

## Original article

# Factors predicting decision-making time among acute myocardial infarction patients with non-ST segment elevation myocardial infarction

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## Abstract

**Background:** The delayed decision-making time for patients with non-ST segment elevation myocardial infarction (NSTEMI) from symptom onset is still unable to conclude the cause clearly.

**Objective:** This study aimed to study the factors affecting the decision-making time for seeking treatment in patients with NSTEMI.

**Methods:** The study samples included 100 patients with NSTEMI who received treatment at two tertiary hospitals in Thailand. Using questionnaires on demographic data form, comorbidity, illness perception, anxiety, and social support. Data were analyzed using descriptive statistics and stepwise multiple regression.

**Results:** Median decision-making time was 90 minutes. Illness perception had the highest predictive coefficient ( $\beta = -0.294$ ,  $P < 0.01$ ), anxiety ( $\beta = -0.237$ ,  $P < 0.05$ ), comorbid ( $\beta = 0.229$ ,  $P < 0.05$ ), social support ( $\beta = -0.207$ ,  $P < 0.05$ ), use of emergency medical services or EMS ( $\beta = 0.125$ ,  $P < 0.05$ ), and hospital experience ( $\beta = 0.117$ ,  $P < 0.05$ ), were statistically significant predictors of decision-making time in seeking treatment.

**Conclusion:** All factors were able to predict the decision-making time for NSTEMI patients, and the results can be used to develop a program that encourages NSTEMI patients to have time to make appropriate decisions about receiving treatment.

**Keywords:** Decision-making time, non-ST segment elevation myocardial infarction, Thailand.

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Non-ST segment elevation myocardial infarction (NSTEMI) falls under acute coronary syndrome (ACS). According to the statistics from the United States, more than 780,000 patients experience an ACS event, of whom 70.0% are diagnosed with NSTEMI, that is more common in males than in females at a ratio of 3 : 2.<sup>(1)</sup> In Singapore, the incidence of patients with NSTEMI during 2019 to 2021 seemed to be higher, accounting for 31.5%, 31.5%, and 32.2%, respectively.<sup>(2)</sup>

In Singapore, an increase in mortality from 2019 to 2021 was observed for 55.5%, 58.3%, and 60.2%, respectively.<sup>(2)</sup> In Thailand, in 2018, the mortality rate for ACS among patients with NSTEMI was as high as 25.0%, while the mortality rate of patients with STEMI was 14.0%.<sup>(3)</sup> The cause of death among patients with NSTEMI was taking much time to make a decision for treatment.<sup>(4,5)</sup> The American College of Cardiology/American Heart Association (ACC/AHA, 2012) states that patients with ACS should make the decision to undergo treatments after having chest pain for no longer than 20 minutes.<sup>(6)</sup>

The treatment decision of patients with ACS depends on several factors. Dracup K, *et al.*<sup>(7)</sup> describes that it depends on 2 types of stimuli that threaten the condition at the time of illness. That is internal stimuli (e.g., individual characteristics like gender, age, and perceived information about the disease). Additionally, past experiences of illness including comorbidities and environmental stimuli like receiving support from families, friends, healthcare professionals like doctors, and nurses will affect the planning of dealing with the ongoing problems, leading to making a treatment decision.<sup>(7)</sup> The duration in decision-making is the period that starts from the moment symptoms begin until the patient makes the decision to undergo treatments at the hospital or seek help.<sup>(8)</sup> According to the literature review, patients with ACS took more than 60 minutes to make a treatment decision.<sup>(8,9)</sup> The review of literature specific to patients with non-ST elevation ACS took time to decide to undergo treatments in the hospital 348 minutes on average (SD = 486), accounting for 66.0%.<sup>(10)</sup> However, the duration of decision-making in seeking treatment is highly important and associated with patients. Appropriate duration of a treatment decision enables patients to be diagnosed and solve a

critical condition in a timely manner.<sup>(8,9,11)</sup> Long decision-making periods cause patients to lose opportunities for effective treatment or gain fewer benefits. According to the information mentioned above, it can be seen that patients with ACS and patients with NSTEMI took a treatment decision longer than 20 minutes, which may result in potential problems or critical conditions, such as arrhythmia, cardiogenic shock, heart failure<sup>(12)</sup>, and probably death.

Previous research revealed factors associated with decision-making in seeking treatment of patients with ACS, such as gender, age, comorbidities, marital status, income, persons accompanying patients while symptoms occur, social support, use of emergency medical services (EMS), hospitalization experience, illness perception, and anxiety.<sup>(13-23)</sup> These factors are important to the duration of treatment decisions for patients with ACS.

The literature review indicated that many research studies conducted overseas show factors related to treatment decision-making, and studies have been conducted for such a long time<sup>(13,21,23)</sup> since it is a critical period directly associated with patients, leading to a quick or delayed treatment before arriving at the hospital. It is considered the longest period as well.<sup>(8,9,11)</sup> In Thailand, most studies were conducted on treatment decision-making in patients with ACS.<sup>(19,24)</sup> At the same time, there is a limited number of studies among patients with NSTEMI, and most of them seek the relationship of factors associated with the duration that patients have signs and symptoms until they arrive at the hospital.

Based on the context of Thailand, factors associated with the duration of treatment decision-making of patients with NSTEMI could not be concluded. The literature review mentioned above found that though signs and symptoms of patients with NSTEMI are unclear, they are able to cause heart attacks if the patients take treatment decision-making longer than 20 minutes. As a result, the patients with NSTEMI with delayed treatment have an increased mortality rate. Therefore, this study aimed to investigate the treatment decision-making period and comorbidities, hospitalization experience, illness perception, anxiety, social support, and the use of EMS in the treatment decision-making period of patients with NSTEMI in Thailand.

### Materials and methods

After the Human Research Ethics Review Committee of Saraburi Hospital and Phra Nakhon Si Ayutthaya Hospital Thailand has approved the research, the researcher described the objectives of the study, anticipated project risks, and benefits to participants. A consent form was distributed to participants to sign their names before data collection began. The participants could withdraw from the study at any time without affecting the medical treatments they received. All information was kept confidential and anonymous.

Predictive correlational research was conducted to study the predictive ability of comorbidities, social support, the use of emergency medical services, hospitalization experience, illness perception, and anxiety towards the treatment decision-making period of patients with NSTEMI. The study was conducted from May to August 2023 in the general internal medicine ward, internal medicine intensive care unit, and cardiac intensive care unit of Saraburi Hospital and Phra Nakhon Si Ayutthaya Hospital, Thailand.

The participants were patients with NSTEMI. The inclusion criteria are patients with a normal level of consciousness, 40 years of age or higher without dementia, able to understand and communicate in Thai, and willing to participate in the research. G\*Power was used to calculate the sample size. The effect size was 0.2 and the power of the test was 0.8. The statistical significance level ( $\alpha$ ) was 0.05. The sample size consisted of 83 persons and increased by 20.0% to prevent sample loss and incomplete data.<sup>(25)</sup> Therefore, the sample consisted of 100 persons.

The Human Research Ethics Review Committee has approved the research. It granted permission for data collection from Saraburi Hospital on April 10, 2023 (project certificate number SRBR66-014), and Phra Nakhon Si Ayutthaya Hospital on April 19, 2023 (project certificate number COA. no. 016/2566), Thailand. The researcher asked for permission and coordinated with nurses in the inpatient ward who met the inclusion criteria. The participants were willing to participate in the study and were described with the information and consent form. They described and clarified how to respond to all five sets of the questionnaire in a comprehensive manner until they understood thoroughly. The researcher confirmed that all information collected should be kept confidential and allowed participants to ask questions at all times. It took them around 20 - 30 minutes to respond to the questionnaire.

Charlson ME, *et al.* comorbidity index (CCI),<sup>(26,27)</sup> Brief Illness Perception Questionnaire (B-IPQ),<sup>(28,29)</sup> State-Trait Anxiety Inventory (STAI) Form Y-1<sup>(30,31)</sup> and multi-dimension scale of perceived social support (MSPSS)<sup>(19,32)</sup> were used in the study. The content validity index (CVI) of the questionnaire, the Thai version, was validated by five experts. Thirty participants participated in the project study to assess the appropriateness or understanding of the participants having similar characteristics to the target people in Phra Nakhon Si Ayutthaya Hospital to increase the reliability of the questionnaire. It was found that the questionnaire had reliability and content validity that met the acceptable criteria.<sup>(33)</sup>

The instrument was developed by the researcher and divided into 2 parts. Part 1 consisted of 11 question items about individual information including age, gender, marital status, number of children, education level, income, person showing symptoms, place where signs and symptoms occur, person accompanying patient, symptoms that make patient decide to go to hospital and get treatments. Part 2 consisted of 5 question items about sickness; 3 lists about hospitalization experiences, the use of EMS, and information regarding the duration of decision-making in seeking treatment that starts from the time the patient has symptoms until making decision to go to hospital or see a doctor.

Charlson ME. Criteria index was developed by Charlson ME, *et al.*<sup>(26)</sup> in 1987 to assess comorbidities affecting the activation of the immune system and sickness. This tool consists of questions about 21 comorbidities, each with a score of 1, 2, 3, and 6 points. The scale score ranges from 0 - 39. A high score means patients with NSTEMI have multiple comorbidities. The content validity of the Thai version in this study was 0.95 and the Cronbach's alpha coefficient was 0.84.

Broadbent F, *et al.* developed the Brief Illness Perception questionnaire (B-IPQ) in 2006 to assess the cognitive and emotional perception of illness in patients.<sup>(28)</sup> The tool consists of 9 questions divided into 9 areas as follows: 1) the effect of illness; 2) the natural history of disease; 3) the ability of the patient to control the disease; 4) the effectiveness of treating illness; 5) characteristics of symptoms of the disease; 6) anxiety about the disease; 7) understanding about the disease; 8) emotional effect; and 9) the cause of the disease. A high score means patients with NSTEMI have a high perception of the disease threats.

The content validity of the Thai version in this study was 1.0 and the Cronbach's alpha coefficient was 0.87.

Spielberger CD, *et al.*<sup>(30)</sup> developed STAI Form Y-1 in 1983 to assess anxiety. The tool consists of 20 question items; 10 items of positive feelings and 10 questions of negative emotions. The questions come in the form of a 4-point rating scale ranging from no feeling to strong feeling. The lowest total score is 20, and the highest total score is 80, showing the patient with NSTEMI has a high level of anxiety. The content validity of the Thai version in this study was 0.75 and Cronbach's alpha coefficient was 0.85.

Zimet GD, *et al.* developed MSPSS in 1988 to assess 3 dimensions of social support including family, friends, and significant others.<sup>(32)</sup> The tool consists of a 12-question item with a 7-point Likert scale. A score of 1 means strongly disagree to strongly agree. The lowest total score is 12, and the highest total score is 84, showing the patient with NSTEMI has a high level of perceived social. The content validity of the Thai version in this study was 1.0 and the Cronbach's alpha coefficient was 0.91.

### Statistical analysis

After data were collected and the accuracy was checked, the data were analyzed using a software package. The statistical significance level was set at  $P < 0.05$ . Individual information and illness of patients with NSTEMI, i.e. age, gender, marital status, number of children, education level, income, income sufficiency, the person accompanying the patient while symptoms occur, place where symptoms occur, the person bringing the patient to hospital, symptoms that make the patient to decide to go to hospital, treatments received-coronary artery angiography, and prior hospitalization experience with other diseases were analyzed using descriptive statistics; frequency of distribution showing number and percentage. The duration of decision-making in seeking treatments of patients with NSTEMI was analyzed using the minimum value, maximum value, mean, median, and standard deviation (SD). The predictive ability of predictive factors including comorbidities, hospitalization experiences, illness perception, anxiety, social support, and the use of EMS towards the duration of decision-making in seeking treatments of patients with NSTEMI was analyzed using stepwise multiple regression.

### Results

There were 100 participants in this study. The mean age was  $62.1 \pm 10.9$  years. More than half (57.0%) of them were women, 88.0% were married, 68.0% had two children, 49.0% finished primary education level, 44.0% had 5,001 - 10,000 baht monthly income and 44.0% had 10,001 - 15,000 baht monthly income. Fifty percent had sufficient income but no savings. 48.0% had their spouse as the accompanying person while the symptoms occurred. The place where the symptoms occurred was in the house, 87.0%. Fifty-eight percent had their children bring the patient to the hospital. The symptom that made the patient decide to go to the hospital was chest pain (63.0%). The treatment the sample received was taking medications (100.0%). Most participants (91.0%) did not receive coronary artery angiography. Only 9.0% received coronary artery angiography. The majority (89.0%) did not have hospitalization experiences due to acute coronary syndrome. Most participants (96.0%) had hospitalization experiences due to other diseases, and most of them (87.0%) did not use EMS (**Table 1**).

Participants had a duration from the time of symptom onset until the patient decided to seek hospital care or seek help. There was a decision period for treatment of more than 20 minutes (93.0%). The mean time was  $122.4 \pm 102.9$  minutes, with a median value of 90 minutes (minimum time = 10 minutes; maximum time = 540 minutes) (**Table 1**).

The factor that could predict decision-making time for patients with non-ST-segment acute myocardial infarction with the highest statistical significance was illness perception ( $\beta = -0.294$ ,  $P < 0.01$ ), followed by anxiety ( $\beta = -0.237$ ,  $P < 0.05$ ), comorbid conditions ( $\beta = 0.229$ ,  $P < 0.05$ ), social support ( $\beta = -0.207$ ,  $P < 0.05$ ), the use of EMS ( $\beta = 0.125$ ,  $P < 0.05$ ) and hospitalization experience with acute myocardial infarction ( $\beta = 0.117$ ,  $P < 0.05$ ), respectively. These factors accounted for 75.7% of the variance in the decision-making time for patients with non-ST segment elevation myocardial infarction) Adjusted  $R^2 = 0.757$ ,  $P < 0.05$ ) as shown in **Table 2**.

**Table 1.** Sociodemographic characteristics and decision-making time of patients with NSTEMI (n = 100).

Variables	N or (%)
<b>Age (years)</b>	
41 - 60	49
≥ 60	51
Min = 41, max = 81, mean = 62.1, SD = 9.1	
<b>Gender</b>	
Female	57
Male	43
<b>Marriage status</b>	
Single	4
Married	88
Divorced	8
<b>Number of children</b>	
None	2
1	8
2	68
3	22
<b>Education level</b>	
Unschoolled	4
Primary school	49
High school	30
Diploma	3
Bachelor's Degrees	14
<b>Income (Baht)</b>	
5001 - 10,000	44
10,001 - 15,000	44
15,001 - 20,000	11
> 20,001	1
<b>Income sufficiency</b>	
Enough income but do not have any left over to save	9
Enough	56
Not enough	35
<b>The person accompanying the patient while symptoms occur</b>	
Spouse	48
Child	20
Alone	18
Relatives/siblings	11
Friends/colleagues	3
<b>Place where symptoms occur</b>	
Home	87
Field/garden	8
Workplace	5
<b>The person brining the patient to hospital</b>	
Child	58
Relatives/siblings	14
Other	13
Come in person	7
Spouse	5
Friends/colleagues	3
<b>Symptoms that make the patient to decide to go to hospital (Answer more than 1)</b>	
Chest pain	63
Panting	24
Heart palpitations	15
Cannot lie down	8
Swell	3

**Table 1.** (Cont.) Sociodemographic characteristics and decision-making time of patients with NSTEMI (n = 100).

Variables	N or (%)
<b>Treatment received(Have more than 1)</b>	
Taking medicine	100
Received enoxaparin	77
Received heparin intravenously	15
Coronary artery catheterization	9
<b>Coronary artery catheterization</b>	
Not received	91
Receive	9
<b>Experience of being hospitalized with acute coronary syndrome</b>	
Ever	11
Never	89
<b>Experience of being hospitalized with diseases rather than acute coronary syndrome</b>	
Ever	96
Never	4
<b>Use of the emergency medical services (EMS)</b>	
Use	13
Don't use	87
<b>Decision-making time</b>	
≤ 20 minutes	79
> 20 minutes	3

**Table 2.** Stepwise multiple regression of comorbid conditions, hospitalization experiences, illness perception, anxiety, social support, and the use of emergency medical services (EMS) in the decision-making time of patients with NSTEMI (n = 100).

Variables	b	Std. Error	$\beta$	t	P-value
Anxiety	-2.962	1.297	-0.237	-2.284	0.025**
Illness perception	-4.124	1.098	-0.294	-3.757	<0.001*
Comorbid conditions	15.925	6.663	0.229	2.390	0.019**
Use of EMS	38.048	17.194	0.125	2.213	0.029**
Social support	-2.586	1.085	-0.207	-2.384	0.019**
Hospitalization experience	38.231	18.388	0.117	2.079	0.040**
(Constant)	564.696	94.854		5.953	<0.001

R, 0.878; R<sup>2</sup>, 0.771; Adjusted R<sup>2</sup>, 0.75; Std. Error, 50.752; Durbin-Watson, 2.153.

\*  $P < 0.01$ ; \*\*  $P < 0.05$

## Discussion

The study found that the median duration of decision-making in seeking treatments in a hospital after symptoms occurred was 90 minutes. More delayed than the practical guideline standard specifying that patients need to make a decision in seeking treatments after signs and symptoms occurred within 20 minutes.<sup>(6)</sup> This is consistent with a previous study conducted on the duration of decision-making in seeking treatments among patients with ACS, the median was 66 minutes<sup>(24)</sup>, but the duration of decision-making in this study was longer. It is possible that the study was conducted among patients with NSTEMI whose signs and symptoms were unclear. Most patients waited to see their symptoms and thought that they were able to wait a bit longer, making the patients have a longer duration of decision-making in seeking medical attention in the hospital.<sup>(4, 34)</sup> It reflects that this group of patients was at risk of arrhythmia, shock, and heart failure<sup>(12)</sup>, causing sudden death before arriving at the hospital. In case that these patients do not die, they may have complications that require longer hospitalization. The time starting from the onset of symptoms until patients make the decision to seek treatments is considered very important and associated with patients<sup>(11, 24)</sup> because the appropriate duration of decision-making shall enable patients to receive a diagnosis and critical situation-solving in a timely manner.

Illness perception was able to predict the duration of decision-making in seeking treatments for patients with NSTEMI. A high level of illness perception would shorten the duration of decision-making in seeking treatments, consistent with a previous study showing that patients with a perception severity of illness were more alert and perceptions that the symptoms occurred were a threat to life and unable to wait, making them decide to see a doctor early.<sup>(18)</sup> Acute myocardial infarction patients with a high level of perception severity of illness would make the decision to get treatments faster than patients with a low level of perception severity of illness. It was also found that patients with acute myocardial infarction who have perception control over symptom status would have more time for decision-making in seeking treatments in the hospital. As the participants had a low level of perception of the severity of the illness being able to control the symptom status, they found a way to relieve the symptoms by themselves. When the symptoms are worse, they make the decision to get treatments, contributing to delays in the duration of decision-making in seeking treatments.

Anxiety was able to predict the duration of decision-making in seeking treatments of patients with NSTEMI. The participants with a higher level of anxiety would have a shorter duration of decision-making in seeking treatments. It is consistent with a previous study finding that patients with ACS who had a low level of anxiety would have slower decision-making in seeking treatments<sup>(21)</sup> as they were uncertain. The symptoms that occurred were unclear if they were the symptoms of ACS as they expected, such as dizziness, fainting, and so on, resulting in delayed decision-making in seeking treatments in the hospital. Patients with ACS who had a low level of anxiety would have delayed decision-making in seeking treatments in the hospital more than those with a high level of anxiety.<sup>(24, 35)</sup> Patients with a low level of anxiety perceived the symptoms that occurred were not caused by heart disease and had less severity, such as nausea, vomiting, sweating, and so on. In this study, patients first managed the symptoms by themselves and did not hurry to make a decision to get treatments in the hospital. Consequently, the duration of decision-making in seeking treatment was longer.

Comorbidities were able to predict the duration of decision-making in seeking treatments for patients with NSTEMI. The patients with NSTEMI had multiple comorbidities with a longer duration of decision-making in seeking treatments, consistent with a previous study showing that patients with acute myocardial infarction together with comorbidities had delayed decision-making in seeking treatments.<sup>(15)</sup> Myocardial ischemia patients with diabetes had delayed decision-making in seeking treatments more than myocardial ischemia patients without comorbidities due to the interpretation of unclear symptoms. The most common similar symptoms found in patients with diabetes are chest pain, arm/hand pain, and fatigue. These symptoms contribute to longer decision-making in seeking help or medical attention among patients with comorbidities.<sup>(36)</sup>

Social support was able to predict the duration of decision-making in seeking treatments for patients with NSTEMI. Participants with NSTEMI had a high level of social support. They perceived that they had persons who helped them, and they were able to ask for assistance from their family, friends, and medical professionals sufficiently. They made quicker decisions to seek treatments than patients who did not have social support. This is consistent with a previous study showing that patients with a low level

of social support had delayed decision-making in seeking treatments.<sup>(37)</sup> Most patients spent a longer time making decisions in seeking treatments due to insufficient social support.<sup>(38)</sup>

The use of EMS resulted in a faster decision to seek treatments. In this study, the majority of the participants were older than 60 years. Aging has effects on the deterioration of body systems. Physiological changes slow down the functions of body systems. The efficiency of nerve signals in the brain decreases, leading to slower decision-making. This is consistent with a previous study showing that when patients with acute myocardial ischemia developed symptoms and asked for help from their spouse or children, these people would contact medical providers or EMS faster than the patients.<sup>(39)</sup>

Hospitalization experience was able to predict the duration of decision-making in seeking treatments of patients with NSTEMI. The participants with NSTEMI who had hospitalization experience due to ACS had a longer time to decide to seek treatments in the hospital. It is consistent with a previous study showing that patients with NSTEMI who had hospitalization experience decided to be admitted to the hospital later than patients without hospitalization experience. Therefore, the treatment period was delayed.<sup>(40)</sup>

However, there are some limitations in the study. First, the number of patients were not randomized from tertiary care hospitals in different locations, making it difficult for generalization. Second, participants in this study were recruited from only one tertiary care hospital. Some of them were referred from other hospitals to receive treatments, and the distance from home to the hospital was not included in the study.

## Conclusion

The study results on predictive factors towards the duration of decision-making in seeking treatments of patients with NSTEMI can be used to develop a preparedness program for patients before hospital discharge and to conduct an experimental research study to promote patients with NSTEMI to have self-management appropriately and make the decision to seek treatments in a timely manner. A study should be conducted about factors affecting the duration of decision-making in seeking treatments of patients with NSTEMI in other regions having different contexts

regarding population characteristics, social characteristics, places of living, transportation system, and social support so that the study results can be feasibly used in the broaden contexts for patients with NSTEMI in Thailand.

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## Conflicts of interest

All authors have completed and submitted the International Committee of Medical Journal Editors Uniform Disclosure Form for Potential Conflicts of Interest. None of the authors disclose any conflict of interest.

## Data sharing statement

Data sharing statement. All data generated or analyzed during the present study are included in this published article. Further details are available for noncommercial purposes from the corresponding author on reasonable request.

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