Emergency Room Observation Unit Reduces Emergency Department Length of Stay Among Non High Risk Heart Failure Patients

Chantra Waiyarat[*] *Charuwan Tadadej*[**] *Nutkamol Chansatitporn*[***] *Khrongwong Musikatavorn*[****]

ABSTRACT

This retrospective study aimed to evaluate outcome of the mean length of stay (LOS) in the emergency department (ED) and rate of ED discharge for nonhigh risk heart failure (HF) patient pre- and post implementation of the emergency room observation unit (EROU). The medical and related records of all the adult patients who visited the ED in one urban university-affiliated hospital from October 2010 through September 2014 were reviewed on a specially designed form comprising 1) patient sociodemographics 2) patients' conditions on ED visit and 3) EDLOS. A total of 950 eligible patients meeting the established criteria were included in the study. The pre-EROU group of 455 patients (attending the ED between October 2010 and September 2012) and the post group of 495 patients (attending the ED between October 2012 and September 2014). Chi square and Log rank test were used to analyze data. The implementation of the EROU significantly decreased overall mean EDLOS among nonhigh risk HF patients from 12 hours and 40 minutes to 10 hours and 53 minutes (p = 0.004). The percentage of nonhigh risk HF patients discharged home from the ED decreased significantly from 67.7% to 49.1% (p <0.001) whereas the percentage admitted to the medical inpatient unit remained unchanged. In conclusion, the implementing an EROU in ED can shorten the overall EDLOS and decrease rate of discharge home from ED among nonhigh risk HF patients.

Keywords: emergency department, length of stay, emergency room observation unit, heart failure

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Correspondence: Charuwan Tadadej, Department of Public Health Administration, Faculty of Public Health, Mahidol University, Bangkok 10400, Thailand. E-mail: charuwan.tad@mahidol.ac.th

[*] Graduate student in Master of Science (Public Health) Program in Hospital Administration, Faculty of Public Health and Faculty of Graduate Studies, Mahidol University

[**] Department of Public Health Administration, Faculty of Public Health, Mahidol University

[***] Department of Biostatistics, Faculty of Public Health, Mahidol University

[****] Department of Emergency Medicine, Faculty of Medicine, Chulalongkorn University

Introduction

Overcrowding in the Emergency Department (ED) is an immense problem in every tertiary care hospital. Patients who attend an ED often experience long waiting times. The prolonged ED length of stay (LOS) is also linked to overcrowding that produces negative consequences on patient care such as a higher inhospital mortality rates[1, 2]. One study on the Input/Throughput/Output (I/T/O) model of patient flow providing a structure to examine factors affecting ED access, quality and outcomes found that to address overcrowding in the ED, hospitals should focus on improving the flow of patients in the EDs[3].

Emergency care is categorized as one group of care processes among Thai hospital indicators[4]. Accreditation is an effective mechanism to evaluate performance and enhance the quality and safety of health care systems. Analyzing hospitals accredited by the Joint Commission International (JCI) from 2002 to 2013 showed a trend of developing international standards among Thai private hospitals[5]. The JCI recommended that boarding time frames in the ED should not exceed four hours with respect to patient safety and quality of care[6]. In a similar manner, the Department of Health for National Health Service Acute Hospitals in England has set the maximum limit on EDLOS at four hours from time of arrival to discharge from the ED to admitted inpatient unit or discharge from an ED[7.] The New Zealand and Australia Ministry of Health have since followed this procedure but with targets of four to six hours. This flexible target time on EDLOS allows a reasonable amount of time for treatment and care[8, 9]. In Thailand, the university hospital network (UHOSNET) and the Health Care Accreditation Institute have developed new indicators of the Thailand Hospital Indicator Project (THIP I&II) setting a time limit on the EDLOS within 60 minutes of patients triage as emergency[4].

The Emergency Room Observation Unit (EROU) within EDs, also known in general as observation units, have been proposed as a potential means of enhancing ED efficiency and improving patient flow; studies have shown that the use of an EROU could improve patient flow and reduce EDLOS[10-13]. EROUs are specialized units designed to manage patients who require more prolonged periods less than 48 hours of observation, further diagnostic testing and continued treatment of an acute condition. The transfer of such patients from the ED to an EROU may allow for more standardized care of selected EROU cases, e.g., abdominal pain, asthma, heart failure, dehydration, syncope, when standard care pathways are used and for more efficient care of other ED patients[14].

Heart failure (HF) is the most common

condition requiring inpatient care[15]. Although the majority of HF patients who attend the ED are admitted to hospital wards, some cannot access long term hospitalization because of limited inpatient beds and strict criteria for patient selection[16]. Admission to the EROU may be beneficial among patients with low and intermediate risk of HF to continue treatment or to assess more precise risk stratification for the need of inpatient admission[17-19].

The effectiveness of the EROU has not been evaluated well for patients with nonhigh risk HF in EDs at any hospital in Thailand. The primary aim of the study was to evaluate whether the implementation of an EROU could shorten EDLOS. The secondary aim was to evaluate the changes in the rate of ED discharged home and admitted to medical inpatient bed unit in this patient group.

Materials and Methods

Study design, setting, and selection of participants

The retrospective study was conducted at the ED of a 1500-bed urban university-affiliated hospital. Its ED sees more than 60,000 patients a year. In 2012, this department launched its EROU, a 10-bed unit staffed by ED physicians in all shifts and accepting only ED admissions.

All adult patients (age ≥ 15 years) with a diagnosis of HF who attended the ED from October 2010 to September 2014 (between October 2010 and September 2012 as the pre-EROU group and between October 2012 and September 2014 as the post-EROU group) were identified by medical record retrieval using the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10) codes I50.9 (heart failure, unspecified) from the hospital electronic database. Patients were excluded when they had one of the following: 1) HF with high risk features (see Methods of measurement and outcome measures section), 2) HF associated with high risk coronary syndromes, e.g., ST-segment elevation myocardial infarction (STEMI), acute coronary syndrome with elevation of the cardiac biomarker, pericardial effusion, suspected concomitant malignant ventricular arrhythmias, severe valvular stenosis, suspected prosthetic valve complications, hypotension (systolic blood pressure lower than 100 mmHg), 3) required mechanical ventilation, 4) died in the ED, 5) transferred from or to other healthcare facility, 6) left without being seen and 7) for those whose essential data was incomplete. The study was approved by the hospital ethics review committee (COA No.180/2015, IRB. No.101/58).

Methods of measurement and outcome measures

The researchers identified patients' profiles

from medical records using a specially designed form comprising 1) patient sociodemographic, 2) patients' conditions on ED visit and 3) EDLOS. The specially designed form was reviewed by three experts for content validity. The researcher recorded the data with three research assistants.

Patient sociodemographic included age, sex and types of healthcare privileges. Patients' conditions on ED visit included (1) risk stratification for mortality in HF based on simple hemodynamic and biochemical profiles categorized in five risk groups, i.e., high risk (blood urea nitrogen, BUN ≥ 43 mg/dL, systolic blood pressure, SBP < 115 mm Hg and creatinine ≥ 2.75 mg/dL); intermediate risk 1 (BUN ≥ 43 mg/dL, SBP < 115 mm Hg and creatinine < 2.75 mg/dL); intermediate risk 2 (BUN ≥ 43 mg/dL and SBP ≥ 115 mm Hg); intermediate risk 3 (BUN < 43 mg/dL and SBP < 115 mm Hg) and low risk (BUN < 43 mg/dL and SBP ≥ 115 mm Hg)[20]. Also recorded was (2) patient triage category (five-level triage algorithm called Emergency Severity Index (ESI)[21] to categorize the severity of their presentation by evaluating both patient acuity and resource needs), i.e., level 1 defined patients requiring an immediate life-saving intervention; level 2 defined patients having a high risk situation or confused/ lethargic/disoriented or severe pain/distress; level 3 defined patients who needed many resources for treatment; level 4 defined patients needing only one resource for treatment and level 5 defined patients needing no emergency care resources. Finally, (3) number of rounds in blood testing was noted. This indicator was included because related studies founded it was associated with EDLOS[22, 23].

The primary aim of this study was to compare changes in EDLOS before and after the establishment of the EROU among patients with low to intermediate risk of HF. The total EDLOS was defined as the number of minutes between the time the patient was registered at and the time the patient was discharged from the ED (Data time of ED time-in and time-out comprised the real time, from when the patients registered to see the physician in the ED through to when "out of ED" was recorded in the medical record of any patient by ED nurses).The secondary aim was to evaluate the changes in ED discharge by determining the medical inpatient bed admission and home discharge rates among this group of patient. The discharge from the ED was categorized as home discharge, admission to medical inpatient unit or admission to EROU groups.

Primary Data Analysis

The researcher used standard descriptive statistics to characterize the sample of patients. The analysis of the differences in the mean

EDLOS used the Survival Analysis of Kaplan-Meier and the log rank test among the patients based on various types of discharge from the ED and between pre- and post EROU time. Chi square was used to compare patient discharge home rate and admitted to medical inpatient unit rate between pre- and post EROU time. The statistical significance level was set at 0.05 for all tests.

Results

A total of 1,518 patient records with HF were reviewed and 950 patients (455 patients between October, 2010 and September, 2012 as the pre EROU group and 495 between October, 2012 and September, 2014 as the post EROU group) were eligible for the study. The reasons for exclusion are shown in Figure 1. Patient characteristics are presented in Table 1.

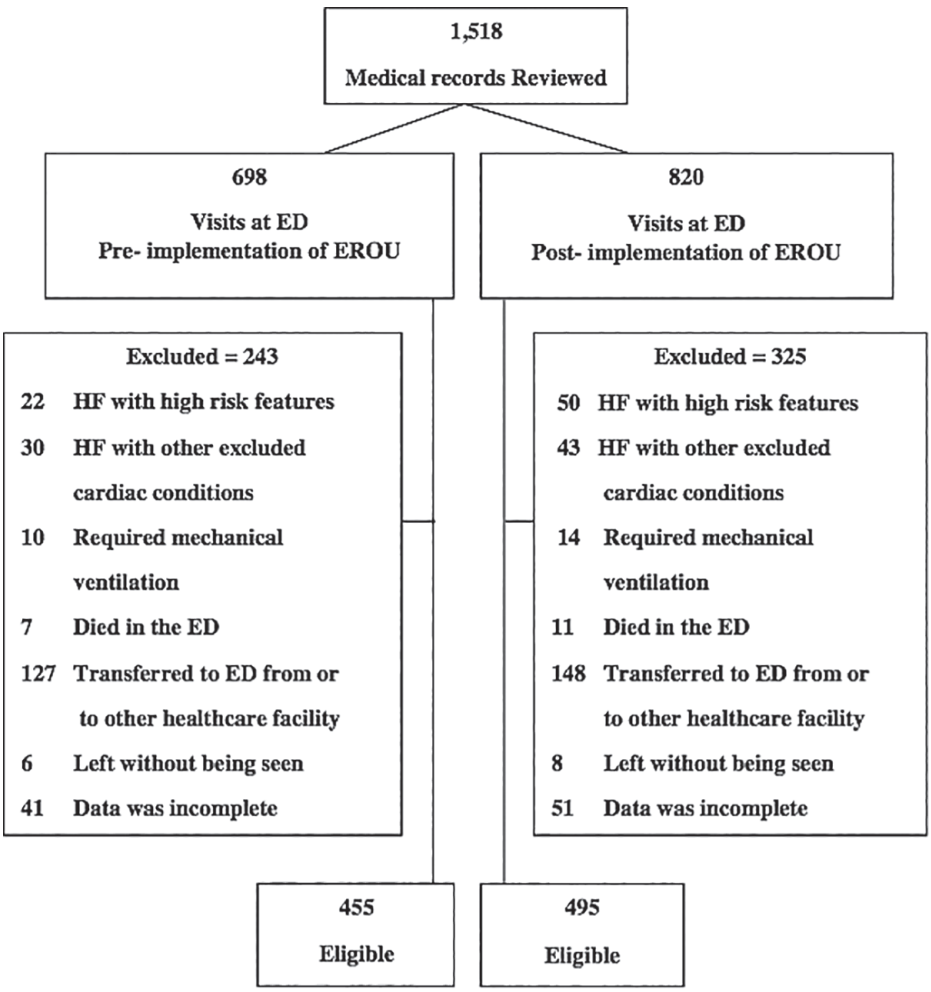

Figure 1 Flow Chart of the Patients in the Study.

Table 1 Characteristics of Patients at the ED Categorized by Pre- and Post implementation of the EROU.

Characteristics	Total (n = 950)	Pre-implementation of EROU (n = 455)	Post-implementation of EROU (n = 495)
Sex, n (%)			
Male	429(45.2)	210(46.2)	219(44.2)
Female	521(54.8)	245(53.8)	276(55.8)
Age (y), n (%)			
<60	270(28.4)	141(31.0)	129(26.1)
≥60	680(71.6)	314(69.0)	366(73.9)
Type of healthcare privileges, n (%)			
Social security imbursement/hospital employee	102(10.7)	25(5.5)	77(15.6)
Nonsocial security imbursement/hospital employee	848(89.3)	430(94.5)	418(84.4)
Risk stratification of HF, n (%)			
Low risk	654(68.8)	307(67.5)	347(70.1)
Intermediate risk	296(31.2)	148(32.5)	148(29.9)
Patient triage categories, n (%)			
ESI 1-3	915(96.3)	438(96.3)	477(96.4)
ESI 4-5	35(3.7)	17(3.7)	18(3.6)
Blood testing (round), n (%)			
1	541(56.9)	245(53.9)	296(59.8)
>1	409(43.1)	210(46.1)	199(40.2)

Note: EROU = Emergency Room Observation Unit; ESI = Emergency Severity Index.

After implementing the EROU, the mean EDLOS for HF patients of nonhigh risk decreased from 12 hours and 40 minutes (median 9 hours and 56 minutes) to 10 hours and 53 minutes (median 7 hours and 58 minutes) after EROU establishment (p = 0.004) (Figure 2). However, EDLOS was similar in patients admitted to the medical inpatient unit or discharged home between the pre- and post EROU periods. The comparisons are shown in Table 2.

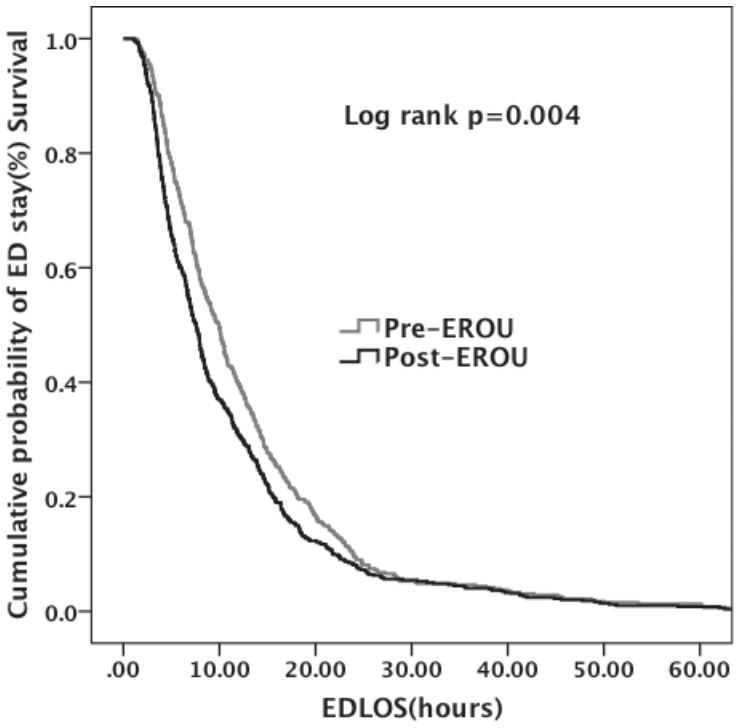

Figure 2 Kaplan-Meier Curves Compares the Probability of the Presence of the Patients in the ED over the Time of Stay among Overall Nonhigh Risk HF Patients between Pre- and Post EROU Periods.

Table 2 Comparison of Outcome Identified by Pre- and Post implementation of the EROU.

Outcome	Pre-implementation of EROU	Post-Implementation of EROU	p
Mean EDLOS (Median)			
Overall EDLOS (ED to discharge)	12 h 40 min (9 h 56 min)	10 h 53 min (7 h 58 min)	0.004[a]
ED to medical inpatient unit	12 h 7 min (7 h 38 min)	11 h 13 min (7 h 40 min)	0.47[a]
ED to discharged home from ED	12 h 57 min (10 h 33 min)	12 h 43 min (9 h 46 min)	0.62[a]
Rate of discharge from ED, n(%)			
ED to medical inpatient unit	147(32.3)	157(31.7)	0.85[b]
ED to discharged home from ED	308(67.7)	243(49.1)	<0.001[b]

Notes: ED = Emergency Department, EROU = Emergency Room Observation Unit, EDLOS = length of stay in Emergency Department, h = hours, min = minutes.

[a] by log rank test

[b] by chi square test

When considering only the post EROU period, identified types of discharge from the ED differed significantly regarding EDLOS ($p < 0.001$). Nonhigh risk HF patients admitted to the EROU group had the lowest of the mean EDLOS at 5 hours and 47 minutes (median 3 hours and 47 minutes), when compared with those discharged home and those admitted to the medical inpatient unit at 12 hours and 44 minutes (median 9 hours and 47 minutes) and 11 hours and 13 minutes (median 7 hours and 40 minutes), respectively. The comparisons are shown in Table 3.

Table 3 Comparison of EDLOS Identified Type of ED Discharge in Post implementation of the EROU Period.

Type of ED discharge	Total (n = 495)	Mean EDLOS (Median) (Hours)	p
ED to home (n, %)	243(49.1)	12 h 44 min (9 h 47 min)	<0.001
ED to medical inpatient unit (n, %)	157(31.7)	11 h 13 min (7 h 40 min)	
ED to EROU (n, %)	95(19.2)	5 h 47 min (3 h 47 min)	

p were obtained by log rank test where appropriate in EDLOS of the three types of ED discharge.

The proportion of HF patients discharged home decreased from 67.7% during the pre EROU period to 49.1% after establishing the EROU ($p < 0.001$) while the proportion of patients admitted to the medical inpatient unit were similar (32.3% and 31.7% in pre- and post EROU groups, respectively, $p = 0.85$). The comparisons are presented in Table 2.

Discussion

The observation unit represents an alternative of the dispositions from EDs for patients who present low acuity conditions requiring short term hospital care[12, 17-19]. The concept of the EROU facilitates the throughput and output processes because the ED usually encounters a shortage of inpatient beds resulting in overcrowding with patient boarding for hospitalization[14]. While related studies have focused on the front end of the ED visit to improve patient flow and decrease EDLOS[24, 25], the present study emphasized ED output to expedite ED discharge for nonhigh risk HF patients by EROU admission.

The present study found that overall EDLOS among patients decreased after implementing the EROU (Figure 2). Our finding is very similar to related reports[10, 13]. We also discovered that patients admitted to the EROU had the lowest likelihood of prolonged ED stay

compared with those discharged home or admitted to the medical inpatient unit during the establishment of the EROU (Table 3). These findings confirmed that implementing an EROU can shorten EDLOS that may potentially reduce patient complications originating from prolonged EDLOS and ED overcrowding. However, no difference was found in EDLOS. Moreover, patients in the ED probably stayed over the stated time guidelines, both those who were discharged home or admitted to the medical inpatient unit. This resulted because the patients boarding time for hospitalization to the medical inpatient unit or discharge home was constant when the ED physicians chose such dispositions for their patients regardless of EROU availability. This implied that EDLOS should be shortened when physicians switched their discretion to admit eligible patients to the EROU.

However, the percentage of nonhigh risk HF patients discharged home from the ED significantly decreased after implementing the EROU. This finding may suggest that physicians decided to divert their patients' who could be discharged home in the ED within 48 hours to be admitted for EROU observation to avoid premature release of patients who actually needed time to monitor a deteriorating condition. Reducing the home discharge rate of ED patients as an effect of using the EROU was not surprising and has been demonstrated in related publications[12, 26].

The likelihood of admission to the medical inpatient unit did not change after implementing the EROU. Our finding is very similar to a related report[27]. The consistency of the inhospital admission rate can be explained by the fact that patients also had other morbidities, e.g., acute coronary syndrome, significant renal insufficiency or concomitant infections, other than HF. Nevertheless, required admission long term to the medical inpatient unit requires full facilities regardless of EROU availability. However, some studies have found that EROU services could reduce the need for inhospital admission[11, 12, 26].

Limitations

Although a considerable numbers of patients were included in the study and this retrospective research was not affected by the Hawthorne phenomenon, it still contained some limitations. First, this study was conducted in a single, urban, tertiary-care teaching hospital. The results may not be generalizable to other centers that may have differing treatment practices, policies or resources. Second, accuracy of lapsed time determination, baseline categorization system and completeness of data was limited due to the retrospective nature of the study. Third, the "pre EROU situation" could have contaminated the post EROU period due to the limited number of beds and shortage of nurses that influenced the functional availability of the

EROU. Therefore, it may have affected the results. Lastly, although we believe that reducing EDLOS can relieve ED overcrowding that is generally accepted as a major risk factor of adverse events among ED patients, its role in improving overall quality and safety of patient care in a diverse range of heterogeneous diseases and a larger sample population remains unclear.

In conclusion, implementing an EROU could shorten the EDLOS among nonhigh risk HF patients. It may improve ED patient flow and reduce ED overcrowding. However, a future study is required to investigate its role in improving overall quality of patient care among other diseases and in a larger population.

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การลดระยะเวลาการให้บริการของห้องฉุกเฉินในผู้ป่วยภาวะหัวใจวายประเภทที่ไม่มีความเสี่ยงสูง ด้วยห้องสังเกตอาการในห้องฉุกเฉิน

จันทรา ไวยรัตน์[*] จารุวรรณ ธาดาเดช[**] ณัฐกมล ชาญสาธิตพร[***] ครองวงศ์ มุสิกถาวร[****]

บทคัดย่อ

การศึกษาครั้งนี้เป็นการศึกษาแบบย้อนหลัง เพื่อประเมินผลของค่าเฉลี่ยระยะเวลาการให้บริการและอัตราการจำหน่ายผู้ป่วยภาวะหัวใจวายประเภทที่ไม่มีความเสี่ยงสูง ก่อนและขณะมีห้องสังเกตอาการในห้องฉุกเฉิน เก็บข้อมูลด้วยแบบบันทึกข้อมูลจากเวชระเบียนผู้ป่วยนอกในผู้ป่วยหัวใจวายทุกคนที่มาห้องฉุกเฉินของโรงพยาบาลมหาวิทยาลัยแห่งหนึ่ง ตั้งแต่เดือนตุลาคม พ.ศ. 2553 ถึงกันยายน พ.ศ. 2557 ได้แก่ 1) ข้อมูลส่วนบุคคล 2) คุณลักษณะของการมายังห้องฉุกเฉิน และ 3) ระยะเวลาการให้บริการของห้องฉุกเฉิน กลุ่มตัวอย่างเป็นไปตามเกณฑ์คัดเข้า จำนวน 950 คน แบ่งเป็นกลุ่มก่อนมีห้องสังเกตอาการ (เดือนตุลาคม พ.ศ. 2553 ถึง กันยายน พ.ศ. 2555) จำนวน 455 คน และกลุ่มขณะมีห้องสังเกตอาการ (เดือนตุลาคม พ.ศ. 2555 ถึง กันยายน พ.ศ. 2557) จำนวน 495 คน วิเคราะห์ข้อมูลด้วยสถิติไคสแควร์ และ Log Rank พบว่าเมื่อมีห้องสังเกตอาการผู้ป่วยหัวใจวายนี้มีค่าเฉลี่ยระยะเวลาการให้บริการของห้องฉุกเฉินลดลงอย่างมีนัยสำคัญจาก 12 ชั่วโมง 40 นาที เป็น 10 ชั่วโมง 53 นาที ($p = 0.004$) และอัตราการนอนรอกลับบ้านจากห้องฉุกเฉินลดลงอย่างมีนัยสำคัญจากร้อยละ 67.7 เป็นร้อยละ 49.1 ($p < 0.001$) แต่อัตราการรับไว้ในหอผู้ป่วยในอายุรกรรมไม่เปลี่ยนแปลง สรุปได้ว่าการมีห้องสังเกตอาการสามารถลดระยะเวลาการให้บริการและลดอัตราการนอนรอกลับบ้านในห้องฉุกเฉินของผู้ป่วยหัวใจวายได้

คำสำคัญ: ระยะเวลาการให้บริการของห้องฉุกเฉิน, ระบบบริการห้องสังเกตอาการ, ห้องฉุกเฉิน, ผู้ป่วยภาวะหัวใจวาย

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[*] นักศึกษาหลักสูตรวิทยาศาสตรมหาบัณฑิต (สาธารณสุขศาสตร์) สาขาบริหารโรงพยาบาล คณะสาธารณสุขศาสตร์ และบัณฑิตวิทยาลัย มหาวิทยาลัยมหิดล

[**] ภาควิชาบริหารงานสาธารณสุข คณะสาธารณสุขศาสตร์ มหาวิทยาลัยมหิดล

[***] ภาควิชาชีวสถิติ คณะสาธารณสุขศาสตร์ มหาวิทยาลัยมหิดล

[****] ภาควิชาเวชศาสตร์ฉุกเฉิน คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย