the relationship between soluble ST2 segment and infarct site within 12 hours to 24 hours in STEMI. Patients with STEMI with 12–24 h onset of angina were included in the study. An exclusion criteria were patients with AMI in addition to STEMI and other potential confounders affecting sST2 levels. Serum sST2 was collected during the first medical exposure upon admission to the emergency unit. Patients were divided into anterior STEMI and anterior STEMI. Levels of sST2 were compared using demographic data, laboratory and clinical variables using t-test of Student's. The correlation of sST2 levels was analyzed using Spearman's correlation coefficient. Experimental results confirmed that

sST2 was not related to the site of infarct within 12–24 h of the onset of STEMI. This result suggests that the site of the infarct may not be responsible for the increase in serum sST2 levels during the acute phase of STEMI.

Bradshaw et al.[10] suggested that when a patient with ST-segment elevation (STE) and chest pain presents to the emergency department and physicians who must quickly make a decision if to prepare the cardiac catheterization team or consider other diagnoses other than STEMI. The differential diagnosis of ST segment elevation involves STEMI, early repolarization, pericarditis, cardiomyopathy such as myocarditis or Takotsubo cardiomyopathy, STE secondary to conduction system abnormalities. Step 2 in this study concurs with Bradshaw et al.[10]. Meanwhile, Gibson et al.[11] asserted that in spite of successful primary percutaneous coronary intervention (PCI) for the treatment of STEMI, myocardial salvage often results in overstimulation leading to massive infarction with a high rate of myocardial infarction increased rates of heart failure and death. Postprocedural microvascular dysfunction frequently occurs and contributes directly to low outcomes in STEMI. Intermittent coronary sinus occlusion (PICSO) is a traditional technology created to minimize microvascular dysfunction in STEMI. Non-randomized studies have promoted that the use of PICSO in primary PCI in STEMI is quite safe, enhances microvascular perfusion, and decreases infarct size. Randomized experiences are being carried out to study the safety and efficacy of PICSO in high-risk patients with STEMI prior to undertaking primary PCI.

Discussing the incidence and prognostic impact of mitral annulus detachment on patients with STEMI – A cardiac magnetic resonance investigation, Troger et al.[12] confirmed mitral annular detachment (MAD) proposes the separation of the hinge point of the mitral leaflet from the ventricular muscle. Its role in patients with STEMI is unknown. The authors focused on the generality of cardiac magnetic resonance imaging (CMR) MAD in patients with STEMI and its association with serious opposite outcomes. Results showed that MAD is a fairly popular findings on patients with STEMI. Patients with MAD have less serious infarct features, however, they are not more influenced by MACE. Further validation and longer follow-up intervals are needed to determine the right role of MAD in patients with STEMI.

On the other hand, regarding the impact of regional STEMI systems on protocol use and quality improvement initiatives in community hospitals without cardiac catheterization laboratories, Handran et al.[13] state that since 2003, the use of STEMI recommendations, agreements, and procedure orders in Minnesota hospitals without CCL has improved markedly with less than 10 percent of hospitals lacking management protocols specific STEMI. The preponderance of hospitals usually refer to patients with STEMI for initial PCI and have thorough Question & Answer procedures in place. The decline in STEMI misery in Minnesota parallels the growth of STEMI systems in the region.

Yang et al.[14] discussed the electrocardiogram (ECG) distinction between hypertrophic cardiomyopathy characterized by Pseudo-cremi and acute STEMI. The ECG profile of hypertrophic cardiomyopathy including ST segment elevation (STE) may lead to misdiagnosis of ST-segment elevation myocardial infarction (STEMI). This pseudo-cremi can bring about unnecessary treatment.

In the context of the Covid-19 pandemic, Casipit et al.[15] studied the outcome relationship between STEMI patients with Covid-19 and cardiogenic shock. The authors reviewed a sample of 22,775 patients with STEMI-CS, of which 1.71 percent were infected with covid-19. Thanks to a stepwise survey multivariable logistic regression model adjusted for patient and hospital confounding factors, consequent covid-19 infection in STEMI-CS patients was discovered to be a factor independent predictor of in-hospital mortality compared to patients without covid-19 (adjusted or adjusted 2.10; 95 percent confidence interval. STEMI-CS patients with consequent covid-19 infection have homogenous in-hospital exertion rates for PCI, coronary artery bypass graft (CABG) and aortic balloon pump (IABP). Renal Replacement Therapy (RRT), mechanical ventilation, and homogenous length of staying in hospital. Results confirm that covid-19 is associated with higher in-hospital temporality in patients with STEMI-associated cardiogenic shock but with homogenous use of interventions and length of staying in hospital.

In addition to the influence of Covid-19, Khdeir & Yalamanchili[16] analyzed the influence of Sars-Cov-2 on consequences in hospitalizations with STEMI. The authors carried out a retrospective cohort investigation using a national inpatient sample database during the period of 2019 and 2020. The authors used the International Classification of Diseases-10 codes to classify STEMI hospitalizations for stratification thanks to the absence or presence of SARS-CoV-2 infection. The authors use Student's t-test Chi-square in order to compare categorical and continuous variables. Multivariate regression technique was used to adjust for potential confounding factors. The empirical results showed that among STEMI hospitalizations, those with SARS-CoV-2 had higher mortality, fibrinolytic drug use, increased THG and LOS, and rates of PCI, CABG and use lower mechanical circulatory reenforce.

Research by Region, Ramakrishnan et al.[17] have shown that the rate of thrombosis to myocardial infarction (STEMI) is low in some parts of India. The authors postulate the influence of capacity building and use of a Tele ECG-based decision support system using the Hub & Spoke model of STEMI care on changes in thrombolysis rates in STEMI patients enrolled in collected districts of India. Initial results of the ACT STEMI ICMR project showed a dramatic improvement in the use of intime thrombolytic method using a health system-based interference.

In the study of genetic factors, Mohamed and Khdeir[18] suggested that familial hypercholesterolemia (FH) is a common reason for early coronary artery disease. The authors examined the influence of FH on hospital outcomes of hospitalizations due to STEMI. Using the National Inpatient Sample database during the period of 2016 and 2019, the authors carried out a cohort study. Similarly in Khdeir and Yalamanchili[16,23], the authors used the International Classification of Diseases-10 codes to classify hospitalizations with STEMI that were stratified thanks to the absence or presence of FH. Chi-square and

Student's t-test criteria were used to compare the categorical and continuous results. To adjust for confounding factors, the authors used multivariate regression analysis. Among the hospitalizations due to STEMI, who with FH had a lower in-hospital mortality rate, the authors found. Nevertheless, they had a higher rate of fibrillation or ventricular fibrillation when undertaking PCI and CABG.

5. Results and discussions

As a result, we collected 280 patients who were eligible to be included in the study, the average age was: 71.9 ± 14.59 (years), sex: 184 male patients, accounting for 69.3%; 86 female, accounting for 30.7%. We were divided into 2 groups: Group I: the group of patients admitted to the hospital before the implementation of the program had 119 people; group II: group of patients hospitalized after implementing STEMI Nghe An program has 161 people.

5.1. Characteristics between 2 groups of patients before and after implementing STEMI

Table 1. Gender and age characteristics of 2 groups of patients

	Group I (n=119)	Group II (n=161)	p
Male (n,%)	84(70.6)	110 (68.3)	>0.05
Female (n, %)	35 (29.4)	51 (31.7)	> 0.05
Average age (year)	73.08 ± 12.09	71.01 ± 16.06	0.239

After implementing STEMI Nghe An program, the number of patients increased by 135%, the mean age and sex between the two groups were not statistically significant.

5.2. Mortality rate, please come back

There were 23 patients (19.3%) who died or were seriously ill in group I, respectively 7 patients in group II (4.3%). Patients in the group before implementing STEMI Nghe An program had a significantly higher mortality rate ($p < 0.001$).

5.3. The time intervals from the time the patient was admitted to the hospital to the time the culprit coronary artery angioplasty was performed

Table 2. Time intervals from hospital admission to coronary revascularization with balloon angioplasty

Time intervals	Group I (n=119)		Group II (n=161)		*p*
	x ± SD (minute)	Median, quarter (minute)	x ± SD (minute)	Median, quarter (minute)	
From the time the patient was admitted to the hospital to the diagnosis of STEMI	19.71±25.05	11 (5 - 16)	12.03 ±12.77	10 (5 - 15)	< 0.001
Hospital transfer time	65.92±41.00	54 (31.25-90)	57.39 ±41.39	55 (25-77.5)	0.142
From diagnosis of STEMI to PCI	129.44±210.48	75.5 (110.5-50)	55.35 ±47.77	49 (68-25.5)	0.009
Time of ball-door	152.29 ± 167.3	110 (177-70)	71.3 ± 71.8	61.5 (80-22)	< 0.001

The group of patients admitted to the hospital after implementing the STEMI Nghe An program had a statistically significant shorter door-to-balloon time. The difference between the time of hospitalization in the 2 groups was not statistically significant.

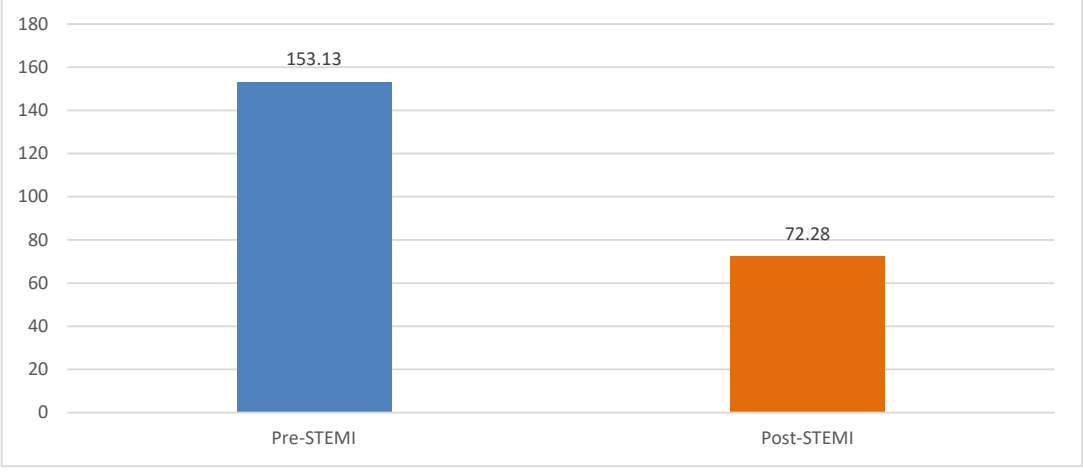

Fig. 2. Time of ball door between 2 groups

Table 3. Door-to-ball ratio comparison between the 2 groups

Time from hospital admission to PCI	Group I (n=119)		Group II (n=161)		*p*
	n	%	n	%	
Under 60 minutes	21	17.6	72	44.7	
60 - 90 minutes	27	22.7	57	35.4	
90 - 120 minutes	18	15.1	15	9.3	0.002
2 - 6 hours	47	39.5	16	9.9	
6 -12 hours	4	3.4	0	0	
12 - 24 hours	2	1.7	1	0.6	
Over 24 giờ	0	0	0	0	

5.4. Time in hospital

The overall mean day of treatment was 8.06 ± 5.23 days. The group of patients admitted to the hospital before the implementation of the STEMI Nghe An program had a hospital stay of 8.81 ± 6.22 days; the Post-hospitalization group was 7.52 ± 4.31 days. Patients with STEMI admitted to the hospital after program implementation received early reperfusion and had a shorter hospital stay (p=0.041).

5.5. Factors affecting PCI delay

Table 4. Causes of PCI delay

Reason	Group I (n=119)	Group II (n=161)	p
Emergency transportation is slow	38 (13.6%)	11(3.9 %)	< 0.001
Administrative procedure problem	36 (12.9%)	3 (1.1%)	< 0.001
Consensus issue from patient and family	29 (30.5%)	16 (16.8%)	0.003
Problems with equipment and facilities cathlab	16 (5.7%)	1 (0.4%)	< 0.001
The patient's condition is severe	16 (5.7%)	9 (3.2%)	0.023

The consent of the patient and the legal entity committed to accepting the PPCI procedure for the patient is also a major cause of delay in the PCI process.

5.6. Discussions

STEMI remains a serious medical condition with high morbidity and mortality if delayed reperfusion therapy occurs. In many countries around the world, many models have been applied to shorten the time of coronary revascularization for patients and have achieved great achievements, bringing the total time of myocardial ischemia below the recommended level. However, in many regions, for both objective and subjective reasons, the delay in revascularization of the culprit coronary artery in STEMI patients still occurs, increasing the burden of disease on society. In our study, although in an area with many difficulties in terms of socio-economic situation and geographical conditions, the criteria for early reperfusion for STEMI patients were significantly improved, significantly reduced. mortality rate.

Regarding the study population, compared with foreign authors, our BN has a higher average age, possibly due to our small sample size and short study period. According to Takagi et al.[19] studied on 1735 Japanese STEMI patients, the average age was 68.5 years old; Females accounted for 24.6%. Duband et al.[20] in France studied 2590 patients with a mean age of 63 ± 14 years, 74% were male.

The overall in-hospital mortality rate in our study was higher than that of Takagi K.'s study in Japan (10.7% vs. 9.2%), and the study of Miyachi et al.[21-26] indicated that the in-hospital mortality rate in Japan's patients with STEMI was 7.7%. However, when comparing between the 2 groups before and after implementing the STEMI Nghe An program in our study, the mortality rate in group 2 decreased significantly with statistical significance.

In terms of door-to-balloon time in our study, it was nearly halved compared to before the STEMI Nghe An program. Compared with other authors such as Vo Thanh Nhan et al.[22] reported at the Science and Technology Conference of Cho Ray Hospital in 2012, REPERFUSION-TIME research at 6 major hospitals including: Cho Ray Hospital, Hospital People 115, Ho Chi Minh City University of Medicine and Pharmacy Hospital (HCMC), Ho Chi Minh City Heart Institute, Thong Nhat Hospital, Cardiology Center - Hue Central Hospital had a total of 305 patients participating in the study. people (only studied STEMI patients admitted within the first 24 hours) in which 60% of patients were over 65 years old and 91.8% of patients were treated with emergency coronary intervention. Research results show that out of 6 participating centers, only 1 center has satisfactory door-ball time (<90 minutes). Other centers all have much longer requirements from nearly double to triple. The proportion of patients with portal-balloon time <90 minutes is only 30%. Mean door-ball time was 154 min, median was 125 min. Door-to-ball time reflects a complex clinical process that requires the coordination of multiple clinical and paraclinical departments to arrive at diagnostic and therapeutic decisions for patients with STEMI. The reason for prolonging this period depends mainly on the health system, from the emergency reception of patients, diagnosis, patient transport to the coordination between units and departments in the hospital, active duty, on duty at intervention centers. Delays can occur at each time segment in the treatment process from the time the patient arrives at the hospital to the time of balloon angioplasty coronary artery. In clinical practice, there are subjective and objective factors that prolong this time.

Subjective factors such as delay in receiving patients for screening, classification and diagnosis, etc. Objective factors include administrative procedures related to paperwork, health insurance, qualified relatives, legal entities to commit to PCI, financial issues. In our research, issues of slow emergency transport, administrative procedures, consent from patient and family, equipment and facilities Cathlab are all significantly improved. Consensus of the patient's family happened faster thanks to the explanation of the medical staff at the lower level, of the doctor on duty.

In our study, the mean treatment day decreased statistically significantly in the group of patients admitted to the hospital after implementing STEMI Nghe An program thanks to early reperfusion to help the ability to recover faster. Compared with the study of Takagi et al.[19], the average day of treatment was 15 days.

The data presented here suggest that efforts to improve mortality after STEMI can be focused on educational efforts to raise awareness among the public and healthcare professionals about the need for prompt emergency call, hospitalization, improved surveillance of patients suspected of having acute coronary syndromes, etc.

6. Conclusions

Initial evaluation of the effectiveness of applying a model to improve early diagnosis and treatment capacity with percutaneous coronary intervention in STEMI patients in Nghe An province to significantly reduce mortality, average days of treatment and especially reduce the door-ball time.

The study took place during the Covid-19 Pandemic, so there were many limitations in terms of early access to STEMI patients. The selected spokes cannot cover the actual number of patients with ST-segment elevation myocardial infarction across Nghe An province. On the other hand, with a large area, but now there is only one cardiovascular intervention center in the whole province, so it reduces the possibility of early PCI for patients with STEMI. However, we have achieved significant improvements in the procedures for early access, diagnosis and treatment, care for patients with STEMI as the results have reflected after implementing the program.

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