Original Article/นิพนธ์ต้นฉบับ

Quality of Care for Patients With ST-Segment Elevation Myocardial Infarction Using Fast Track Service in Thailand

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Abstract

Background: The ST-segment elevation myocardial infarction (STEMI) fast track care recommend door to needle within 30 minutes. The current guideline is implemented in the community hospitals for timely reperfusion therapies, however, evaluation on its quality is limited.

Objective: To evaluate quality of care for patients with STEMI in community hospitals, Thailand.

Method: A descriptive design was conducted in three community hospitals, where distance from primary percutaneous coronary intervention (PCI)-capable hospital are more than 120 minutes. Consecutive sampling was used to select sample of patients with STEMI from October 1, 2016, to Mach 31, 2017. Data were collected from STEMI patients in 3 community hospitals using questionnaire and medical record reviews.

Results: Thirty-two STEMI patients participated in this study. The mean age of the patients was 62.5 ± 11.4 years. Most of them (87.5%) used self-transportation. Approximately 51.7% received streptokinase within time, while the average door to needle time was 48.4 minutes. The mean total ischemic time were 246.2 ± 365.7 minutes, and 18.8% of patients died in-hospital.

Conclusions: This study showed that door to needle time, door to balloon time, door to ECG, door to referral time, and total ischemic time were longer than recommended time. The main reasons were patients delay and system delay particular delayed diagnosis.

Keywords: STEMI, Quality of care, Emergency department, Community hospitals

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Introduction

The goal of management in patients with ST-segment elevation myocardial infarction (STEMI) is timely reperfusion treatments both thrombolytic therapy and primary percutaneous coronary intervention (PCI).[1] The qualities of care is adherence of healthcare providers to the guideline of managements for the patients with STEMI.[2] The current pathway for non-PCI-capable hospital is thrombolytic agent as reperfusion therapy. The healthcare providers should consider the criteria for referral to PCI-capable hospital as follows: 1) after the patients receiving streptokinase, if the electrocardiogram (ECG) shows evident non-solution, patients should be transferred to PCI immediately; and 2) the patients with cardiogenic shock should be transferred to PCI immediately.

Nowadays, reperfusion therapy with thrombolytic agent was implemented in community hospitals. Thereafter, patients receiving streptokinase was transferred for PCI in tertiary hospital. This strategy can increase better patients' outcome. In Chiang Mai, a northern province of Thailand, there were some distant non-PCI-capable community hospitals cannot refer and perform primary PCI within 90 to 120 minutes. The streptokinase is only choice of reperfusion treatments in these community hospitals. The STEMI fast track protocol was implemented to reduce reperfusion therapies time in these areas. Several studies focus on evaluation of the STEMI fast track protocol in tertiary hospitals and university hospitals,[3-5] while a few studies included patients with very long transfer distances.

Furthermore, Thai guideline management for acute coronary syndrome[6] are not appropriate for both individual management of STEMI and the distant commnunity hospitals. More data are needed on development of appropriate strategies of the management in the community hospitals. Understanding of this specific context might affect patient outcomes and lead to better quality of care for patients with STEMI.

This study aims to describe the quality of care among patients with STEMI including structure of care, processes of care and outcomes of care using STEMI fast track service in community hospitals.

Methods

Participants

A quantitative method with descriptive design was conducted during six months on three emergency departments of the community hospitals in Chiang Mai province, Thailand. This study was guided by the Donabedian Quality of Care framework[7] in assessing STEMI fast track care including structure of care, the process of care and outcome of care. This study was approved by the Institution Review Board for the Protection of Human Subjects from the Faculty of Medicine Ramathibodi Hospital, Mahidol University, No. MURA2015/750, on December 29, 2015.

Through consecutives enrollment, 32 participants met the following inclusion criteria: 1) visiting during October 2016 to March 2017; 2) having first diagnosis with STEMI by the physicians as described in medical record; and 3) being able to speak Thai language. Data were collected in an emergency room (ER) of three community hospitals, the non-PCI-capable hospitals. All settings were located in remote areas which distance from PCI-capable hospital are more than 150 kilometers. One hospital had internal medicine and intensive care unit.

Patients with STEMI visiting to ERs in these hospitals received treatments including thrombolytic agents, then were transferred to receive primary PCI at PCI-capable hospital.

Questionnaire

The demographic questionnaire and medical information record form were developed by the researcher. The questionnaire was validated by three experts in emergency and critical care. Evidence of content validity index (CVI) was determined. The CVI of this questionnaire was 0.93. The questionnaire was collected information including 6 items of patients' demographic and 18 items of medical information.

Outcome Measurement

This study outcomes were patients' demographic and medical information of patients including personal characteristics, clinical characteristics, geographical characteristics, mode of transport, pre-hospital management in the emergency medical service (EMS), use of STEMI fast track care in emergency department, referral system, outcome delivered, and health status of STEMI fast track care.

Statistical Analysis

The data were checked for the outliers or error and coded before entering to the computer program. In order to meet the purposes of study, the data were analyzed using descriptive analysis including mean, mode, median, frequency, percentage, and standard deviation.

Results

A total of 32 presented to three emergency departments with STEMI. There were 17 male and 15 female patients with average age of 62.5 ± 11.4 years. Most of them (75%) obtained elementary education. Their mean of body mass index (BMI) was 23.2 ± 4.2 kg/m^2 while half of them were overweight. Most of them had universal coverage health insurance. Approximately one-third (31.3%) had underlying of hypertension.

Anterior wall MI was the most frequent electrocardiogram (ECG) result (46.9%), following by inferior wall MI (37.5%). There were 65.6% of patients who had Killip class I, while 15.6% had moderate to severe heart failure (Killip class III-IV). The average of systolic and diastolic blood pressure at ER was 120.1 ± 31.8 and 71.8 ± 20.6 mmHg, respectively whereas 21.9% of the patients developed cardiogenic shock.

Most of the patients used self- transportation (87.5%) and only 12.5% used EMS transportation. All received acetylsalicylic acid (ASA) 325 mg and clopidogrel 300 mg in ERs, and 22.9% received inotropic drug. Approximately 12.5% were endotracheal intubated in ER, 68.8% were admitted at the intensive care unit (ICU) in community hospitals, 31.2% were referred to PCI-capable hospitals due to cardiogenic shock and failure thrombolytic therapy. Patient characteristics and clinical characteristics were described in Table 1.

The mean door to needle time was 48.4 ± 48.8 minutes and approximately half of the patients (51.7%) received streptokinase within 30 minutes recommended. The mean door to balloon time was 175.0 ± 52.6 minutes. All patients underwent primary PCI after 90 minutes of onset. The mean total ischemic time (TIT) was 246.2 ± 365.7 minutes (median, 162.5). Approximately 56.2% of patients had TIT less than 180 minutes. The mean door to referral time was 137.3 ± 71.2 minutes. In-hospitals mortality rate were 18.8%, while 6.3% died during referrals and 12.5% died within 1-month. The total mortality rate in this study was 31.2%.

Discussion

According to European Society of Cardiology (ESC) guideline for STEMI 2017, factors associated with mortality included advancing age, diabetes, history of MI, Killip class III- IV, left ventricular ejection fraction, time delay to treatment, and treatment strategies.[8] The high mortality of in-hospital patients can represent the quality of pre-hospital care and care delivery. In this study, the factors might be delay triage process. The fast track care is activated after triage nurses or physician expecting ACS. Time to ECG is longer due to waiting for screening process. The other factors might be the clinical characteristic of patients including cardiogenic shock and comorbidity that increase risk of death. According author's study, it is 18.8% of the patients had underlying of diabetes and comorbidity. The patients with diabetes and comorbidity increased significantly with increasing risk of mortality during ACS event.[8] Alabas et al[10] compared the risk of in-hospital mortality between patients with and without diabetes. The results found that those with diabetes had higher risk of in-hospital mortality than those with no diabetes.

Table 1 Patient Characteristics and Clinical Characteristics (N = 32)

Variables	No. (%)
Age, mean ± SD (min - max), y	62.5 ± 11.4 (44 - 86)
Gender	
Male	17 (53.1)
Female	15 (46.9)
Education	
Informal education	6 (18.8)
Elementary school	24 (75.0)
High school	2 (6.3)
Health insurance	
Universal health coverage	29 (90.6)
Civil servant medical benefit	2 (6.3)
Social security	1 (3.1)
BMI, mean ± SD (min - max), kg/m^2	23.2 ± 4.2 (17.5 - 35.2)
< 18.5	4 (12.5)
18.5 - 22.9	16 (37.5)
23 - 24.9	4 (12.5)
25 - 29.9	10 (31.3)
≥ 30	2 (6.2)
Underlying disease	
None	7 (21.9)
HT	10 (31.3)
DM	3 (9.4)
DLP	4 (12.4)
Comorbidity (n = 8)	
HT and DLP	3 (9.4)
DM and DLP	3 (9.4)
HT, DM, and DLP	2 (6.2)
ECG result	
Anterior wall MI	15 (46.9)
Inferior wall MI	12 (37.5)
Posterior wall MI	1 (3.1)
Anterior lateral MI	4 (12.5)
Clinical status during emergency care	
Cardiogenic shock	7 (21.9)
Systolic BP, mean ± SD (min - max), mm Hg	120.1 ± 31.8 (79 - 183)
Diastolic BP, mean ± SD (min - max), mm Hg	71.8 ± 20.6 (40 - 109)
Heart rate, mean ± SD (min - max), bpm	89.0 ± 26.5 (48 - 138)
Mode of transport	
Self- transport	28 (87.5)
EMS (ALS and FR)	4 (12.5)

Table 1 Patient Characteristics and Clinical Characteristics (N = 32) (Continued)

Variables	No. (%)
Treatment in Emergency department	
ASA	32 (100.0)
Clopidogrel	32 (100.0)
Isosorbide dinitrate	22 (68.8)
Inotropic drug	7 (22.9)
Intubation ET-tube	4 (12.5)
Refer to PCI-capable hospital	
No	22 (68.8)
Yes	10 (31.2)
ED to PCI-capable hospital	8 (80.0)
ICU to PCI-capable hospital	2 (20.0)
Clinical status during referral (n = 10)	
On ET-tube with ventilator	4 (33.3)
Received inotropic drugs	7 (58.3)
CPR	2 (16.7)

Abbreviation: ALS, advanced life support; ASA, acetylsalicylic acid; CPR, cardiopulmonary resuscitation; DLP, dyslipidemia; DM, diabetes mellitus; EMS, emergency medical service; ET, endotracheal tube; FR, first response; HT, hypertension; ICU, intensive care unit; MI, myocardial infarction; PCI, percutaneous coronary intervention; SD, standard deviation.

Table 2 Outcome of Care (N = 32)

Variable	No. (%)	
	Live	Death
Door to needle time (n = 29)		
Mean ± SD (min - max), min	48.4 ± 48.8 (15 - 249)	-
≤ 30 min (guideline recommended)	15 (51.7)	2 (13.3)
> 30 min	14 (48.3)	5 (35.7)
Door to ECG, mean ± SD (min - max), min	15.0 ± 15.6 (2 - 60)	-
ECG to needle time, mean ± SD (min - max), min	12.1 ± 1.1 (2 - 20)	-
Door to balloon time (n = 3),		
Mean ± SD (min - max), min	175.0 ± 52.6 (120 - 255)	-
≤ 90 min (guideline recommended)	-	-
> 90 min	3 (100.0)	3 (100.0)
Onset to hospitals time		
Mean ± SD (min - max), min	192.1 ± 407.8 (6 - 2115)	-
Total ischemic time		
Mean ± SD (min - max), min	246.2 ± 365.7 (32 - 2160)	-
≤ 180 min (guideline recommended)	18 (56.2)	4 (28.6)
> 180 min	14 (43.8)	6 (33.3)
Self-transportation, mean ± SD, (min - max), min	183.0 ± 102.6 (32 - 496)	-
EMS transport, mean ± SD (min - max), min	155.0 ± 78.4 (95 - 270)	-

Table 2 Outcome of Care (N = 32) (Continued)

Variable	No. (%)	
	Live	Death
Door to referral time (guideline recommended 30 min)		
Mean ± SD (min - max), min	137.3 ± 71.2 (60 - 300)	-
Number of death		
Death in hospital	6 (18.8)	-
During transfer	2 (6.3)	-
PCI-capable hospital	4 (12.5)	-
Death in ED	-	-
Death within 1-month	4 (12.5)	-
Total of death	10 (31.2)	-

Abbreviation: ECG, electrocardiogram; ED, emergency department; PCI, percutaneous coronary intervention; SD, standard deviation.

In this study, 21.9% of patients had cardiogenic shock, while 15.6% had Killip class III –IV. The reduction of left ventricular ejection fraction (LVEF) is commonly a cause of heart failure and sudden cardiac arrest due to a decrease of cardiac output.[11] The patients with cardiogenic shock needed a proper management need further explanation, while in community hospitals the streptokinase was the only choice for patients with cardiogenic shock.[1, 12] Although there are two fibrinolytic drugs available in Thailand including alteplase and streptokinase, Universal Health Coverage could cover only streptokinase for patients with STEMI. Ascef et al[13] reported that patients with cardiogenic shock receiving alteplase had lower in-hospital mortality than those receiving streptokinase. Some studies recommended that alteplase was appropriate for patients with poor prognosis more than streptokinase.[13, 14]

In cases of patients having contraindications to Streptokinase, all of them were transferred to PCI-capable hospitals. The distance from PCI-capable hospital can cause delay PCI time. The characteristic of road in this study area might have impact on PCI time because they cannot speed the ambulance due to the traveling through curvy and slope road. Moreover, system delay is one of reasons. The minimize door to refer time was 60 minutes. Reasonably, nursing shortage in emergency department can interrupt transferal process. In this situation, it is necessary to wait for referral nurses from the other department that lead to delay transferal time. The early recognition and decision making to seek health care provider is very important in patients with STEMI.[3] Furthermore, the longer door to treatment time, both fibrinolytic and primary PCI, has an effect directly on total ischemic-time.

In this study, most of the patients delayed door to treatments and door to hospitals time. Although the previous studies in Thailand reported that after implementing STEMI fast track care system, most of the patients had door to needle and door to balloon within time recommendation.[3, 15-18] This study, most of them had delayed door to needle time. The cultural diversities in northern Thailand is one of barrier for providing care in those hospitals due to different languages.[19] The information with error can cause negative patients' outcome. The short cut process of care in community hospitals is very important for patients with STEMI especially detecting patients with symptoms of ACS and consultation process with the cardiologist.[18, 20]

Although the Thai guideline provides strategies, in real practice the guideline cannot be implemented effectively in community hospitals with distance from PCI-capable hospitals for more than 120 minutes. A qualitative research is recommended for a future study. The results can be used to inform the future development of strategies for management and guide health care providers to promote

timely reperfusion therapy in patients with STEMI both individual patients and system of care. The triage training program should provide for triage nurse both triage department and emergency department. The organization of manpower can interrupt system delay due to not enough to provide care in emergency situation. The community hospitals could provide referral nurses for ACS patients and available all time. The community hospitals are node of healthcare service (M1) where locate in rural area and distance form PCI-capable hospital more than 2 hours. They could provide PPCI in community hospital (M1) or general hospital to reduce door to PCI time. The STEMI patients could be transferred to any PCI-capable government hospitals, although the PCI-capable hospital locates in other province. The awareness of ACS warning sign should be promoted for people with different culture and languages in rural area. It is necessary to reduce patients' delay.

Conclusions

This study showed that the results of door to needle time, door to balloon time, door to ECG, door to referral time and total ischemic time were longer than time recommendation due to patients delay and system delay particular delayed diagnosis. It may be difficult to conclude as a high or poor quality of care in the community hospitals with distance from PCI-capable hospitals. The sample in this study was too small, a further study needs to extend period of study for more sample. Different contexts and resources might need different evidence based practice to provide care for the patients.

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Original Article/นิพนธ์ต้นฉบับ

คุณภาพการดูแลผู้ป่วยโรคกล้ามเนื้อหัวใจขาดเลือดเฉียบพลันชนิดคลื่นไฟฟ้าหัวใจเอสทียกสูงที่ใช้บริการช่องทางด่วนในประเทศไทย

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บทคัดย่อ

บทนำ: ระบบการดูแลผู้ป่วยโรคกล้ามเนื้อหัวใจขาดเลือดเฉียบพลันชนิดคลื่นไฟฟ้าหัวใจเอสทียกสูง (ST-segment elevation myocardial infarction, STEMI) ที่ใช้บริการช่องทางด่วน ถูกนำมาใช้ในโรงพยาบาลชุมชนเพื่อให้การรักษาเปิดเส้นเลือดในเวลาที่รวดเร็วที่สุด แนวปฏิบัติปัจจุบันได้แนะนำระยะเวลาตั้งแต่ผู้ป่วยมาถึงโรงพยาบาลจนถึงได้รับยาละลายลิ่มเลือดภายใน 30 นาที ขณะที่การประเมินคุณภาพระบบช่องทางด่วนในโรงพยาบาลชุมชนยังมีข้อจำกัด

วัตถุประสงค์: เพื่อศึกษาคุณภาพของการดูแลผู้ป่วยโรคหัวใจขาดเลือดเฉียบพลันชนิดคลื่นไฟฟ้าหัวใจเอสทียกสูงในโรงพยาบาลชุมชน

วิธีการศึกษา: การวิจัยเชิงบรรยายโดยทำการศึกษาในโรงพยาบาลชุมชน 3 แห่ง ซึ่งอยู่ห่างไกลโรงพยาบาลที่สามารถให้การรักษาด้วยการขยายหลอดเลือดหัวใจ (Percutaneous coronary intervention, PCI) และมีระยะเวลาเดินทางนานมากกว่า 120 นาที กลุ่มตัวอย่างได้รับการคัดเลือกตามความสะดวกระหว่างวันที่ 1 ตุลาคม พ.ศ. 2559 ถึงวันที่ 31 มีนาคม พ.ศ. 2560 จากนั้นเก็บข้อมูลกลุ่มตัวอย่างดังกล่าวโดยใช้แบบบันทึกข้อมูลส่วนบุคคล และแบบบันทึกข้อมูลการใช้บริการสุขภาพ

ผลการศึกษา: กลุ่มตัวอย่างผู้ป่วยโรคกล้ามเนื้อหัวใจขาดเลือดเฉียบพลันชนิดคลื่นไฟฟ้าหัวใจเอสทียกสูง จำนวน 32 คน อายุเฉลี่ย 62.5 ± 11.4 ปี พบว่า ร้อยละ 87.5 ผู้ป่วยเดินทางมาโรงพยาบาลด้วยตนเอง ร้อยละ 51.7 ผู้ป่วยได้รับยาละลายลิ่มเลือดภายใน 30 นาที ขณะที่ระยะเวลาเฉลี่ยตั้งแต่ผู้ป่วยมีอาการจนถึงโรงพยาบาลเท่ากับ 48.8 นาที ระยะเวลาเฉลี่ยตั้งแต่ผู้ป่วยมีอาการจนถึงได้รับการรักษาเปิดเส้นเลือดเท่ากับ 246.2 ± 365.7 นาที และร้อยละ 18.7 ผู้ป่วยเสียชีวิตในโรงพยาบาล

สรุป: แนวทางการดูแลผู้ป่วยโรคกล้ามเนื้อหัวใจขาดเลือดเฉียบพลันชนิดคลื่นไฟฟ้าหัวใจเอสทียกสูงอย่างมีประสิทธิภาพเป็นหัวใจหลักของการลดความล่าช้าในการรักษา การศึกษาครั้งนี้พบว่าระยะเวลาตั้งแต่ผู้ป่วยมาถึงโรงพยาบาลจนถึงได้รับการรักษาเปิดเส้นเลือด การตรวจคลื่นไฟฟ้าหัวใจ การส่งตัวรักษาต่อ และระยะเวลาตั้งแต่ผู้ป่วยมีอาการจนถึงโรงพยาบาลล่าช้ากว่าเวลาในแนวปฏิบัติซึ่งสาเหตุมาจากการล่าช้าของผู้ป่วย และการล่าช้าของระบบ โดยเฉพาะการวินิจฉัยล่าช้า

คำสำคัญ: โรคหัวใจขาดเลือดเฉียบพลันชนิดคลื่นไฟฟ้าหัวใจเอสทียกสูง คุณภาพการดูแล แผนกฉุกเฉิน โรงพยาบาลชุมชน

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